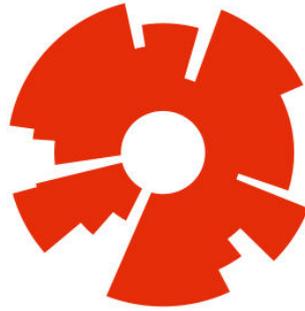


Final Report



HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

Computer Science

Registers Iceland – Form Portal

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1 Introduction

The project is a web-based form portal that functions as a central place for all forms. All forms are delivered by the form portal streamlining the entire process for both senders and receivers of any forms. Registers Iceland (*i. Þjóðskrá Íslands*) is the party that proposed the idea. It is an institution which maintains the Property Registry and the National Registry. It also decides fire insurance value, does property appraisal, conducts investigations of the real estate market and issues passports, ID cards, IceKeys and multiple certificates for various things. It gives special importance to electronic governing and operates the call center for the information and service provider Island.is.

1.1 The Problem

Currently, if employees want to pass on a request or report anything, they need to find the correct email address for the matter at hand or figure out who handles the matter. Even when employees know who to contact, they still often have to find out what information needs to be included with their request/report. Another issue with the current state of things is that it is hard to pass on a request/report anonymously since the employee's email address is visible when an email is sent. It is also difficult to remain anonymous if one must ask around in the process of reporting or requesting something.

1.2 The Aim

The goal of the project is to create a web-based form portal, to be used by the employees of Registers Iceland. The forms can be about the quality of services, comments regarding the quality system, safety notices et cetera. The aim is that all these different types of forms can be created within the system by an admin and he can choose how they are forwarded, whether that is by email, Trello or Jira and that it is done securely and correctly. The employees can then go to this form portal and find any forms they want to fill out, and the system will handle delivering them to the correct place.

The application eliminates all the wasted time and security risks that arise when matters are handled like they currently are. Additionally, as the process for delivering a request/report is simplified, employees are less likely to shy away from sending them because of the hassle involved.

1.3 The Structure of the Report

The report is divided into seven chapters. The second chapter discusses the methodology and demonstrates the working process. Chapter three addresses the requirement of the software. In chapter four a risk assessment is conducted. Chapter five discusses the design and in chapters 5.3 and 5.4 the Form Portal is tested by the *Think-aloud* method. Chapter six contains the progress overview and then the project retrospective is discussed in chapter seven.

2 Methodology and Working Process

2.1 Methodology

The team and the product owner decided on its first meeting that the Scrum methodology would be a good fit for the project, because of its flexibility. The methodology is based on the Agile concept of repetition and ever-evolving development, where requirements and solutions evolve gradually.

2.2 Roles

A scrum team consists of three roles, a product owner, a scrum master and the development team. These roles are all important and each of them has specific responsibilities which are covered here in the following subchapters.

2.2.1 Product Owner

Registers Iceland had already assigned its quality- and security officer, Tryggvi Rúnar Jónsson, as a product owner. Being a product owner, he served as a link between stakeholders and he was made aware of all major decisions regarding the project.

2.2.2 Scrum Master

The team decided that Hannes Kristjánsson would take on the role scrum master. The scrum master has the role of a facilitator and time-controller. He also ensures that the development team works on the project according to Scrum rules.

2.2.3 Development Team

Since the project is relatively small, Hannes was also a member of the development team with Benedikt Rúnar Valtýsson, Bjarki Baldvinsson, Fjöltnir Unnarsson and Þórný Stefánsdóttir. The development team was a cross-functional, self-organizing team that was jointly responsible for the outcome.

2.3 Communication

2.3.1 Meetings with Instructor

The team met the instructor, Hildur Andrjesdóttir, every Friday at 13:00. These weekly meetings were a good opportunity for the team to ask Hildur questions and receive comments

from her on the project. If the team did not have any questions or any new updates on the project, that week's meeting was cancelled.

2.3.2 Meetings with Client

The team had weekly meetings with the client, Registers Iceland. If the team felt there was no need for a meeting, that week's meeting was cancelled. The team had access to the project owner, Tryggvi R. Jónsson, as well as one of Registers Iceland's programmer, Bjarni K. Árnason. Having access to a programmer that works in the client's organization was very valuable to the team.

2.3.3 Team Meetings

Following the Scrum methodology, the team had standup meetings, retrospective meetings and sprint planning meetings. How these meetings were arranged is covered here in the following subchapters.

2.3.3.1 Stand-Up Meetings

Each workday started with a standup meeting where the team went over what each member was doing, discussed the progress of the project and planned the workday. These meetings were also ideal to discuss any problems and get feedback and help from other members.

2.3.3.2 Retrospective Meetings

Retrospective meetings were held at the end of each sprint. The team discussed the previous sprint, i.e. what went well, what could have been better and talked about improvements to be enacted in the next sprint.

2.3.3.3 Sprint Planning Meetings

At the beginning of each sprint, the team held a meeting to discuss and plan the sprint. The agenda for such meetings was mainly 4 steps. The first step was to close last sprint and go over the unfinished tasks. Next step was to discuss if any of the team members would be unavailable on workdays, i.e. clarify the team's availability. Step 3 was to create the sprint backlog by pulling tasks from the product backlog. The final step was to make sure everyone agreed and start the sprint when team members were on the same page.

2.4 Technical Environment

This chapter covers the technical environment of the project. The project was programmed in Visual Studio and Visual Studio Code 1.41.1, the newest version. The project runs on the ASP .NET Core 3.1 framework, which is the newest stable version of .NET Core. The project was set up as a web app with the Blazor framework and the main programming language is C#. The idea was to use the Blazor web assembly functionality for the front end and use JavaScript if any problems were encountered with that approach.

GitHub was used for source control and the team relied on a branch workflow. Branches were created for each feature, and they were then merged to the master branch with pull requests. Azure was used for hosting, Continuous Integration/Continuous Deployment and for hosting an SQL database. Personalized Google Sheets were used for the Scrum project management.

