USER CENTERED DESIGN METHODS USED BY GRADUATED STUDENTS FROM REYKJAVIK UNIVERSITY

Research report
Helena Sif Magnúsdóttir

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B.Sc. Computer Science

Supervisor: Marta Kristín Lárusdóttir
Examiner: Yngvi Björnsson

T-619-LOKA
School of Computer Science

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ABSTRACT

This report describes the results of a research regarding User Centered Design methods used in the Icelandic software industry in 2011. The participants are computer scientists, software engineers and IT managers that did graduated from Reykjavik University in 2005 to 2010.

An online survey was sent out to all of the respondents where the respondents were asked to describe what background they have in using UCD methods; how often they use the methods, and where do the users come from that take part of the software development. Furthermore, the respondents are asked about the education they got in using UCD methods and also how useful the education in Reykjavik University has been in their work.

The respondents' experiences are mostly from the education they got from Reykjavik University, and from work. *Meetings* are the most popular method used in software development projects today, and are *Meetings* most often used once a week. The customers participate in *Meetings* in rarely half of the time. The methods that also scored high in the survey were *Interviews* and *Low-fidelity prototypes,* but the methods that got a bad review, and are the least used, are *Questionnaires* and *Personas*. In most of the methods, besides from *Interviews* and *Questionnaires*, the software company's employees are the user who evaluates the software. Half of the respondents are using Scrum in their projects, and are over 60% using some kind of the Agile methodology. Results points out that most of the respondents want to use the User Centered Design methods more often in the software development they are working on, and/or introduce these methods to their company. The respondents are usually satisfied with the education they got but still want to learn more about these methods and get a deeper understanding by using them.

SAMANTEKT

Þessi ritgerð fjallar um niðurstöður rannsóknar á notendamiðaðri hugbúnaðargerð í íslenskum hugbúnaðariðnaði 2011. Þátttakendurnir eru tölvunarfræðingar, hugbúnaðarverkfræðingar og kerfisfræðingar sem eru útskrifaðir frá Háskólanum í Reykjavík frá árinu 2005 til 2010.

Gerð var spurningakönnun á netinu og voru þátttakendurnir beðnir um að lýsa því hvaða reynslu þeir hafa á notendamiðuðum aðferðum, hversu oft þeir notast við þær og hvaðan notendurnir koma sem koma að gerð hugbúnaðarins sem þeir vinna að. Einnig eru þátttakendurnir spurðir hvaða menntun þeir hafa fengið í notendamiðuðum aðferðum og hvernig námið í Háskólanum í Reykjavík hefur nýst þeim í starfi.

Reynsla þátttakendanna einkennist helst frá námi sem og vinnu. Aðferðin *Fundir* er mest notuð í hugbúnaðarverkefnum í dag og eru *Fundir* oftast haldnir einu sinni í viku. Viðskiptavinirnir taka þátt í *Fundum* í tæplega helming tilfella. Þær aðferðir sem fengu einnig góða dóma eru *Viðtöl* og *Grófhönnunarfrumgerðir* en þær aðferðir sem fengu lélega dóma og eru sjaldnast notaðar eru *Spurningakannanir* og *Persónur.* Í flestum aðferðunum, fyrir utan *Viðtöl* og *Spurningakannanir*, eru það starfsmenn hugbúnaðarfyrirtækisins sem taka þátt sem notendur við prófun hugbúnaðinum. Helmingur þeirra sem svara könnuninni nota Scrum aðferðafræði í sínum verkefnum, og eru yfir 60% sem nota einhverskonar Agile aðferðafræði. Niðurstöður sýna að sumir þátttakendur vilja nota meira og/eða innleiða notendamiðaðar aðferðir í þróunarverkefnin sem þeir vinna að. Þátttakendurnir eru yfirleitt ánægðir með námið sem þeir tóku en vilja kynnast þessum aðferðum meira og fá dýpri skilning á þeim.

1 INTRODUCTION

This report describes and discusses the results of an online survey regarding User Centered Design methods, conducted in March 2011. The purpose of this study is to examine how computer scientists, software engineers, and IT managers, graduated from Reykjavik University, are using their knowledge they've gained by using User Centered Design methods to evaluate software in the software development process. In addition, this report shows which of the successful methods are taught in Reykjavik University.

In recent years, software development has grown in Iceland. People are getting more aware of the profession Usability Specialists, and that usability helps software to sell better (Bygstad, Ghinea & Bervik, 2008). But how do software developers understand User Centered Design methods in general? Are software developers using their own methods, which may be put together with pieces from well-known and formal methods, or are they using only formal and strict methods from the start and to the very end of their projects? Furthermore, are those methods, which stand out, taught in the Reykjavik University or are the developers taking special User Centered Design methods classes elsewhere?

In the early 1980, Icelandic software companies emerged. Throughout the next decade the industry grew while the computers became more common as an office tool. The development was in everything from office applications to food processing and metal industry. Studies have been done in several countries to collect the information on how developers use methods for involving users in the software development. When the results are compared, it shows that the emphasis on using User Centered Design methods is quite different between countries. I will compare few questions with other similar questions from other studies.

In recent years, software testing and evaluation has gained more respect in Icelandic software developing companies. This has started because organizations have been adopting the ISO 27001 standard (Bjarnadóttir, 2009). In 2009, students in Reykjavik University did a study on User Centered Design methods and a study like that had never been done before. I am doing focusing only on people graduated from Reykjavik University. I will get more understanding in how and what methods are mostly used and will only focus on UCD methods.

Never before has a survey been conducted that measures how good the education at Reykjavik University is, by the assessment of graduated students from the School of Computer Science. Furthermore, in this survey, the respondents all have a similar background such as; they have all taken courses like Human Computer Interaction and Software Engineering in the last 8 - 10 years, and respondents all graduated in the years 2005 – 2010 from the School of Computer Science. Therefore, this survey is a great valuation on the teaching, moreover the valuation on the UCD methods that are used today in the software development in Iceland.

In addition, the idea for this research topic came from taking the courses Software Engineering and Human Computer Interaction in Reykjavik University. After taking these courses I noticed the ideas of usability testing had to be more discussed and known in the software industry in Iceland and I wanted to be a part of that wave. Errors, and failures should be detected before the project gets too extensive and they get too hard to handle (Ammann & Offutt, 2008). Furthermore, testing is necessary because we all make mistakes.

I learned to use all kind of User Centered Design methods to evaluate software, while getting the user's requirements fulfilled. The number one question that lead to this research report was; are graduated people, from Reykjavik University, actually using these User Centered Design methods, and if so, how are they using them?

To summarize, the research questions are:
- What User Centered Design methods are being used?
- How do the respondents rate the methods they have used?
- How frequently are the methods used?
- Are users involved while using the methods?
- Did the respondents get enough preparation to use the User Centered Design methods at Reykjavik University?

This paper is structured as follows. In section 2, I have the research background and other studies on UCD methods. In section 3, I describe my method for creating the online survey, how the respondents were chosen, respondent's backgrounds, how a survey should be created and the responses gotten in the survey. In section 4, I present my results for the survey, which is followed by section 5, where I discuss my findings. In section 6, I discuss future work.

2 BACKGROUND

Theoretical background is imposed on UCD methods in this chapter. The first is the definition on UCD methods and related researches.

2.1 UCD Methods

User Centered Design is a process in which the users of a product are given a great attention to each state of the design process to tell their needs, wants, and limitations. UCD is an approach to software development that helps not only the IT workers, but also the users of business and home software (Stone, Jarret, Woodroffe & Minocha, 2005).

User Centered Design methods puts the intended users at the center of the development and design by talking directly to the user. Users are involved at every key points in the project, to make sure the software will deliver the customer's requirements (Webcredible, 2006). This process helps software developers to fulfill the goal of a project, while the users requirements are considered right from the beginning and included into the product cycle.

User Centered Design methods can be used in three different stages in the software development. Some can be used in the software analysis, others in the design of the software, and yet another in evaluating the software. Another methods can be used in all of these stages. For example, low-fidelity prototypes are used in the software design stage while the *Think Aloud* method can be used when an evaluator is evaluating the lo-fidelity prototype and a user is there to assist the evaluator. *Think Aloud* can be used in both software design and testing.

There are some difficulties in estimating User Centered Design methods for their cost-effectiveness, and because of that, and the diversity of UCD methods, planning usability activities can be a hard task. In the last NordiCHI, which was held in Reykjavík in 2010, a study was made which describes the Usability Planner, a tool to support the selection of UCD methods. The tool also estimates the relative costs benefits of applying usability methods at different stages. This tool was released as contribution from the authors to support UCD methods and therefore an open source system (Ferre, Bevan & Escobar, 2010).

2.2 Studies on UCD Methods

Reports have been made on User Centered Design methods, but they are mostly from the US. To name a few Rauch and Wilson made two reports, with UPA members in 1993 and in CHI 1994. They both revealed that usability testing wasn't popular among computer scientists or engineers. Vredenburg continued the study on CHI'2000 and among UPA members (Vredenburg,

2002). There was the first sign of User Centered Design (UCD) methods were going to be a big help in software development and gaining impact in industry.

Rosenbaum defined in her report (Rosenbaum, 2000) the barriers to strategic usability including, resource constraints, resistance to User Centered Design methods, lack of understanding of the usability concept, and lack of trained usability experts. Rosenbaum found that informal, low-cost, UCD methods, were used a lot but ranked less successful than more expensive methods.

A survey was made in 2003 about exploring where and how usability specialists are working in Sweden (Gulliksen and more, 2004). The survey was handed out to people whom were mostly computer scientists or engineers. The importance of some key factors for usability testing was evaluated. The results were in this order: 1) the usability should be a part of the project from the start, 2) support from the project management, 3) support from management, 4) support from users, and 5) acceptance from the software developers.

In the same survey people answered questions about what usability methods worked best for their projects. About 47% answered low-fidelity prototyping was the very best method. When adding *very good* and *fairly good,* the number one method was think aloud, low fidelity was second, and next came interviews, field studies and scenarios. What came out to be the worst method were personas, but only 12% thought it was a very good method.

Very few researches have been conducted on the use of UCD methods in Iceland. Two students at Reykjavik University in 2005 used contextual interviews to gather data from seven companies. Their main purpose of the report was to know how user interaction is during the software development to increase usability in the software. Their results were that Icelandic companies collaborate with the users through meetings and altogether a lack of knowledge of UCD methods (Jónsdóttir & Ísleifsdóttir, 2005).

Again in 2009, 2 students studied User Centered Design in the software industry in Iceland. They made an online survey, which they sent to large number of people who were somehow involved in the software development industry. The survey reached approximately 300 target respondents and 85 responded, so they estimated that approximately 30% of the people contacted responded to the survey. What came out of the online survey was that Scrum respondents seem to include users less and in fewer phases than in the other processes. Also the survey showed us that questionnaires or surveys are the least used method and meetings are the most used in involving users (Mikkelsen & Haraldsdóttir, 2009).

3 METHOD

This chapter is about the method used to gain information for the research. First there is the selection of respondents and background, and then there is the creation of the online survey that is followed by a description about the responses from the survey.

3.1 Selection of Respondents

The first method that was used to research the UCD methods was an online survey, which was sent out on the March 9th, to 402 people who graduated from Reykjavik University in Computer Science, Software Engineering or with an IT diploma from 2005 to 2010.

At the beginning of this research progress, I got a list from the Reykjavik University, which contained all graduated students from their Computer Science Department. The list included 1250 names, home addresses and graduate year, but no e-mail addresses. Therefore I had no other choice than send a letter to their home address. After a talk with my supervisor and the department's administrative director, we came to the conclusion that I should sent it to people who graduated in the last 5 years.

One of the main focuses of this study is to compare the use of the User Centered Design methods, and see if they had been taught in Reykjavik University. In the last 5 years, there has been a huge increase in the software development in Iceland. New methods are gaining popularity. Therefore, new methods need to be taught while other methods are taken out of the syllabus. The graduated people from the last 5 years are the best fit, I think, that can answer the survey in the most significant way possible.

A formal letter was written and sent out to the respondents, where they were informed about the resource paper I am conducting, and they were asked to go on the survey site to participate in the survey. See figure 5.

3.2 Background of the Respondents

All of the respondents have a degree from Reykjavik University and have a similar background when it comes to comparing core courses they must have taken to graduate. A few of the respondents have taken M.Sc. degree and gotten their knowledge in Software Design and using User Centered Design methods as turns out in the results chapter.

Here is the background you get by studying B.Sc. in Computer Science and Software Engineering, and a Diploma in IT Management:

B.Sc. degree in Computer Science

Students need to complete 180 ECTS in order to graduate with a B.Sc. degree in Computer Science, 120 ECTS credits of which have to be selected from within the School of Computer Science, including all core courses. See core courses in table 6.

B.Sc. in Software Engineering

Students need to complete 180 ECTS in order to graduate with a B.Sc. degree in Software Engineering, 132 ECTS are core courses. Software engineering is an interdisciplinary study, which combines technology and engineering. Students are allowed to take 30 ECTS credits within the School of Computer Science and in the School of Science and Engineering and 18 ECTS credits in pure electives. See core courses in table 7.

IT Manager Diploma

Students need to complete 120 ECTS, thereof at least 108 ECTS from the School of Computer Science, including all core courses. All students have got 12 ECTS credits in pure electives. See core courses in table 8.

Software Requirements and Design is a core course in every program. Before 2010, Software Design was a stand-alone course and had been taught by Marta Kristín Lárusdóttir since 2000. In 2010 the Human Computer Interaction course was combined with Software Requirements. Every graduated student from Reykjavik University, with a degree in Computer Science or Software Engineering has taken a course Human Computer Interaction, taught by Marta Kristín Lárusdóttir. For more insight in the Software Design, students can take an elective course in User Centered Design, which is also taught by Marta Kristín Lárusdóttir.

In the Software Design part of the course are taught the fundamentals of design on the part of the computer system relating to users. User group analysis and how users and their projects are described is taken in details. Design is taught based on user's projects at various stages of the software development, from sketches to an interface done in a programming environment. Testing of interfaces with an emphasis on how easy it is for users to solve problems with their software. It is emphasized that students learn to use one method for each stage of interface design and more familiar methods.

3.3 The Survey

The survey was created in QuestionPro, which is online survey software. Respondents were asked to go to the link http://survey.helenasif.is and then they were moved automatically to the questionpro.com site.

The survey included 38 questions, which were divided into 19 multiple choice and 17 open-ended questions. The survey was made from a combination of questions from other researches and questions that I came up with my self and wanted answers to.

The questionnaire contained number of questions on:
- The respondent's background and experience.
- Their job: title, environment and tasks.
- Type of company's industry.
- Their experience with UCD methods.
- If and when they include users and how they are selected.
- Usability and its importance for the success of the software.

When asking about the User Centered Design methods, a short description was in the survey so there wouldn't be any misunderstanding about the methods. The methods are described in the appendix.

UCD Methods I focus on in this research are: *Interviews, Questionnaires, Personas, User Stories, Scenarios, Low- fidelity prototypes, High-fidelity prototypes, Meetings,* and *Think Aloud method*.
These specific methods were chosen because most of them are taught in Reykjavik University, and are the respondents likely to know them. All but *User Stories*, which is taught in Software Engineering, and *Meetings,* is taught in the Human Computer Interaction, which is now called Software Requirements and Design. The *Meeting* method was chosen because it is the most used method in every study that has been done in Iceland regarding User Centered Design Methods.

I also had the ability to ask the respondent to answer the same questions about other User Centered Design methods that they know, and possibly use. Some may send Beta version of the software to users and ask if they can write comments on how easy it was to use the software. Also there are more informal tests than *Think Aloud* method, where there are no determined tasks to resolve and users are asked to review the software and give some feedback.

Two weeks after the first letter that was sent out, on the March 9th, 10 % had completed the survey. A lot of them came 2 days after the letters went to the post-office. Nine of the respondents were willing to let me take an interview with them regarding this study. A week

from the March 9th, the numbers of new respondents that had completed the survey reduced substantially. But after the second letter that I sent out, as a reminder, the number of respondents increased up to 20% and on the April 1st, which was the last day the survey was open the respondents were 26%, or to be precise 105 total respondents. I got 16 letters back, market as the respondents had gone away or not registered on the mailbox.

3.4 Creating a survey

Surveys are useful to collect data from a large number of people, but are not suitable for getting detailed data.

The population is critical when creating a survey. If the population for a survey is not easily well defined the result can be diverse (Lazar, Feng & Hochheiser, 2010, p.103). For this specific research, all of the students graduated in the years of 2005 to 2010 were chosen and was no need for random sampling, like is normally preferred.

Developing survey questions can be challenging. Open-ended questions are useful in getting a better understanding, because they give complete flexibility in their answers. On the other hand, open-ended questions must be carefully worded, if not, they may lead to responses that don't really help the research, or they don't give enough information. Closed-ended question, also called multiple choices, has two types of questions; ordered response, for instance, using a scale such as "strongly agree to strongly disagree", and unordered. (Lazar, Feng & Hochheiser, 2010, p. 111-112).

The overall structure of the survey is as important as well written questions. A survey must begin with instructions, and every section should be given an appropriate heading. It is critical to have as much white space, so the respondent does not feel overwhelmed by the amount of information on each page (Lazar, Feng & Hochheiser, 2010, p.113).

In this project the above instructions were carefully followed.

3.5 Responses

Responses were 105 total, that is, some respondents didn't answer all the questions, and the average of answers per question was 94. This gives 26% of the graduates answered the online survey. The respondents were 73% male, and 27% females, 59% of them were between 30 – 39 years old, 18% were between 20 – 29 years old, 18% between 40 - 49 years old, and 5% were older than 50.

According to the address list, the best participation came from the graduated year of 2007 where 31% of the graduates from that year answered the survey, next was the class of 2010, with 23% responses. The same percentage, 21%, of the survey responses graduated in 2005 and in 2007, as shown in table 1, but table 2 shows that only 18% of the class of 2005 answered the survey.

Nine percentages of the responses came from respondents graduated in 2011, 2004, 2003 and 2002, which probably is because of a failure in the address list I got from the school. I kept the answers from those respondents in the results.

Table 1 – Graduation year
Question 22. What year did you graduate?
This table points out the graduation year of the respondents that answered the online survey.

Year	Responses	Percentage of responses
2002	1	1%
2003	1	1%
2004	4	5%
2005	17	21%
2006	9	11%
2007	17	21%
2008	10	12%
2009	6	7%
2010	14	17%
2011	2	2%

Table 2 – Percentage of the graduate students per year
This table shows the responses from each graduate year and the percentage that responded the online survey.