Programming environment	Visual Studio & Visual Studio Code 1.41.1
Framework	ASP .NET Core 3.1
Back end	C#
Front end	Blazor components, HTML, CSS and JavaScript
Main programming language	C#
Source control	GitHub
Continuous deployment/integration	Azure
Hosting	Azure
Database	Azure
Project management	Google sheets

Table 1 - Technical environment overview

2.4.1 Testing

The Blazor framework used in the project came out production ready in September 2019. Due to how new it is, unit testing the Blazor components turned out to be difficult. As a result, only actions against the database were tested.

The team used an in-memory database and created fake data to test the system's database functions. The XUnit testing framework was used to write the tests and the team managed to test about 22% of the code. Since it was the plan from the beginning to connect the

project to Registers Iceland's Active Directory, it was deemed unnecessary to test the part of the code pertaining to the Identity Framework which is used for the system's authentication.

2.5 Physical Environment

As the product owner could not provide an office, the team rented an office space in Akureyri, accessible 24/7. Meetings with the product owner were first held at Registers Iceland's office but were later moved to Microsoft Teams, due to the COVID-19 situation.

2.6 Work Schedule

As previously mentioned, the team relied on the Scrum methodology to plan the workflow. The work schedule was divided into sprints that were influenced by the deadlines throughout the project. Every sprint had a predetermined length and some goals the team focused on completing before the end of the sprint.

2.6.1 Sprints

The working capacity was largely dependent on how much time team members needed to spend on other courses. The team had three different types of working capacity. The workload was different between team members because they were taking different courses, and three of them were taking courses from the University of Akureyri. Nevertheless, the team agreed that the sprint schedule and capacity plan would follow the Reykjavík University calendar. For the RU exam period, the team expected to reduce the workload to 10 hours a week per team member. However, it was not expected that team members spent time on the project during the Easter break which happened to be in the middle of the exam period. From the end of the exam period until the final due date, the team scheduled 40 hours a week per team member.

The following table (*Table 2*) shows a list of all sprints, their goals, dates and the release dates of documents for the sprint concerned. Finally, the table shows how many hours per week each team member should have spent on the project in each sprint. The table has been updated throughout the project, see [chapter 6](#) for more details on each sprint.

#	Sprint dates	Sprint goal	Release dates	Hours/week
0	Jan 20 th - Jan 28 th	Work schedule Planning & Preparation Organization planning	January 28th First draft of work schedule Organization planning	20 hours
1	Jan 29 th – Feb 11 th	Product backlog Requirement list Setting up development environment Work schedule Risk analysis Draft of design Progress overview and product Status report		20 hours
2	Feb 12 th - Feb 25 th	Project setup Programming preparation Database connection Design	Feb 6th Work schedule Risk analysis Draft of design Progress overview	20 hours
3	Feb 26 th - Mar 10 th	Complete authentication Start programming work Database design Set up main razor pages		20 hours
4	Mar 11 th - Mar 24 th	Update report Examine Jira and Trello Database table creation	Mar 12th Status report 2	20 hours
5	Mar 25 th – Apr 7 th	Programming work		20 hours
6	Apr 8 th – Apr 21 th	Complete general user features <i>Easter break</i> <i>RU exam period</i>		10 hours
7	Apr 22 th – May 5 th	Programming work Testing <i>RU exam period</i> <i>UNAK exam period</i>		10 hours
8	May 6 th – May 18 th	Finish programming main features Testing Operation manual Complete final report Complete final presentation Final product	May 6th Status report 3 May 15th Final product May 18th Final presentation	40 hours

Table 2 - Project overall plan

3 Requirement Analysis

In software projects it is important to analyze requirements. It is vital before the programming starts that each member realizes what the system should include and what it needs to be functional. The team started by defining the user groups of the system and then created a list of requirements.

3.1 User Groups

There are two user groups of the system, 'General users' and 'Admins'. The following table (*Table 3*) demonstrates what the general users and admins can do in the software.

User group	Background	System usage	Environment	Main goals
General users	Age: 20-67 Education: Anything Computer skills: Normal and above average	Usage: As needed Training: Not required % of user base: Around 90%	Technical environment: Laptop/PC/tablet Real environment: At work	Fill out a form and submit it to the correct recipient
Admins	Age: 20-67 Education: Anything Computer skills: Normal	Usage: As needed Training: Not required % of user base: Around 10%	Technical environment: Laptop/PC/tablet Real environment: At work	Create new forms from scratch and link it to the correct recipient

Table 3 - User groups

3.2 Requirement List

The requirement list contains the requirements of the system where each requirement is ranked by priority. *Table 4* shows the three priority categories:

Priorities	
A	Critical
B	Important
C	Desirable

Table 4 - Definitions of priorities

The team started to analyze requirements based on the information given and its own ideas about the project. Then the team had a meeting with the product owner and updated the list in consultation with him. *Table 5* shows a list of the system's requirements which has been regularly updated throughout the project in consultation with the product owner.

During sprint planning throughout the project, each requirement was broken into smaller tasks, in the spirit of Agile/Scrum methodology.