Year	Responses	Graduate students	Percentage of responses
2005	17	95	18%
2006	9	69	13%
2007	17	54	31%
2008	10	63	16%
2009	6	74	8%
2010	14	62	23%

What is disappointing in these responses is that there is huge difference between graduate years and that does not give the best overall result. On the other hand, the three highest percentages of responses are spread among the years of 2005, 2007 and 2010. These results can be significant enough for the School of Computer Science when estimating the education they have to offer.

About 200 people started the survey, which leaves us with 95 who didn't complete it. Some of those who didn't answer all the questions, wrote that they were not good respondents because they didn't work in the software industry, and therefore they couldn't answer those questions I laid on to them. I got 16 letters back, market as the respondents have gone away or didn't have their name registered on the mailbox.

Most of the respondents who completed the survey, or 80%, graduated with a Computer Science degree, and 77% of them with a B.Sc., others with M.Sc. or a Diploma of some kind.

4 THE RESULTS

This chapter describes the results from the online survey. The chapter starts with describing respondent's work environment, then the quality in the software the respondents have been working on. Next is described how the respondents rated the User Centered Design methods, which is followed by the education the respondents got in Reykjavik University and elsewhere.

4.1 Respondent's Work Environment

When asked about their work responsibilities, respondents could choose more than one option. Most of the respondents work in programming, or 22.2% and next comes design with a 17.1% response.

Figure 1 – Work responsibility

Question 2. What is your work responsibility? (Choose what defines your job the past 3 months. You can choose more than one option).
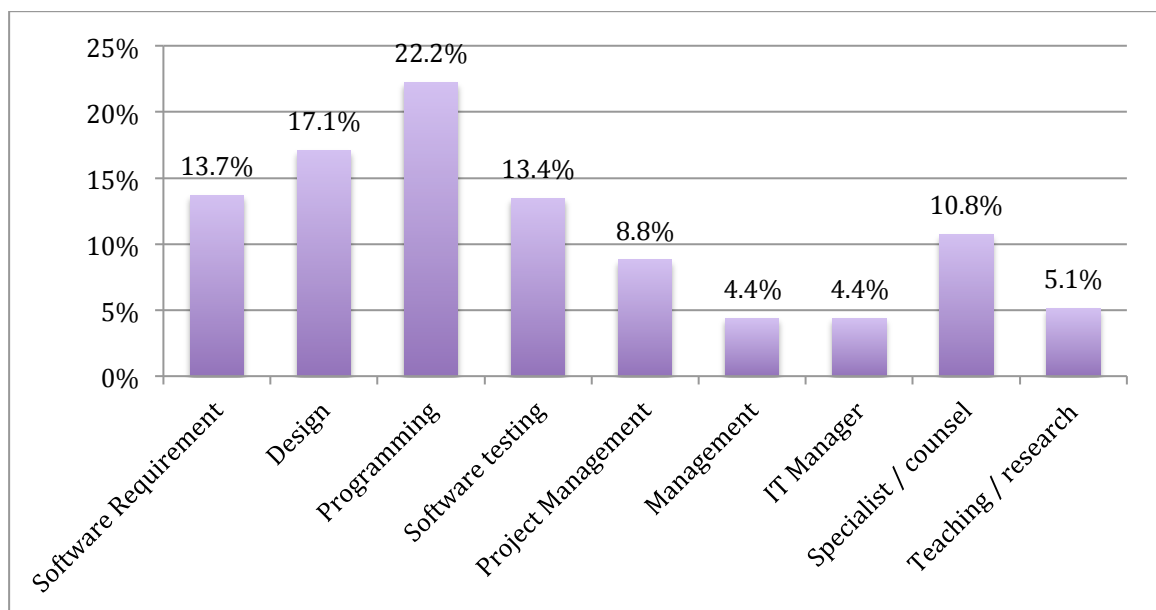
Employee count is very scattered, and did the respondents answer that 30% have 51 - 250 employers, which is classified as a medium enterprise by the SME standard, roughly 29% have 251+ employers, which is a large enterprise, and slightly 28% answered that they have 11-50 employers, which is classified as a small enterprise. The last 12% have 1 - 10 employers, and that amount of employers is classified as an extra small enterprise. That shows that, in a very roughly estimate, about one third work in a small or extra small company, one third in a medium company and one third in a large company. When asked about how many of the employees

worked in software development, 38.8% said that only 0 - 20% employers worked in the software development. In 41.5% cases, the company is based in one location, and in 2 - 4 locations in 34.6%, 10.8% in 5 - 9 locations and 13,1% in more than 9 locations. The companies running in more than 9 locations are mostly banks.

In order to get clear answers about what User Centered Design methods are being used, the questions were focused on a project they were working in the most the past 3 months. Before asking about that one project, a question was about how many projects the respondents were working on at the same time, the last 3 months. Slightly more than 42% worked on 5 projects or more at the same time, 5.6% worked on 2 – 4 projects and only 12.3% only worked on a one single project at a time.

When asked about the project the respondents have been working in the most, the past 3 months, many different answers came up. This was an open question with a comment box. Most of the projects, 37.5% of those who answered the question, were working on business related software. About 10.4% were working on a web related project, and in third place with 8.3% were both data and game related projects. Other responses were; school system, maintenance of older software, airline projects and many more.

Figure 2 – Type of software development

Question 8: What type is the software you have been working on the most, the past 3 months? (For example; Game, Business, Communication, …).
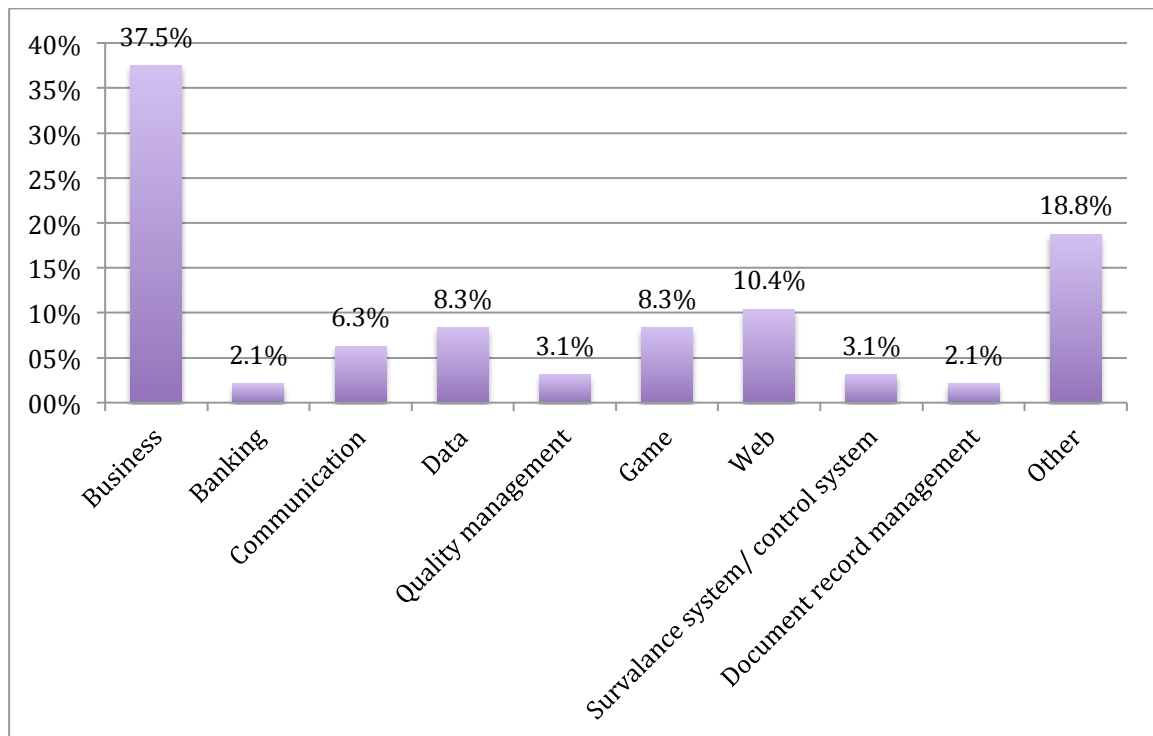
A large fraction, 48% of the respondents, is using Scrum as their project management style. See figure 4. The respondents who checked with Scrum also said that Scrum worked like a charm, it was a way to get people to stand up from the computer and talk together about the project.

Most respondents said that it took a while to get the method to work, and it doesn't work with little projects, which is well known and Scrum is not made for that kind of projects. Scrum is more common in the larger companies. Most of the respondents who checked with "other", said they are using, and/or have used, Kanban. Precisely 50% of the respondents said the company they were working for had 5 – 9 persons in a team, which can be linked directly to the Scrum answers, and 32% have 1 – 4 per team.

Figure 3 – Methodology for PM

Question 9. What methodologies for project management have been used in the project you have been working on the past 3 months? (You can choose more than one thing).
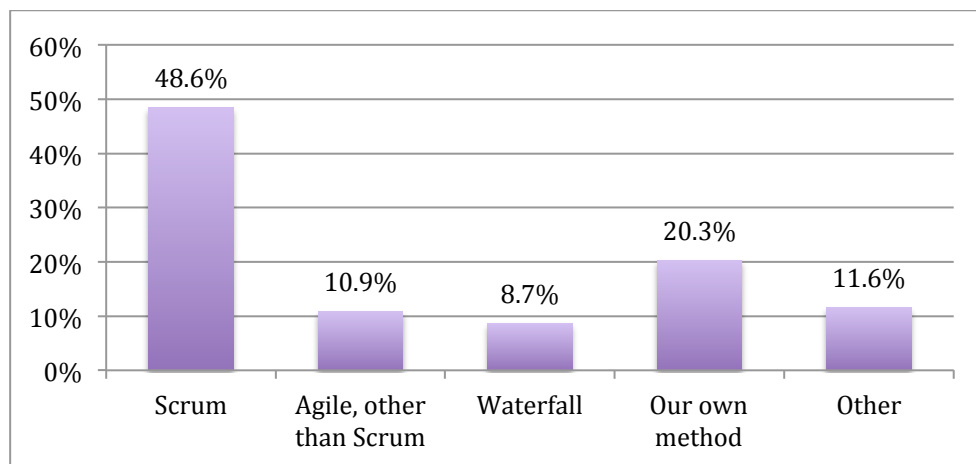
When asking about if the software the respondents were working on was either *Custom made* or *Commercial off the shelf*, 56.8% said it was a pure custom made product but 28.9% said *Other* and wrote an explanation. Half of those who said *Other,* said it was a combination of both, others said it didn't apply. This question was followed by the question about if the users/customers had a choice to use other software than the one the respondent is working on. It was nearly a tie, 43.6% said *no* and 41.8% said *yes. Other* said 14.6% and they explained that it didn't apply too their project or it was a combination of *yes* and *no*. Often it is a strict policy for the company itself to use only this product/software, when other users/customers can choose between few options. In the game industry people can play other games, but they aren't comparable with the one the respondent are making.

The companies that have been using Scrum for a while are at most part satisfied using only Scrum, and no other method to contact the customer other than meetings and interviews, while others talk about that the pure Scrum methods do not work because there isn't suppose to be a specific programmer and a specific tester. There are only software developers that do both programming and testing. Not everyone are meant to do great tests, and they need a special education, and/or experience. When there is a specific testing team, the project team is more likely to make successful software that needs little improvement after publishing. When people combine Scrum with some of the User Centered Design methods, such as *Personas* and *Think Aloud*, some projects are more successful than the others that only have a meeting with the customer after each sprint. In companies that have higher work ages, it is more likely to be a challenge to introduce new methods.

Respondents are mostly satisfied using the methods they are using at the moment, but all the criticism is about using Scrum more, and in all the stages in the projects. Furthermore, some people added that they wanted to use more of the User Centered Design methods because it would increase the quality of the software, but the problem is that the companies aren't always willing to change the methods they are used to.

4.2 Software Quality

Vredenburg did a study where the respondents were asked to describe a few quantitative and qualitative measures of the effectiveness of UCD methods, applied in their company. (Vredenburg, Mao, Smith & Carey, 2002). What Vredenburg and co. were looking for was the change in these measureble aspects. What I did in my survey was to take these aspects and ask about what the respondents thought was the major role in the project they had been working on the past 3 months. I asked about 6 out of ten aspects Vredenburg asked about and choose them from the frequency they got in Vredenburg's questionnaire. Customer's satisfaction, easy to use and reduced helpdesk calls got the highest scores, and that matches Vredenburg's answers.

Customer's satisfaction is the main goal for most of the respondents, but it was very close to *fewer problems while using software*, and after that came *the software is easy to use.* In other, people said the security and reliability was number one, because they work with personal data and calculations. The people who work in the game industry agreed on that the game had to be both fun and addictive. See Figure 5.

Figure 4 – Major roles in the project

Question 12. Which of the following issue do you think is the major role in the project you have worked the most on the past 3 months? (You can choose more than one option).
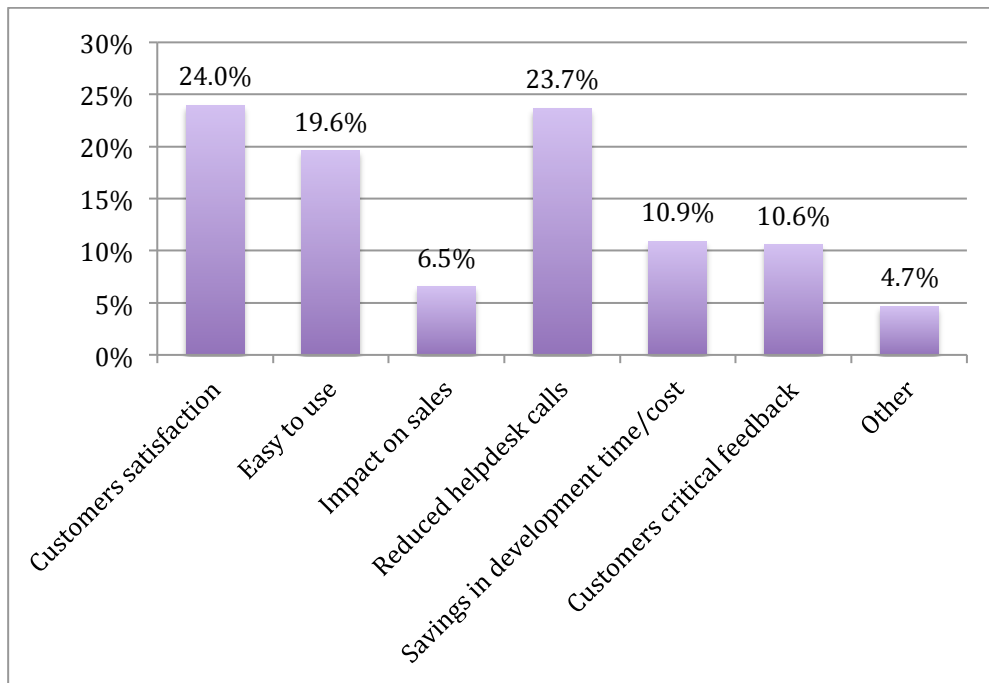
The ISO 9126 standard (ISO, 2001) is used to rate software quality and it is defined by *Reliability, Portability, Usability, Efficiency, Maintainability and Functionality.* The characteristics are described in table 3.

Table 3 – ISO 9126

Characteristics	Explanations
Reliability	The efficiency of software to manage its level of performance under certain conditions.
Portability	The competency of software to be transferred between environments.
Usability	The efficiency of software to be usable by an individual estimate.
Efficiency	The level of performance of software plus the resources used under certain conditions.
Maintainability	The efficiency of software to make specified modifications.
Functionality	The efficiency of software to endure a set of functions under certain conditions.

The respondents were asked to rate the quality of the project they had been working on the last 3 months by the ISO 9126 standard. The result displays the *Reliability* of software scored highest

with 71.8% in 7, where 7 is the highest. Hildur B. Vernudóttir did a study on Use of Free and Open Source Software by Icelandic Software Developers (Vernudóttir, 2010) and asked the interviewees to rate the quality of Free and Open Source software products by the ISO 9126 standard. The result she got displayed that *Reliability* scored highest, and *Portability* scored lowest. Those answers were about Open Source Software while in this study I asked about the project the respondents had been working on, which may have been an open source software or not. This shows that software developers have it in common that they want the software to be reliable. *Usability*, *Efficiency* and *Functionality* also scored high, but all under 50%, which is not a clear sign of that is what most people want to have in their software.

Table 4 – Quality of the project
Question 13. What quality characteristics do you think is most important in the project you have been working on the past 3 months, on the scale 1 - 7? (1 = least important, 7 = most important).

Characteristics	1	2	3	4	5	6	7
Reliability	2,7%	0,0%	0,9%	2,7%	7,3%	14,5%	**71,8%**
Portability	15,6%	18,3%	12,8%	**20,2%**	16,5%	9,2%	7,3%
Usability	2,7%	1,8%	4,5%	4,5%	15,5%	25,5%	**45,5%**
Efficiency	2,8%	2,8%	2,8%	9,2%	21,1%	21,1%	**40,4%**
Maintainability	2,8%	2,8%	8,3%	11,9%	22,9%	**26,6%**	24,8%
Functionality	1,8%	0,9%	4,5%	9,1%	14,5%	21,8%	**47,3%**

When asked about if there were anyone responsible regarding the usability of the software, which is made in their company, many different answers came up. People mentioned that the responsibility was with the testers, product owner, scrum master, division manager, or someone else in charge of the project team. Others said they did not have anyone responsible for the software to be easy to use, and most of them said they needed one. Some answered that the programmers all agreed to have the software easy to use, and someone added that wasn't working well enough. Someone needs to be in charge.

It is common that companies have no measurable requirements that say if the software is easy to use or not. Some respondents talked about a time requirements and the customer's approval. In the game industry it can be measurable to see how far along a player can go in a game, how long it takes him and how enjoyable it was to play the game. Bigger companies, like Microsoft, have a very strict testing process, which includes all kinds of measurable tests.

4.3 Rating the UCD Methods

After taking the answers out that said *Never Used the Method*, I scaled the answers to the number of respondents who answered they had used the method. *Meetings* came out to get the highest score in have been used and *Personas* got the lowest score. Other methods are being used in some cases, but 30 responded they have never used another method beside from the list of methods that was given.