ID	Description	Priority	Status
1	User can log into the system with email	A	Done
2	The application respects the privacy laws	A	Done
3	User can submit a new form	A	Done
4	User can submit a form to an external system via email (SMTP)	A	Done
5	User gets a confirmation after submitting a form	A	Done
6	The application uses its own database	A	Done
7	Admin can access a list of recent submissions	A	Done
8	Admin can create a new form	A	Done
9	The application does not require training	A	Done
10	The application works like it should in Chrome and Firefox	A	Done
11	Submissions are stored in a database for 7 days	A	Done

12	Exceptions caused by user action are handled	A	Done
13	All inputs are validated	A	Done
14	User can add/edit/delete a category	A	Done
15	Application is tested against common vulnerabilities (OWASP)	B	Done
16	User can access his/hers submitted forms	B	Done
17	Creator of form can choose that it is submitted via Jira	B	Done
18	Creator of form can choose that it is submitted via Trello	B	Done
19	Admin can give another user admin privilege	B	Done
20	User can submit a form anonymously	B	Done
21	Admin can edit/delete a form	B	Done
22	User can use external user authentication	B	Removed
23	External user can use the system	C	Done
24	Admin activities are logged into a log file	C	Done
25	User can submit an inquiry to the system administration	C	Done
26	User can search for categories and forms	C	Done
27	Admin can search for an individual user when viewing the list of users	C	Done
28	Admin access is restricted to type	C	Removed

Table 5 - Requirement list

3.3 Cancelled Requirements

As shown in the requirement list in the previous chapter, [chapter 3.2](#), two of the requirements were removed. These requirements and the reasons why they were removed are covered in the following subchapters.

3.3.1 User Can Use External User Authentication

The original plan was to connect the project to Registers Iceland's Active Directory so that users would be automatically logged into the system. However, because of unrepresented circumstances caused by COVID-19, Registers Iceland's IT department was unable to assist the team in this matter. Therefore, the requirement was dropped in consultation with the product owner.

3.3.2 Admin Access Is Restricted to Type

The original idea of this requirement was to restrict each admin's access to a certain type of forms. For example, the admin of safety matters would only be able to modify forms regarding safety. In consultation with the product owner, it was decided to cancel this requirement because it did not add enough value to the project.

4 Risk Analysis

The team performed a risk analysis to identify potential issues that could negatively affect the work of the project. Team members came up with possible risks, discussed how likely they were to happen and how much it could affect the work. Finally, the team came up with a mitigation and a response for each risk. *Table 6* shows risks identified by the team.

#	Risk	Probability	Impact	Severity	Mitigation	Response	Responsible
1	Sickness (COVID-19 etc.)	4	4	16	Washing hands frequently and thoroughly	If a team member gets sick, he will not enter the office. The team will discuss if it is likely to have an impact on the project and minimize the risk	Þórný
Event log 24/02/20: Þórný sick, worked from home. 28/02/20: First COVID-19 case confirmed in Iceland. 16/03/20: First COVID-19 case confirmed in Akureyri. Hannes's child quarantined. 20/03/20: Bjarki sick, worked from home. 23/03/20- 02/04/20: Benedikt's twins sick.							
2	Workload in other courses	4	3	12	Try to be on track in courses from the beginning	Make up the work when workload decreases	Bjarki
Event log 12/02/20: Compulsory attendance in UNAK course 27/02/20: Midterm exam in RU course 01/04/20: Workload in UNAK courses							
3	Issues connecting to external APIs	5	2	10	Try to help each other and	Get help from Registers Iceland's	Bjarki

					work as a team through obstacles like this	programmer or the team's instructor	
	No events						
4	Unexpected bugs	3	3	9	Test everything before pushing it to the master	Work on a bug by pair programming	Fjölpir
	Event log 17/04/20: Presentation to Registers Iceland and the instructor Hildur did not go as expected and exposed some bugs. 13/05/20: Unexpected bugs came up after made changes. Fixed immediately. 14/05/20: Mail was being sent to submitter's email instead of the destination email. Fixed immediately.						
5	Absence of group members because of unforeseen reason	5	1	5	Plan meetings and work days ahead of time	Work from home if possible	Hannes
	Event log 19/02/20: Benedikt trapped in Blönduós 28/02/20: Hannes's family trip. Bjarki's child sick.						
6	Connecting to a database	1	4	4	Connect a database to the project early to have time to fix problems	Get help from more experienced programmers	Benedikt
	No events						
7	Stuck on a problem	4	1	4	Get help from other team members	Pair programming	Þórný
	Event log 23/03/20: Stuck on how to submit a dynamic form. 21/04/20: Stuck on nested validation in form submission. 21/04/20: Stuck on testing for the Blazor environment. 24/04/20: Stuck on how to delete data from database on a regular basis using a free Azure account.						
8	Downtime of external systems	3	5	15	Use reliable systems	The project can be run locally	Bjarki
	Event log 17/04/20: Azure websites unavailable 17/04/20: FontAwesome, used for icons on the website, unavailable						
9	Loss of code	1	4	4	Use version control and commit frequently	Reprogram the lost code in a pair. Revert to the latest stable version if all else fails.	Benedikt
	No events						
10	OS compatibility issues	1	3	3	Team uses VS Code which fully works on Mac and Windows	Team will try to get information on the issues and find a way to overcome it	Þórný
	Event log						

	11/02/20: Could not run local database on Mac OS. Connected all local projects to the database.						
11	Contacts at Registers Iceland not available for meetings	3	1	3	Team has scheduled weekly meetings with Registers Iceland	The team can send Registers Iceland 's contacts any questions they have via Messenger	Fjölur
Event log: 20/03/20: Due to the outbreak of COVID-19, meetings were online during the gathering ban							
12	A group member leaves the project	1	2	2	Keep good moral within the team and tackle problem between team members right away	Cut down the requirements and divide the extra workload	Hannes
No events							
13	Web browser compatibility on Firefox and Chrome	2	1	2	Test the website on both browsers in each sprint	Get help from our instructor or Registers Iceland's programmer, Bjarni	Benedikt
Event log: 07/05/20: Checkbox did not look the same in Chrome on Mac and Windows.							

Table 6 - Risk analysis

5 Design

This chapter covers the design and structure of the project. The goal is to make the system as easy to use as possible. Users should be able to fill out a form without any difficulty and should also be sure that their form will end up and be processed at the right place.

Registers Iceland did not have official guidelines for design but gave the team latitude in that regard.