Table 5 – Number of respondents that have and have not used the methods
The bolded numbers are the highest numbers in have used *and* never used *column.*

Methods	Have used	Never used	Didn´t answer
Interviews	67	19	19
Questionnaires	50	36	19
Personas	46	**40**	19
User stories	73	13	19
Scenarios	72	13	20
Low-fidelity prototypes	68	17	20
High-fidelity prototypes	55	29	21
Meetings	**81**	5	19
Think aloud	51	35	19
Other	52	30	23

When looked at the percent of each method been used, it shows that the *Interviews* and *Meetings* are the top best working method the respondents are using. *Interviews* have 40.3%, while *Meetings* have 40.7% in *Working well*, but the *Interviews* has a 32.8% in *Working really well*, which is the highest score in *Working really well*. The respondents are satisfied with *Questionnaires* and *Personas*, but are leaning towards the *Doesn't work well* option. Both *Low-fidelity* and *High-fidelity* prototypes are working well, and also the *Think Aloud* method.

Table 6 – Methods the respondents have used
The bolded numbers mean the two highest scores and the red numbers mean the highest score.

Methods	Doesn't work	Doesn't work well	Works OK	Working well	Working really well
Interviews	3.0%	4.5%	19.4%	**40.3%**	**32.8%**
Questionnaires	10.0%	**34.0%**	**38.0%**	12.0%	6.0%
Personas	13.0%	**21.7%**	**32.6%**	17.4%	15.2%
User stories	5.5%	8.2%	19.2%	**35.6%**	**31.5%**
Scenarios	5.6%	5.6%	**30.6%**	**34.7%**	23.6%
Low-fidelity prototypes	5.9%	5.9%	**25.0%**	**38,2%**	**25.0%**
High-fidelity prototypes	7.3%	12.7%	**25.5%**	**29.1%**	**25.5%**
Meetings	0.0%	7.4%	**25.9%**	**40.7%**	**25.9%**
Think aloud	5.9%	15.7%	**25.5%**	**31.4%**	21.6%
Other	1.9%	7.7%	**36.5%**	**32.7%**	21.2%

When the answers to the question about how frequently users have been a part in these methods that are being used are looked at, a very similar percentage is in the highest scores in every method, or about 29% to 39%.

Highest score in rating and is used the most often once a week, are *Meetings.* That method have never been taught in Reykjavik University, or never even mentioned as a way to reach the user in the software development. *Interviews* are more common as a User Centered Design method, and score a high rate from these respondents, but are not used as often as *Meetings* are. *Questionnaires* are not getting a high score, and that is probably because of that, not being used often. Same story can say about *Personas*.

Table 7 – Respondents' frequency of using the methods
The bold numbers mean the highest scores.

Methods	Once a week	2 – 3 times a month	Once a month	2 – 4 times a year	Once a year or less
Interviews	12.5%	**30.4%**	**30.4%**	19.6%	7.1%
Questionnaires	0.0%	10.7%	10.7%	**39.3%**	**39.3%**
Personas	11.5%	15.4%	11.5%	**30.8%**	**30.8%**
User stories	11.5%	**28.8%**	25.0%	21.2%	13.5%
Scenarios	9.4%	18.9%	28.3%	**32.1%**	11.3%
Low-fidelity prototypes	3.8%	17.0%	30.2%	**37.7%**	11.3%
High-fidelity prototypes	7.5%	12.5%	**30.0%**	27.5%	22.5%
Meetings	**30.0%**	28.6%	25.7%	10.0%	5.7%
Think aloud	6.5%	22.6%	16.1%	**29.0%**	25.8%
Other	10.8%	27.0%	18.9%	**37.8%**	5.4%

The respondents were asked about what group the users usually came from when they are apart in using the User Centered Design methods. The only method that had a clear saying that the user are usually the customers, with total 39%, was *Interviews.* Surprisingly enough, company's employees got 29%. All other methods had the highest score in using the companies' employees as users for evaluating the methods. See table 8 on the next page.

Table 8 – Groups that users belong to
Question 21. If the users have participated while using these methods, from what group do they come from? (You can choose more than one option).

The bolded numbers are the highest percentage when someone participates in these methods.

Methods	Do not participate	Company's employees	Customers	Friends	Other
Interviews	26.3%	29.5%	**39.0%**	5.3%	0.0%
Questionnaires	64.1%	16.7%	**19.3%**	0.0%	0.0%
Personas	63.6%	**23.4%**	10.4%	1.3%	1.3%
User stories	31.1%	**41.1%**	23.3%	4.4%	0.0%
Scenarios	35.7%	**39.3%**	23.8%	1.2%	0.0%
Low-fidelity prototypes	29.2%	**44.9%**	24.7%	1.1%	0.0%
High-fidelity prototypes	44.1%	**35.7%**	17.9%	2.4%	0.0%
Meetings	6.6%	**48.6%**	43.9%	0.9%	0.0%
Think aloud	54.3%	**28.4%**	12.4%	4.9%	0.0%
Other	14.9%	**47.1%**	31.0%	3.5%	3.5%

4.4 Education in Reykjavik University

Mixed feelings are about how well the education on User Centered Design methods was in Reykjavik University. The respondents are either very happy or don't think the courses have helped them at all. Some people even admit they didn't pay enough attention in those classes.

About 15% said they had a very good preparation from Reykjavik University to use the User Centered Design methods, 47% said they had pretty good preparation and 31% that they had neither good or bad preparation for using them. The people whom are very happy are saying Human Computer Interaction and Software Engineering taught them extremely well how to talk to customers and understand what the customer needs. The elective course, User Centered Design methods, taught by Marta Kristín Lárusdóttir, is getting good review from the respondents. That course was effective in getting to know how to use some of the User Centered Design methods.

Half of the respondents have gotten a little more education, beside from the education in Reykjavik University, in using User Centered Design methods. Three respondents said they've taken Masters degree in Software Engineering or Computer Science. Others went to a lecture or had a workshop in the company where they talk about the methods that can be used in the projects they are working on and practiced the methods before using them in real projects. Some companies have book clubs and meetings about the methods the company is using or want to use in the projects. Not everyone get this help from the company, but used books and internet for gathering information in the methods they want to get to know better. Nearly every respondent in the survey mentioned that they want to learn more about these UCD methods, and/or use them more in their projects.

One third of the respondents said that the best teacher was Hannes Péturson, which taught Agile methods in Software Engineering with Guðlaugur Stefán Egilsson, which was also named as a good teacher. The final projects got a big hit on the best course, and the reason for that was mostly because of that is when students get a real feeling on how it is like to work with companies, do an requirement analysis, prototyping, and to use Scrum. Also is the final project with emphasis on researching a useful way to learn how to create questionnaires and document results.

Design & Software construction taught by Ólafur Andri Ragnarsson, Window system interfaces taught by Daníel Brandur Sigurgeirsson, Programming and Databases Systems & Services got a high score in the survey, when the focus is no longer on just the education on UCD methods and other methodology. Software Engineering and Human Computer Interaction was also mentioned, including the final project and the practical courses (also known as the 3-week courses). People were over all happy about their education they got in Reykjavik University.

Some of the respondents had a constructive criticism and came with the ideas such as; teaching software testing and said that a special course is needed that only focuses on testing software. Furthermore, there is need for courses that teach Quality Management, Network Infrastructure Management and Release Management. Likewise, two requests were regarding if the School of Computer Science would offer B.Sc. in Computer Science and B.Sc. in Software Engineering for distance students.

5 DISCUSSION

This chapter is a discussion on the results from the survey. Starting with a discussion on the opinion the respondents have on User Centered Design methods following with a discussion on the rating respondents give to the UCD methods. Next comes a discussion on the preparation the respondents got in Reykjavik University or elsewhere.

5.1 Respondents' Opinion on UCD methods

The first thing that stands out in the result is that the software development companies are using Agile methods in more than 60% of projects, Scrum being in 48% of projects. In 2009, one third of the Icelandic developers were using the Scrum process, and it is almost up to half of the projects today. The Scrum group didn't rate usability as highly as developers using other processes in the study 2009 (Mikkelsen & Haraldsdóttir, 2009).

More small- and medium-sized companies are using Agile, and therefore they are not using many of the UCD methods. But the companies seem to be using the Agile methods, unevenly strict, and those who use them not as strict as the manual says, they have either put the usage of UCD methods in the projects, or even create their own way to understand what the customer needs, and wants.

It seems to be, that people are willing to learn more about the User Centered Design methods, and use them more in their projects. Now days, the software industry has to be so rapid, and in the Scrum projects, a new release of the product needs to be ready every two to three weeks. That doesn't leave any time for evaluating or get help from the customer to evaluate the product.

5.2 What UCD methods are being used

The most used User Centered Design methods are *Meetings, Interviews* and *User Stories,* which may link directly to how often the Scrum process is used. These three UCD methods are often used at least once a month, and *Meetings* are used once a week in 30% cases.

Low-fidelity prototypes get a high score in the *working well* category and people are leaning equally to *working OK* and *working really well, and* does that give us that 88% are satisfied, or more than satisfied, with *Low-fidelity prototypes.* This method is mostly used 2 – 4 times a year, or down to once a month, but that doesn't tell us that this method isn't good enough. It is simply that kind of method. *High-fidelity* prototypes gets lower score in *working well*, but still scores

77.5% with people who are satisfied, or more than satisfied. *High-fidelity prototypes* seem to be used more often than *Low-fidelity prototypes*, and score 30% it at least once in a month.