5.1 Diagrams

5.1.1 Entity Relationship Diagram

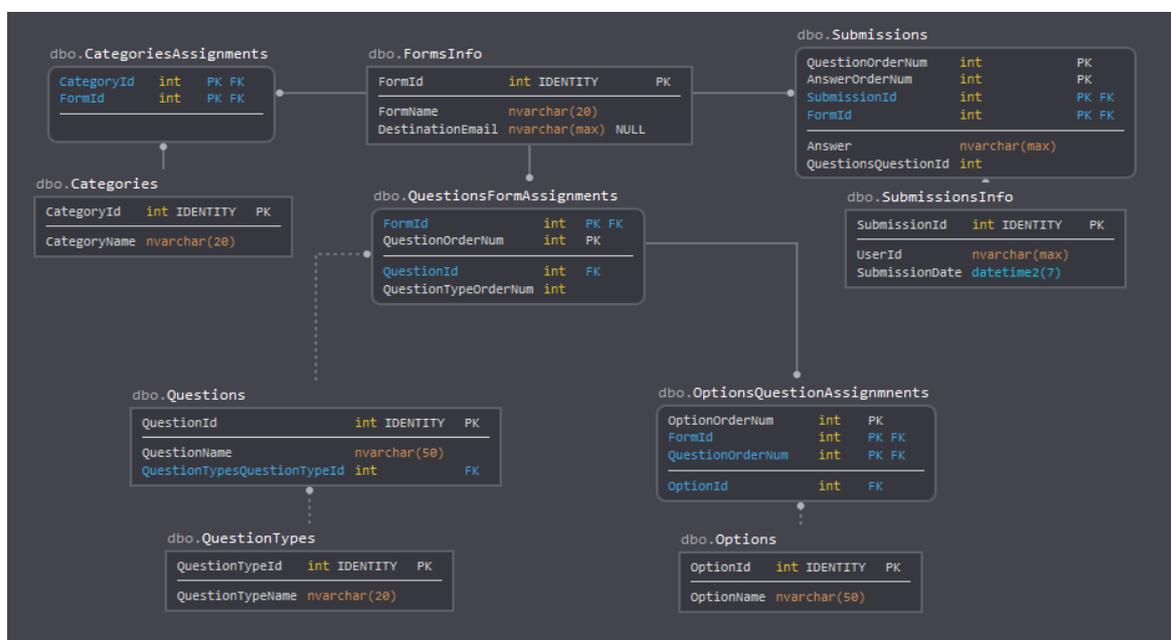


Figure 1 - ER diagram of the form part of the database

Figure 1 shows an entity relationship diagram of the part of the database that handles the forms. FormsInfo stores all the created forms and relevant information. The forms employees fill out are comprised of the tables FormsInfo, Questions, QuestionTypes and Options. QuestionsFormAssignment specifies in which form questions belong in and likewise OptionsQuestionAssignment specifies in which question options belong. The FormsCategoryAssignments table specifies in which category forms belong in.

Figure 2 below shows an entity relationship diagram of the part of the database that handles submissions. The table SubmissionsInfo stores all the submitted forms and relevant information and the Submissions table contains all the answers to the submitted forms in SubmissionsInfo.

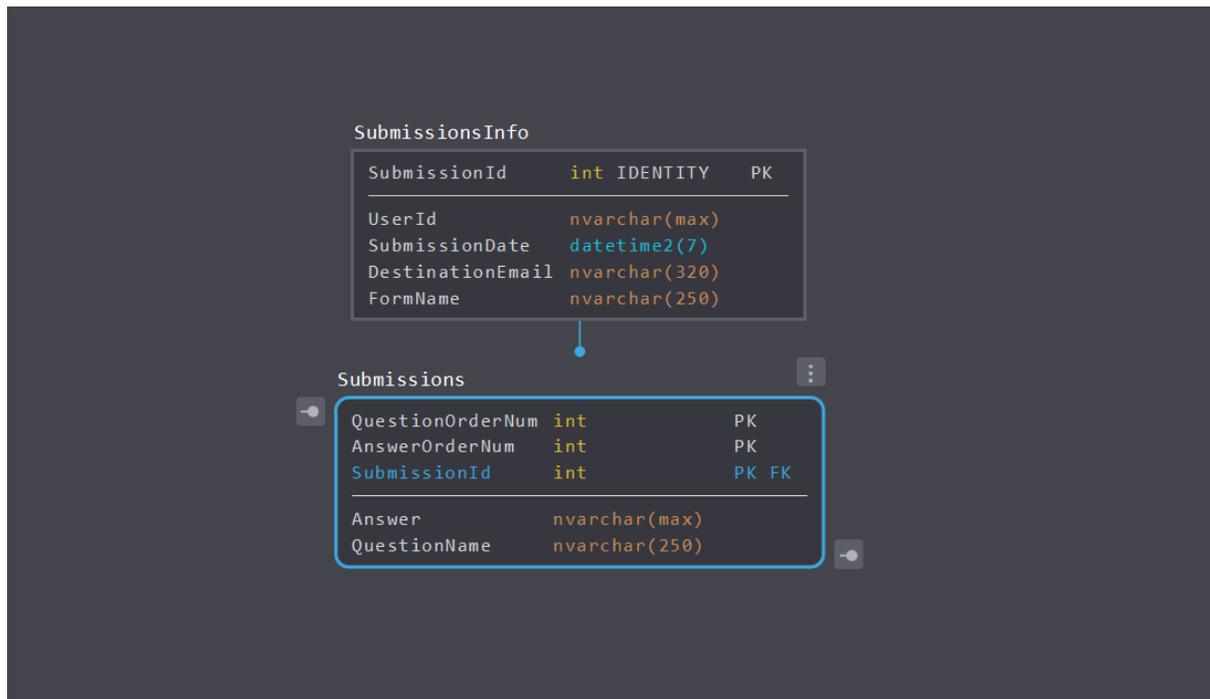


Figure 2 - ER diagram of the submissions part of the database

5.1.2 Navigation Diagrams

Navigation diagrams are useful to understand the flow of the website. Each box in the diagram represents a page/view and the arrows show how the user can navigate between those pages. As shown in [chapter 3.1](#), two user groups for the system were defined, and the team created one navigation diagram for each group, shown in [Figure 3](#). The text next to some of the boxes reference the system prototypes in [chapter 5.2](#).

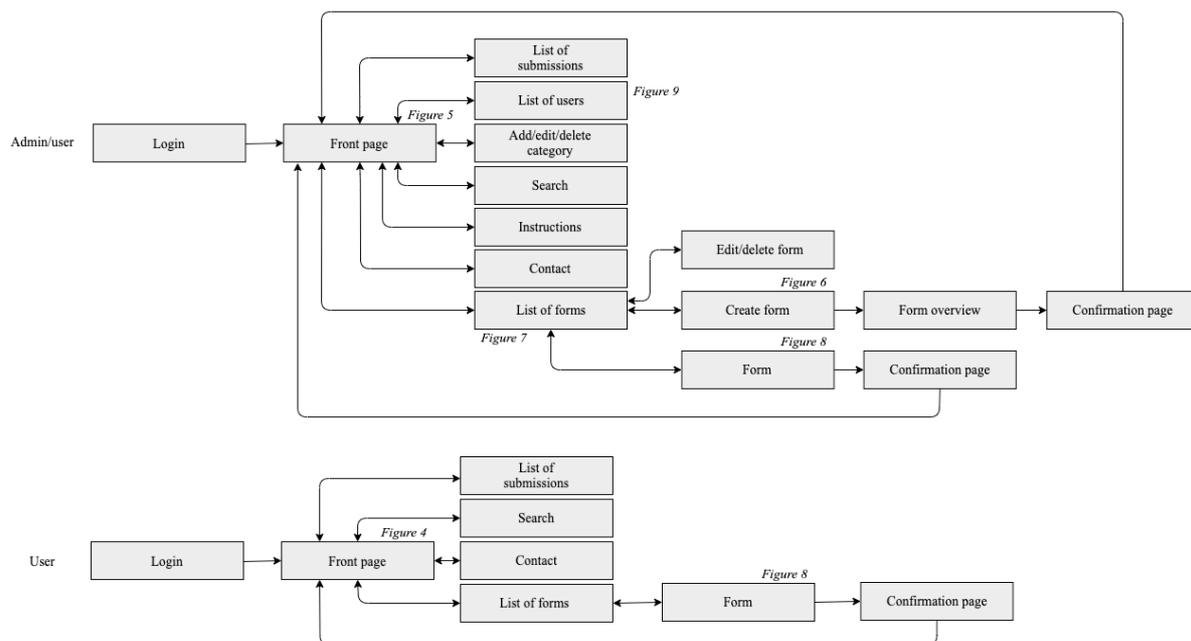


Figure 3 - The text above the boxes reference the system prototypes

5.2 Prototypes

In the very beginning of the project, the team discussed how the website should look and started drawing the first prototypes using a whiteboard. The team members all agreed that the website should be very simple and not require any training. After exchanging multiple ideas and discussing it with the product owner, prototypes for the system were created using an online tool called *MockFlow*. This chapter covers the main prototypes, but for those who wish to see more, please refer to [Appendix A](#).

Figure 4 shows the home page of the general user. On the home page, the user can choose to view his/her profile or click on a category appropriate to the form he/she wants to submit.

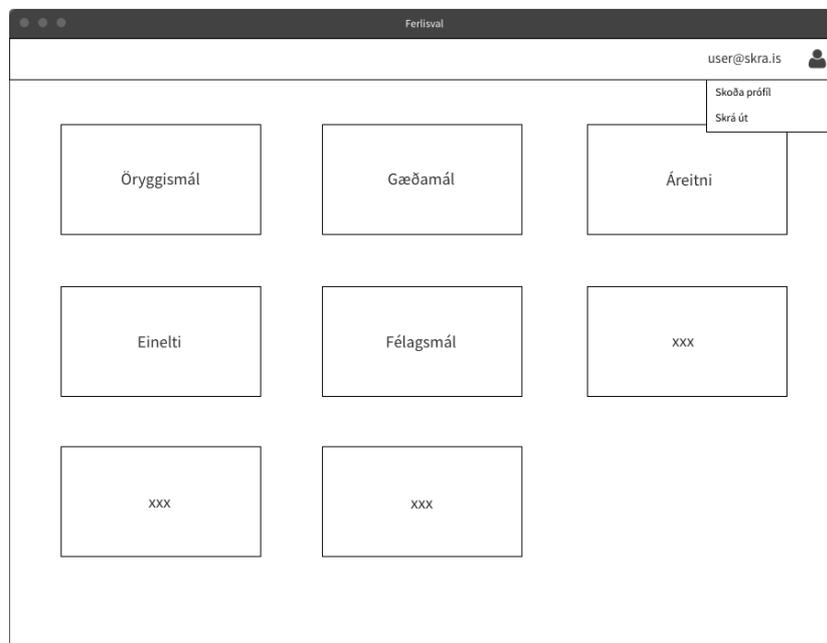


Figure 4 - User's home page

Figure 5 shows the home page of an admin user. An admin has a few more options but can do all the same things as a general user. Admin has the option of creating and deleting a category as well as creating and deleting a form. Also, the Admin can view a list of users and give them admin privileges.