Think Aloud method is working rather well, and is used as frequently as *Prototypes*, both low- and high-fidelity. Which is understandable because of the type of method. *Think Aloud* method is great while evaluating prototypes.

Scenarios got really high score and are over 88% of the respondents satisfied with that method. *Questionnaires* and *Personas* got a bad rate, and was the highest rates in *works OK* and second highest in *doesn't really work.* These methods are used at most 4 times a year and got an even score in *once a year or less.*

What is interesting that the customer isn´t the number one user that evaluates the software, it is the software company's employees, which are not going to use the software in the future. The only category where the customers were often a part of was the interviews.

The top three User Centered Design methods today, in Iceland, seem to be *Meetings, Interviews* and *Low-fidelity prototype*s, which is similar to Sweden in the year 2003 where the top methods were *Think Aloud, Low-fidelity prototypes*, and in third place came *Interviews*. (Gulliksen & more, 2004). Gulliksen didn't ask about *Meetings* in his study, presumably because the method *Meetings* is nowhere to be found in any textbook on user involvement.

Think Aloud and *Scenarios* are working rather well in the Icelandic projects today, but not used as often as in Sweden and that is probably because Icelandic developers know less about the use of *Think Aloud* method to evaluate projects. What was also alike between these two studies is that *Personas* and *Questionnaires* are considered the worst UCD methods. Gulliksen asked about many more methods in his study, but still the highest and lowest scores goes to the same methods.

Most of the participants in evaluating the software with the UCD methods are the company's employees, which is the opposite with the study Bygstad did in Norway 2007. In Bygstad's study there was only 9% of the company's employees helping with the project evaluation, 23% were customer's employees and 40% were representative sample of users (Bygstad, Ghinea & Brevik 2008).

When comparing these methods together and the answers from the respondents, I have to agree with Bygstad and say *there is a gap between intention and reality*. The respondents are all together satisfied with these User Centered Design methods, and say they want to use them more in their projects, but most of the methods aren't used as often as they want.

5.3 Preparation from Reykjavik University

People are mostly satisfied with the education they got in Reykjavik University and have nothing to complain about the Human Computer Interaction course or the preparation to use User Centered Design methods. The results from the survey showed that people want to learn more about the User Centered Design methods, and use them more and more in projects. They are getting more insight in these UCD methods in meetings and book clubs at their company. Not everyone get the opportunity to use the UCD methods, or even learn about them in other way than in books and Internet.

The final projects, and the practical projects are the major courses where the use of all the methods learned, and all of the education gotten from other courses is joined together. Those courses bring out the feeling you are working on a project for some company, where you have to create a project from the beginning to the end.

6 FUTURE WORKS

When this research started, it was planned to take interviews with few of the people who responded the online survey. Then the survey took a bit longer than expected, and there was no time to plan and take the interviews. In the survey there was a question that asked the respondents to leave their e-mail address if they were willing to talk more about these User Centered Design methods and would like to come in for an interview. 15 people left their e-mail address.

My supervisor, for this study, suggested that I would take these interviews in the summer, as an independent assignment. I will then ask more about the UCD methods, and ask how they are being used in their company.

The online survey I created is useful for Reykjavik University to valuate the teaching and education they are offering. The School of Computer Science is welcome to use this survey again in the future.

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TABLES

Table 9 – Core courses for B.Sc. degree in Computer Science

Core Courses are 108 ECTS		
Introduction to Computer Science	Data structures	Software Requirem. & Design
Discrete Mathematics I	Discrete Mathematics II	Practical project
Software Engineering	Algorithms	Calculus and Statistics
Operating Systems and networks	Programming languages	Computer Architecture
Final Project	Web Programming	Databases and client-server
Programming	Problem Solving	

Table 10 – Core courses for B.Sc. degree in Software Engineering

Core Courses are 132 ECTS		
Introduction to Computer Science	Data structures	Software Requirem. & Design
Discrete Mathematics for Engineers	Mathematics I	Mathematics II
Software Engineering	Algorithms	Statistics
Operating Systems and networks	Programming languages	Practical Project
Linear Algebra	Numerical Analysis	Theory of Computation
Software Engineering II	Physics I	Operations Research
Web Programming	Problem Solving	Databases Systems & Services
Programming		

Table 11 – Core Courses for a Diploma in IT Management

Core Courses are 90 ECTS:		
Introduction to Computer Science	Data structures	Software Requirem. & Design
Discrete Mathematics I	Web Programming	Practical project
Software Engineering	Algorithms	Final Project
Operating Systems and networks	Problem Solving	Databases and client-server
Programming		

APPENDIX

Appendix 1 - Description of the UCD Methods

Interviews can be straightforward or loosely planned. In straightforward interviews, the interviewee answers questions that have been written before the interview. In loosely planned interviews the interviewer goes more into special items that come up during the interview.

Questionnaires, or surveys, are sent out to respondents either on paper or digital. Mostly, the respondents answer the questionnaires alone, and therefore can't ask questions if something is unclear.

Personas are a way to express users. Personas are precisely described with a text and also often with a picture. The persona's background, expectations, vision, and goals are described. The advantages are that while software developers think about those fictional personas, they have a better vision on what the real users might need in the software they are building (Wikipedia, 2011a).

User Stories define features and their business value. They are often described; "As a <role>, I want <goal/desire> so that <benefit>". User stories are a lot used in Scrum (Wikipedia, 2011b).

Scenarios are informal description on the use of the computer system. Story is written in details about how defined task is performed.

Low-fidelity prototypes are rough sketches made on paper or with a software tool, where the basic system design is presented. Emphasis is on deciding what should be on every page, or in every window, and where a page or window is located in the software.

High-fidelity prototypes are more accurate than the low-fidelity prototypes. Here are the colors, shapes, sizes and styles of widgets (buttons, links, input fields, etc.) determined and presented. Also there's a specific placement of widgets.

Meetings are arranged in that way that two or more people meet on a decided time and discuss. There is, in the most cases, one goal with the meeting. When the meeting is over, a summarized report is written.

Think Aloud method is a method to evaluate how easy it is to use the system by users. One user at a time solves pre-determined task, which he gets handed over from the manager and talks about what he's thinking while he resolves the task. There are often interviews both before and after the project work. Number of users in the tests depends on the size of the test.

FIGURES

Figure 5 – Formal letter to respondents

The letter that was sent to the respondents was written in Icelandic:

Háskólinn í Reykjavík
Tölvunarfræðideild
9. mars 2011

Efni: Þátttaka í könnun vegna lokaverkefnis.

Ágæti viðtakandi.

Ég er nemandi á 3ja ári í tölvunarfræði við HR og vinn að lokaverkefni á vorönn 2011. Leiðbeinandi minn er Marta Kristín Lárusdóttir lektor við Tölvunarfræðideild HR. Megin viðfangsefni lokaverkefnisins er að rannsaka hvernig útskrifaðir tölvunarfræðingar, hugbúnaðarverkfræðingar og kerfisfræðingar frá HR nota þá þekkingu sem þeir hafa fengið um þátttöku notenda í hugbúnaðargerð. Þetta bréf er sent á þá nemendur sem hafa lokið námi frá árinu 2005.

Ég vil biðja þig að svara spurningakönnun á http://survey.helenasif.is. Það tekur um 10 mínútur að svara könnuninni. Hún verður opin til og með 1. apríl. Það er mjög mikilvægt fyrir mig að þú takir þátt til að niðurstöður verði sem marktækastar. Hvert svar skiptir máli.

Annar hluti verkefnisins er að taka viðtöl við nokkra einstaklinga sem tóku þátt í könnuninni. Markmiðið er að auka skilning á niðurstöðum könnunarinnar. Ef þú vilt veita mér viðtal, skráðu þá inn netfang þitt í síðustu spurningunni í könnuninni og mun ég hafa samband við þig eins fljótt og unnt er.

Niðurstöður verða birtar í maí 2011. Þá verður hægt að sjá hvaða notendamiðuðu aðferðir eru mest notaðar í hugbúnaðargerð og hvernig þær hafa reynst. Þess vegna mun þátttaka þín skipta máli.

Með bestu kveðju,
Helena Sif Magnúsdóttir
Tölvunarfræðinemi við
Háskólann í Reykjavík
helenasif@helenasif.is

Figure 6 – The second letter to respondents
The reminder that was sent to the respondents was written in Icelandic:

Háskólinn í Reykjavík
Tölvunarfræðideild
21. mars 2011

Efni: Ítrekun um þátttöku í könnun vegna lokaverkefnis.

Ágæti viðtakandi.

Það hafa ekki borist næg svör til þess að niðurstöðurnar séu nógu marktækar og þess vegna er send út ítrekun. Ef þú hefur nú þegar tekið þátt í könnuninni, þá vil ég þakka þér fyrir þátttökuna.

Ef þú hefur ekki enn tekið þá vil ég biðja þig að svara spurningakönnun á http://survey.helenasif.is. Það tekur um 10 mínútur að svara könnuninni. Hún verður opin til og með 1. apríl. Það er mjög mikilvægt fyrir mig að þú takir þátt til að niðurstöður verði sem marktækastar. Hvert svar skiptir máli.

Niðurstöður verða birtar í maí 2011. Þá verður hægt að sjá hvaða notendamiðuðu aðferðir eru mest notaðar í hugbúnaðargerð og hvernig þær hafa reynst. Þess vegna mun þátttaka þín skipta máli.