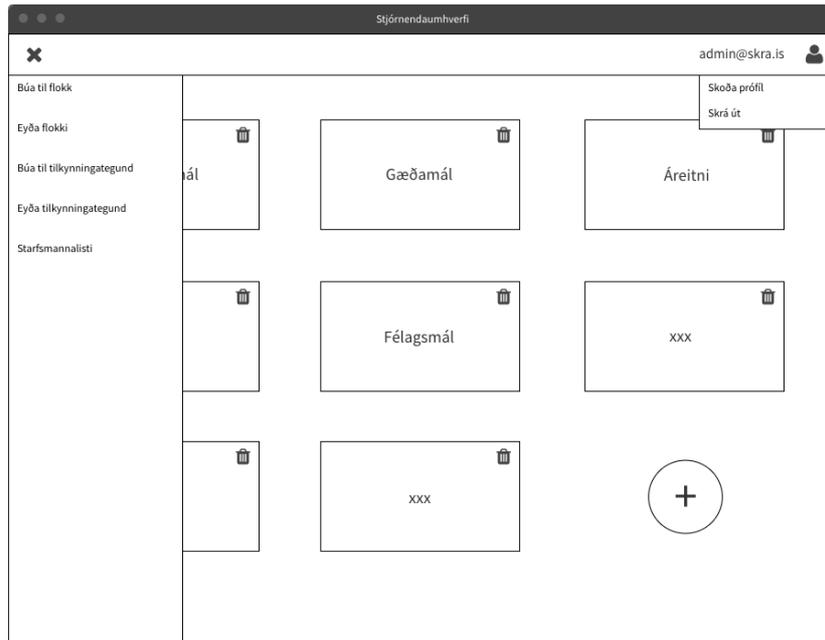


Figure 5 - Admin's home page

Figure 6 shows the page the admin sees when he/she wants to create a new form. At first, one chooses a category if needed, and then adds questions and chooses the question's type.

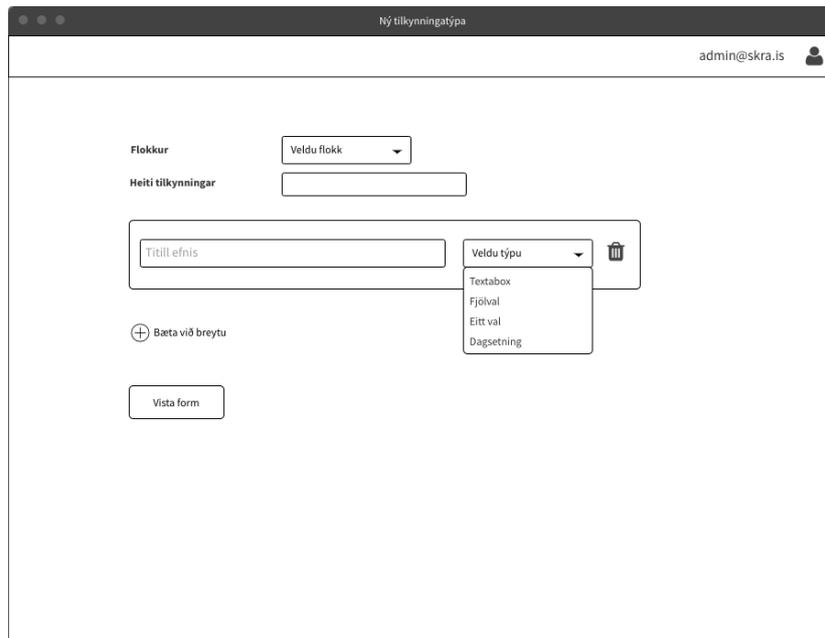


Figure 6 - The page where admin can create a form type

Figure 7 shows a list of forms. On the left is what admin sees and on the right what a general user sees. User chooses what type of form he/she wants to submit. In addition, admin can edit and delete a form as well as create a new one.

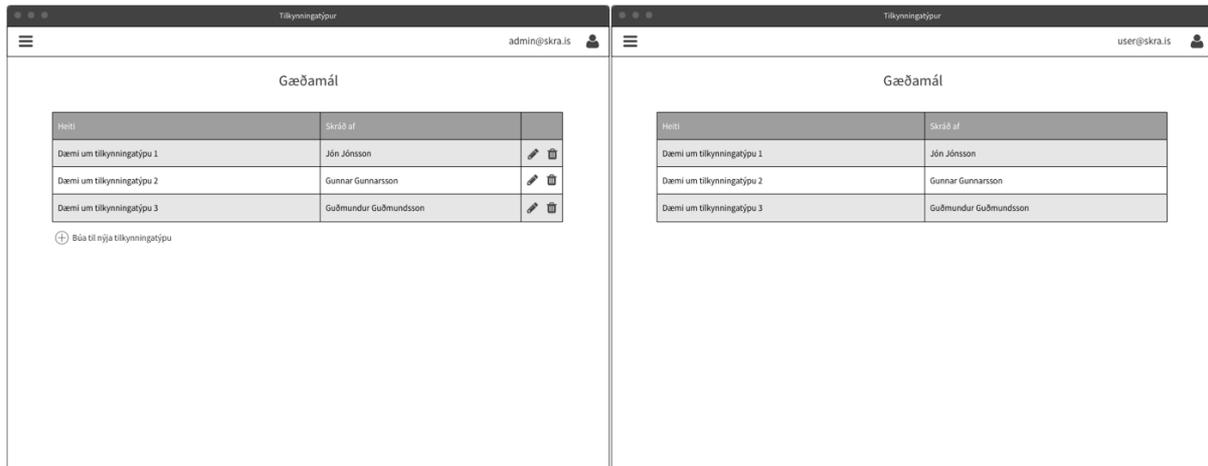
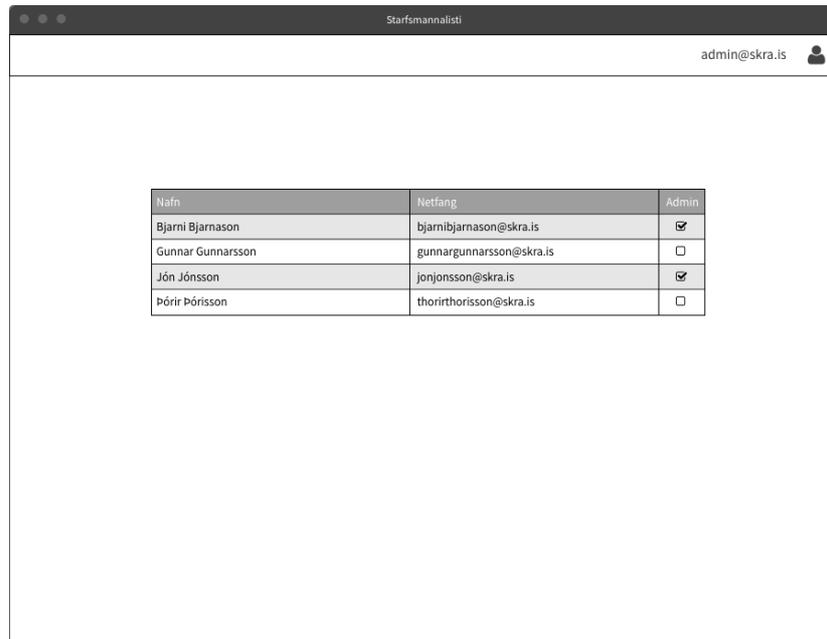


Figure 7 - List of types of form for chosen category, left one for admin and right one for general user

Figure 8 shows an empty form for the user to fill out. These forms are created by admins and can therefore be very different.

Figure 8 - An example of an empty form

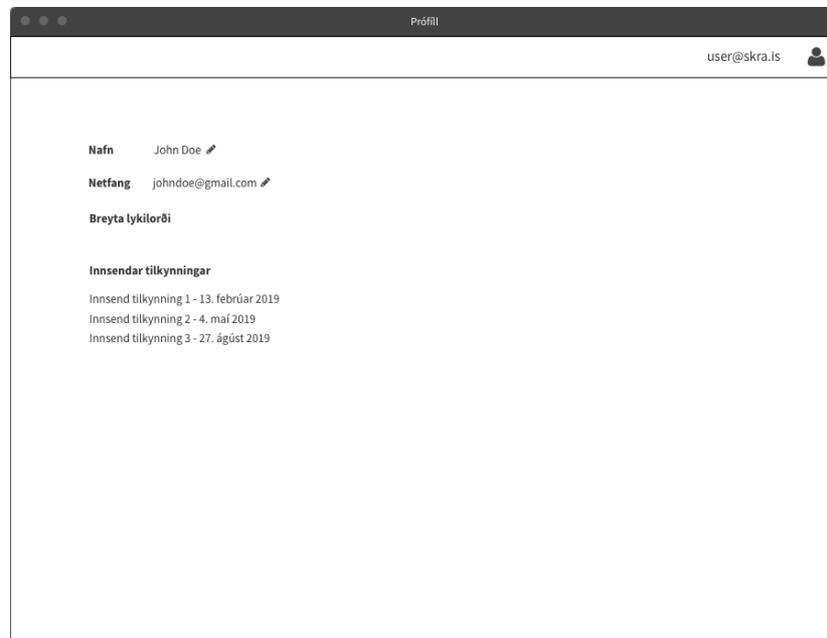
Figure 9 shows the list of all users. On this page, admin can give another user admin privilege or remove the privileges from another admin.



Nafn	Netfang	Admin
Bjarni Bjarnason	bjarnibjarnason@skra.is	<input checked="" type="checkbox"/>
Gunnar Gunnarsson	gunnargunnarsson@skra.is	<input type="checkbox"/>
Jón Jónsson	jonjonsson@skra.is	<input checked="" type="checkbox"/>
Þórir Þórisson	thorirthorisson@skra.is	<input type="checkbox"/>

Figure 9 - Page where admin can give other users admin privileges

Figure 10 shows a user's profile, including a list of all submitted forms. It is, however, not possible to view a submitted form due to privacy reasons.



Nafn John Doe ✎

Netfang johndoe@gmail.com ✎

Breyta lykilorði

Innsendar tilkynningar

- Innsend tilkynning 1 - 13. febrúar 2019
- Innsend tilkynning 2 - 4. maí 2019
- Innsend tilkynning 3 - 27. ágúst 2019

Figure 10 - Page where user/admin can see a list of submitted form

5.3 Usability Testing with Prototypes

It was decided to perform usability testing using a method called the *Think-aloud* method. That method was chosen because it helps in discovering bugs that have not been noticed by developers or had been missed during the performance of other types of testing.

In a think-aloud test, the participants are asked to solve tasks that the testers have prepared for them. While solving the tasks, the participants are supposed to think aloud while testers monitor and take notes. This method is proved to help developers discover typical user behavior, such as misinterpretation of some design elements. It gives developers opportunity to see if they need to add or change things that they would not discover otherwise.

To measure the system's efficiency, it was decided to time participants solving the tasks. To measure satisfaction, participants were asked what they thought about the system after completing the tasks. Two members of the development team went to Registers Iceland's office in Akureyri to perform the testing, one conducted the tests and the other kept track of the time and took notes. The script the team wrote and used for the testing can be found in [Appendix B](#).

5.3.1 Participants Background

The product owner selected three employees from Registers Iceland to participate in the testing. Two of them tested the user's side of the system while the third tested the admin's side. *Table 7* shows the participants' age group, computer skills, how many hours per day they spend on the computer and which user group they tested for.