Með bestu kveðju,
Helena Sif Magnúsdóttir
Tölvunarfræðinemi við
Háskólann í Reykjavík
helenasif@helenasif.is

Figure 7 – The survey
The introduction and questions in the online survey:

Kæri þátttakandi.

Ég er nemandi á 3ja ári í tölvunarfræði við HR og vinn að lokaverkefni á vorönn 2011. Leiðbeinandi minn er Marta Kristín Lárusdóttir lektor við Tölvunarfræðideild HR. Megin viðfangsefni lokaverkefnisins er að rannsaka hvernig útskrifaðir tölvunarfræðingar, hugbúnaðarverkfræðingar og kerfisfræðingar frá HR nota þá þekkingu sem þeir hafa fengið um þátttöku notenda í hugbúnaðargerð. Þetta bréf er sent á þá nemendur sem hafa lokið námi frá árinu 2005.

Það tekur um 10 mínútur að svara könnuninni. Hún verður opin til og með *1. apríl*. Það er mjög mikilvægt fyrir mig að þú takir þátt til að niðurstöður verði sem marktækastar. Hvert svar skiptir máli.

Annar hluti verkefnisins er að taka viðtöl við nokkra einstaklinga sem tóku þátt í könnuninni. Markmiðið er að auka skilning á niðurstöðum könnunarinnar. Ef þú vilt veita mér viðtal, skráðu þá inn netfang þitt í síðustu spurningunni í könnuninni og mun ég hafa samband við þig eins fljótt og unnt er.

Niðurstöður verða birtar í maí 2011. Þá verður hægt að sjá hvaða notendamiðuðu aðferðir eru mest notaðar í hugbúnaðargerð og hvernig þær hafa reynst. Þess vegna mun þátttaka þín skipta máli.

Ef þú óskar eftir að fá niðurstöðurnar sendar í tölvupósti, vinsamlegast sendu tölvupóst á helenasif@helenasif.is og ég mun senda þér niðurstöðuskýrslu í lok maí.

Takk fyrir að taka þátt!
Helena Sif Magnúsdóttir

The online survey questions with answers to the multiple-choice questions:

1. Hvaða starfsheiti hefur þú í dag?

2. Hvert er þitt starfssvið? (Hakið við það sem einkennir starfssvið þitt síðastliðna 3 mánuði. Hægt er að haka við fleiri en einn valmöguleika).

Þarfagreining	13,69%
Hönnun	17,11%
Forritun	**22,25%**
Hugbúnaðarprófanir	13,45%
Verkefnisstjórnun	8,80%
Stjórnun	4,40%
Kerfisstjórnun	4,40%
Sérfræðingastörf / ráðgjöf	10,76%
Kennsla / rannsóknir	5,13%

3. Hver er þinn starfsvettvangur:

Banki, tryggingarfélag eða fjármálaþjónusta	30,60%
Fjarskipti, símafyrirtæki eða þróunarfyrirtæki	12,69%
Tölvuþjónusta eða hugbúnaðarhús	**35,07%**
Verslun eða þjónusta	0,75%
Ríki eða sveitafélag	1,49%
Menntastofnun	5,22%
Annað, þá hvað?	14,18%

4. Hver er starfsmannafjöldinn á vinnustaðnum þínum?

1 - 10	12,78%
11 - 50	27,82%
51 - 250	**30,08%**
251+	29,32%

5. Hversu margir starfsmenn vinnustaðarins eru í hugbúnaðarþróun?

0 - 20%	**38,76%**
21 - 40%	17,05%
41 - 60%	19,38%
61 - 80%	13,18%
81 - 100%	11,63%

6. Ef vinnustaðurinn er rekinn á fleiri en einum stað, hversu mörgum er hann rekinn?

2-4	34,62%
5-9	10,77%
10+	13,08%
Það er bara rekið á einum stað	**41,54%**

7. Hefur þú verið að vinna í mörgum verkefnum í einu síðustu 3 mánuði?

Nei, bara einu verkefni	12,28%
Já, 2-4	**45,61%**
Já, 5 eða fleiri	42,11%

8. Af hvaða tegund er verkefnið sem þú hefur mest unnið í síðastliðna 3 mánuði? (Dæmi; Leikur, viðskiptahugbúnaður, samskiptahugbúnaður, ...).

9. Hvaða aðferðafræði við verkefnastjórnun hefur verið notuð í verkefninu sem þú hefur mest unnið í síðustu 3 mánuði? (Hægt að velja fleiri en einn valmöguleika).

Scrum	**48,55%**
Aðrar Agile aðferðir en Scrum	10,87%
Fossalíkan	8,70%
Okkar eigin aðferðafræði	20,29%
Annað, þá hvað?	11,59%

10. Ef notuð var eigin aðferðafræði, lýstu henni.

11. Hversu margir eru í fullskipuðu teymi í hugbúnaðarþróun í þínu fyrirtæki?
Teymi = Forritarar, hópstjórar, prófarar o.fl.

1-4	32,76%
5-9	**50,00%**
10-15	3,45%
16+	3,45%
Á ekki við	10,34%

12. Hvert af eftirfarandi atriðum finnst þér skipta höfuðmáli í verkefninu sem þú hefur mest unnið í síðustu 3 mánuði? (Hægt er að velja fleiri en einn valmöguleika).

Ánægja viðskiptavinar	**23,99%**
Auðvelt að nota hugbúnaðinn	19,63%
Söluaukning hugbúnaðar	6,54%
Fækkun vandamála við notkun kerfisins	23,68%
Kostnaður og tími við gerð hugbúnaðarþróunar minnkar	10,90%
Álit viðskiptavinar	10,59%
Annað, þá hvað?	4,67%

13. Í verkefninu sem þú hefur unnið að síðastliðna 3 mánuði, hvaða gæðaþættir finnst þér vera mikilvægastir á skalanum 1-7? (1 = minnst, 7 = mest).
Áreiðanleiki (e. Reliability)

1	2,73%
2	0,00%
3	0,91%
4	2,73%
5	7,27%
6	14,55%
7	**71,82%**

Flytjanleiki (e. Portability)

1	15,60%
2	18,35%
3	12,84%
4	**20,18%**
5	16,51%
6	9,17%
7	7,34%

Nytsemi (e. Usability)

1	2,73%
2	1,82%
3	4,55%
4	4,55%
5	15,45%
6	25,45%
7	**45,45%**

Skilvirkni (e. Efficiency)

1	2,75%
2	2,75%
3	2,75%
4	9,17%
5	21,10%
6	21,10%
7	**40,37%**

Viðhaldsþægni (e. Maintainability)

1	2,75%
2	2,75%
3	8,26%
4	11,93%
5	22,94%
6	**26,61%**
7	24,77%

Virkni (e. Functionality)

1	1,82%
2	0,91%
3	4,55%
4	9,09%
5	14,55%
6	21,82%
7	**47,27%**

14. Lýstu ástæðum fyrir því af hverju þér finnst þetta skipta máli:

15. Hvort er hugbúnaðurinn:

Sérsmíðaður fyrir ákveðna viðskiptavini (e. Custom made)	**56,76%**
Hilluvara (e. Commercial Off The Shelf)	15,32%
Annað, þá hvað?	27,93%

16. Hafa notendurnir / viðskiptavinirnir val um að nota annan hugbúnað í stað þess hugbúnaðar sem þú vinnur að?

Já	41,82%
Nei	**43,64%**
Annað, þá hvað?	14,55%

17. Hvert er þitt mat á eftirfarandi aðferðum?

Viðtöl við notendur (e. Interviews)

Aldrei notað	22,09%
Nýtist ekki	2,33%
Nýtist lítið	3,49%
Nýtist sæmilega	15,12%
Nýtist vel	**31,40%**
Nýtist mjög vel	25,58%

Spurningalistar (e. Questionnaires)

Aldrei notað	**41,86%**
Nýtist ekki	5,81%
Nýtist lítið	19,77%
Nýtist sæmilega	22,09%
Nýtist vel	6,98%
Nýtist mjög vel	3,49%

Persónur (e. Personas)

Aldrei notað	**46,51%**
Nýtist ekki	6,98%
Nýtist lítið	11,63%
Nýtist sæmilega	17,44%
Nýtist vel	9,30%
Nýtist mjög vel	8,14%

Notendasögur (e. User Stories)

Aldrei notað	15,12%
Nýtist ekki	4,65%
Nýtist lítið	6,98%
Nýtist sæmilega	16,28%
Nýtist vel	**30,23%**
Nýtist mjög vel	26,74%

Atburðarásir (e. Scenarios)

Aldrei notað	15,29%
Nýtist ekki	4,71%
Nýtist lítið	4,71%
Nýtist sæmilega	25,88%
Nýtist vel	**29,41%**
Nýtist mjög vel	20,00%

Grófhönnunarfrumgerðir (e. Low-fidelity prototypes)

Aldrei notað	20,00%
Nýtist ekki	4,71%
Nýtist lítið	4,71%
Nýtist sæmilega	20,00%
Nýtist vel	**30,59%**
Nýtist mjög vel	20,00%

Millihönnunarfrumgerðir (e. High-fidelity prototypes)

Aldrei notað	**34,52%**
Nýtist ekki	4,76%
Nýtist lítið	8,33%
Nýtist sæmilega	16,67%
Nýtist vel	19,05%
Nýtist mjög vel	16,67%

Fundir (e. Meetings)

Aldrei notað	5,81%
Nýtist ekki	0,00%
Nýtist lítið	6,98%
Nýtist sæmilega	24,42%
Nýtist vel	**38,37%**
Nýtist mjög vel	24,42%

Prófunaraðferðin Hugsa upphátt (e. Think aloud)

Aldrei notað	**40,70%**
Nýtist ekki	3,49%
Nýtist lítið	9,30%
Nýtist sæmilega	15,12%
Nýtist vel	18,60%
Nýtist mjög vel	12,79%

Aðrar nytsemisprófanir með notendum

Aldrei notað	**36,59%**
Nýtist ekki	1,22%
Nýtist lítið	4,88%
Nýtist sæmilega	23,17%
Nýtist vel	20,73%
Nýtist mjög vel	13,41%

18. Ef þú hefur notað aðrar aðferðir en spurt er um í spurningunni hér fyrir ofan, vinsamlegast lýstu þeim og þínu mati á þeim.

19. Hversu oft hafa notendur tekið þátt í noktun þessara aðferða?

Viðtöl við notendur (e. Interviews)

Aldrei	**30,00%**
1x í viku	8,75%
2x-3x í mánuði	21,25%
1x í mánuði	21,25%
2x-4x á ári	13,75%
1x á ári eða sjaldnar	5,00%

Spurningalistar (e. Questionnaires)

Aldrei	**65,00%**
1x í viku	0,00%
2x-3x í mánuði	3,75%
1x í mánuði	3,75%
2x-4x á ári	13,75%
1x á ári eða sjaldnar	13,75%

Persónur (e. Personas)

Aldrei	**66,67%**
1x í viku	3,85%
2x-3x í mánuði	5,13%
1x í mánuði	3,85%
2x-4x á ári	10,26%
1x á ári eða sjaldnar	10,26%

Notendasögur (e. User Stories)

Aldrei	**35,00%**
1x í viku	7,50%
2x-3x í mánuði	18,75%
1x í mánuði	16,25%
2x-4x á ári	13,75%
1x á ári eða sjaldnar	8,75%

Atburðarásir (e. Scenarios)

Aldrei	**33,75%**
1x í viku	6,25%
2x-3x í mánuði	12,50%
1x í mánuði	18,75%
2x-4x á ári	21,25%
1x á ári eða sjaldnar	7,50%

Grófhönnunarfrumgerðir (e. Low-fidelity prototypes)

Aldrei	**33,75%**
1x í viku	2,50%
2x-3x í mánuði	11,25%
1x í mánuði	20,00%
2x-4x á ári	25,00%
1x á ári eða sjaldnar	7,50%

Millihönnunarfrumgerðir (e. High-fidelity prototypes)

Aldrei	**50,00%**
1x í viku	3,75%
2x-3x í mánuði	6,25%
1x í mánuði	15,00%
2x-4x á ári	13,75%
1x á ári eða sjaldnar	11,25%

Fundir (e. Meetings)

Aldrei	12,50%
1x í viku	**26,25%**
2x-3x í mánuði	25,00%
1x í mánuði	22,50%
2x-4x á ári	8,75%
1x á ári eða sjaldnar	5,00%

Prófunaraðferðin Hugsa upphátt (e. Think aloud)

Aldrei	**61,25%**
1x í viku	2,50%
2x-3x í mánuði	8,75%
1x í mánuði	6,25%
2x-4x á ári	11,25%
1x á ári eða sjaldnar	10,00%

Aðrar nytsemisprófanir með notendum

Aldrei	**52,56%**
1x í viku	5,13%
2x-3x í mánuði	12,82%
1x í mánuði	8,97%
2x-4x á ári	17,95%
1x á ári eða sjaldnar	2,56%

20. Ef þú hefur notað aðrar aðferðir en spurt er um í spurningunni hér fyrir ofan, vinsamlegast lýstu hversu oft notendur taka þátt í notkun þeirra.

21. Ef notendur hafa tekið þátt við notkun þessara aðferða, úr hvaða hópi koma þeir yfirleitt? (Hægt er að haka við fleiri en einn valmöguleika).

Viðtöl við notendur (e. Interviews)

Notendur hafa ekki tekið þátt	26,32%
Starfsmenn vinnustaðarins	29,47%
Viðskiptavinir	**38,95%**
Vinir og kunningjar	5,26%
Annað	0,00%

Spurningalistar (e. Questionnaires)

Notendur hafa ekki tekið þátt	**64,10%**
Starfsmenn vinnustaðarins	16,67%
Viðskiptavinir	19,23%
Vinir og kunningjar	0,00%
Annað	0,00%

Persónur (e. Personas)

Notendur hafa ekki tekið þátt	**63,64%**
Starfsmenn vinnustaðarins	23,38%
Viðskiptavinir	10,39%
Vinir og kunningjar	1,30%
Annað	1,30%

Notendasögur (e. User Stories)

Notendur hafa ekki tekið þátt	31,11%
Starfsmenn vinnustaðarins	**41,11%**
Viðskiptavinir	23,33%
Vinir og kunningjar	4,44%
Annað	0,00%

Atburðarásir (e. Scenarios)

Notendur hafa ekki tekið þátt	35,71%
Starfsmenn vinnustaðarins	**39,29%**
Viðskiptavinir	23,81%
Vinir og kunningjar	1,19%
Annað	0,00%

Grófhönnunarfrumgerðir (e. Low-fidelity prototypes)

Notendur hafa ekki tekið þátt	29,21%
Starfsmenn vinnustaðarins	**44,94%**
Viðskiptavinir	24,72%
Vinir og kunningjar	1,12%
Annað	0,00%

Millihönnunarfrumgerðir (e. High-fidelity prototypes)

Notendur hafa ekki tekið þátt	**44,05%**
Starfsmenn vinnustaðarins	35,71%
Viðskiptavinir	17,86%
Vinir og kunningjar	2,38%
Annað	0,00%

Fundir (e. Meetings)

Notendur hafa ekki tekið þátt	6,54%
Starfsmenn vinnustaðarins	**48,60%**
Viðskiptavinir	43,93%
Vinir og kunningjar	0,93%
Annað	0,00%

Prófunaraðferðin Hugsa upphátt (e. Think aloud)

Notendur hafa ekki tekið þátt	**54,32%**
Starfsmenn vinnustaðarins	28,40%
Viðskiptavinir	12,35%
Vinir og kunningjar	4,94%
Annað	0,00%

Aðrar nytsemisprófanir með notendum

Notendur hafa ekki tekið þátt	**43,96%**
Starfsmenn vinnustaðarins	29,67%
Viðskiptavinir	20,88%
Vinir og kunningjar	5,49%
Annað	0,00%

23. Hversu góðan undirbúning fékkst þú í náminu til að nota ofangreindar aðferðir?

Mjög góðan	14,94%
Frekar góðan	**47,13%**
Hvorki né	31,03%
Frekar lélegan	3,45%
Mjög lélegan	3,45%

24. Getur þú lýst því nánar, til dæmis hvernig námskeið eða verkefni nýttust?

25. Hversu góðan undirbúning hefur þú fengið til að nota ofangreindar aðferðir utan náms í HR? Vinsamlegast lýstu hvar og hvernig það fór fram.

26. Hvernig hefur gengið að samræma notkun aðferðanna við hugbúnaðarferlið/ferlin (Scrum, XP, Fossalíkan, ...) hjá vinnustaðnum?

27. Myndir þú vilja nýta þér aðferðirnar á annan hátt og hverjar eru ástæður þess?

28. Er einhver á vinnustaðnum sem ber ábyrgð á því að hugbúnaður, sem gerður er á vinnustaðnum, verði auðveldur í notkun? Ef svo er, lýstu hver það er og hvernig staðið er að því.

29. Eru settar fram mælanlegar kröfur um að hugbúnaður sé auðveldur í notkun? Ef svo er, lýstu hvernig það er gert.

30. Háskólanám:

Tölvunarfræði	**80,22%**
Hugbúnaðarverkfræði	2,20%
Kerfisfræði	13,19%
Annað, þá hvað?	4,40%

31. Hæsta gráða:

Diploma (1-2 ár)	9,89%
B.Sc.	**76,92%**
M.Sc.	9,89%
Ph.D	0,00%
Annað, þá hvað?	3,30%

32. Útskriftarár frá Háskólanum í Reykjavík:

33. Hvaða áfangi úr náminu í HR finnst þér hafa nýst þér best í starfi?

34. Er eitthvað sem þér fyndist ætti að breyta í náminu? Ef svo er, vinsamlegast lýstu ástæðum þess.

35. Kyn:

Kona	26,67%
Karl	**73,33%**

36. Aldur:

20-29	17,78%
30-39	**58,89%**
40-49	17,78%
50-59	4,44%
60+	1,11%

37. Er eitthvað fleira sem þú vilt að komi fram varðandi efni þessarar könnunar?

38. Annar hluti verkefnisins er að taka viðtöl við nokkra einstaklinga sem tóku þátt í könnuninni. Markmiðið er að auka skilning á niðurstöðum könnunarinnar. Ef þú vilt veita mér viðtal, skráðu þá inn netfang þitt hér að neðan og mun ég hafa samband við þig eins fljótt og unnt er.