Age group	Computer skills	Computer usage	User group
51-67	Average	> 8 hours	General user
31-50	Expert	> 8 hours	General user
31-50	Average	> 8 hours	Admin user

Table 7 - Participants' background information

5.3.2 Tasks

The participants who tested as a general user were asked to solve [two tasks](#), and the participant who tested as an admin user was asked to solve [four tasks](#). The tasks, followed by the appropriate user group and usability factor, as well as how the usability factor was measured, and finally the goal and actual results average is shown in *Table 8*

#	Description	User group	Usability factor	Data	Goal	Test value (avg)
1	It takes users 60 seconds on average to submit a form	Users	Efficiency	Time (sec)	<= 60 sec	235
2	It takes users 10 seconds on average to view their profile	Users	Efficiency	Time (sec)	<= 10 sec	10
3	It takes admins 10 seconds on average to create a new category	Admins	Efficiency	Time (sec)	<= 10 sec	18
4	It takes admins 90 seconds on average to create a new form type	Admins	Efficiency	Time (sec)	<= 90 sec	34
5	It takes admins 15 seconds on average to delete a form type	Admins	Efficiency	Time (sec)	<= 15 sec	7
6	It takes admins 10 seconds on average to give another user admin rights	Admins	Efficiency	Time (sec)	<= 10 sec	28
7	Average rating of the system is higher than 8.5	Users/admins	Satisfaction	Rating (0-10)	> 8.5	7.8
8	Users/admins find the system simple to use	Users/admins	Satisfaction	Yes/no	> 85% yes	100%

Table 8 - Tasks for usability testing

5.3.2.1 Results

The participants did very good and solved the tasks without any major problems. All the participants were quite satisfied with the system and all agreed that they found it simple to use. The following table, *Table 9*, lists the comments from the participants and how the team responded to those comments.

Comment	Response
Option of changing username and email not relevant with AD connection	User profile removed completely
The two topmost field in the form confusing	No response, admin creates the form
No option of submitting form anonymously	Anonymous feature added
Account icon might not appear clickable to some people	No response, team decided to keep the icon

Table 9 - Comments from participants of usability testing

5.4 Usability Testing with Web App

Usability testing with the web app was performed using the same method as was used for the usability testing with prototypes, the *Think-aloud* method.

Due to the COVID-19 situation, the testing took place online through Microsoft Teams. Two members of the development team performed the testing, one to conduct and the other to keep track of time and take notes for each task. The script the team wrote and used for the testing can be found in [Appendix B](#).

5.4.1 Participants Background

The product owner, Tryggvi Rúnar, selected four people to participate in the testing, including himself and Bjarni Konráð. Tryggvi and Bjarni tested the admin's side of the system and the other two tested the user's side. *Table 10* shows the participants' age group, computer skills, how many hours per day they spend on the computer and which user group they tested for.

Age group	Computer skills	Computer usage	User group
31-50	Average	> 8 hours	General user
31-50	Average	> 8 hours	General user
31-50	Expert	> 8 hours	Admin user
31-50	Expert	> 8 hours	Admin user

Table 10 - Participants' background information

5.4.2 Tasks

The participants who tested as a general user were asked to solve [six tasks](#), and the participants who tested as an admin user were asked to solve [seven tasks](#). The tasks, followed by the appropriate user group and usability factor, as well as how the usability factor was measured, and finally the goal and actual results average is shown in *Table 11*

#	Description	User group	Usability factor	Data	Goal	Test value (avg)
1	It takes user 60 seconds on average to find and fill out a certain form	Users	Efficiency	Time (sec)	<= 60 sec	39
2	It takes users 20 seconds on average to access own submissions	Users	Efficiency	Time (sec)	<= 20 sec	4.5

3	It takes users 15 seconds on average to go back to home page	Users	Efficiency	Time (sec)	≤ 15 sec	2
4	It takes users 40 seconds on average to fill out a certain form	Users	Efficiency	Time (sec)	≤ 40 sec	11.5
5	It takes users 30 seconds on average to find a certain form from the home page	Users	Efficiency	Time (sec)	≤ 30 sec	11.5
6	It takes users 35 seconds on average to send in a request on the website	Users	Efficiency	Time (sec)	≤ 35 sec	25
7	It takes admins 15 seconds on average to create a new category	Admins	Efficiency	Time (sec)	≤ 15 sec	22.5
8	It takes admins 90 seconds on average to create a new form with 1 question	Admins	Efficiency	Time (sec)	≤ 90 sec	77
9	It takes admins 20 seconds on average to edit name of form	Admins	Efficiency	Time (sec)	≤ 20 sec	21.5
10	It takes admins 15 seconds on average to view all submissions	Admins	Efficiency	Time (sec)	≤ 15 sec	13.5
11	It takes admins 15 seconds on average to view own submissions	Admins	Efficiency	Time (sec)	≤ 15 sec	5
12	It takes admins 20 seconds on average to add a user to the system	Admins	Efficiency	Time (sec)	≤ 20 sec	55
13	It takes admins 10 seconds to give other user admin rights	Admins	Efficiency	Time (sec)	≤ 10 sec	7.5
14	Average rating of the system is higher than 8.5	Users/admins	Satisfaction	Rating (0-10)	> 8.5	8.1
15	Users/admins find the system simple to use	Users/admins	Satisfaction	Yes/no	$> 85\%$ yes	100%

Table 11 - Tasks for usability testing

5.3.2.1 Results

The participants solved the tasks without any troubles. They were all very satisfied with the system and all agreed that it is simple to use. The following table, *Table 12*, lists the comments from the participants and how the team responded to those comments.

Comment	Response
Option of submitting anonymously should not be available for all forms	Option for admin to choose whether the anonymous option should be available added
Use of different words confusing	Consistency improved
Submission-ID missing from list of all submissions	Submission-ID added to list of all submissions

Table 12 - Comments from participants of usability testing

6 Progress Overview

This chapter covers the team’s progress throughout the project with details of all the sprints. For each sprint there is a sprint backlog, a sprint burndown and a sprint retrospective.

6.1 Sprint 0 – End Date: 28.01.2020

As this is the very start of the project, this sprint’s focus was to get prepared for the project. The organization planning was made, including a work schedule. Team member roles were organized, and physical locations clarified (an office space rented). Overall methodology, including technical environment was defined. Team spent time on overall preparation such as reading sources and looking at other final projects.

6.1.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Organization Planning	Team	Done	50	
Work schedule draft	Team	Done	30	
Project Setup	Benedikt	Done	20	
			100	

Figure 11 - Sprint 0, sprint backlog

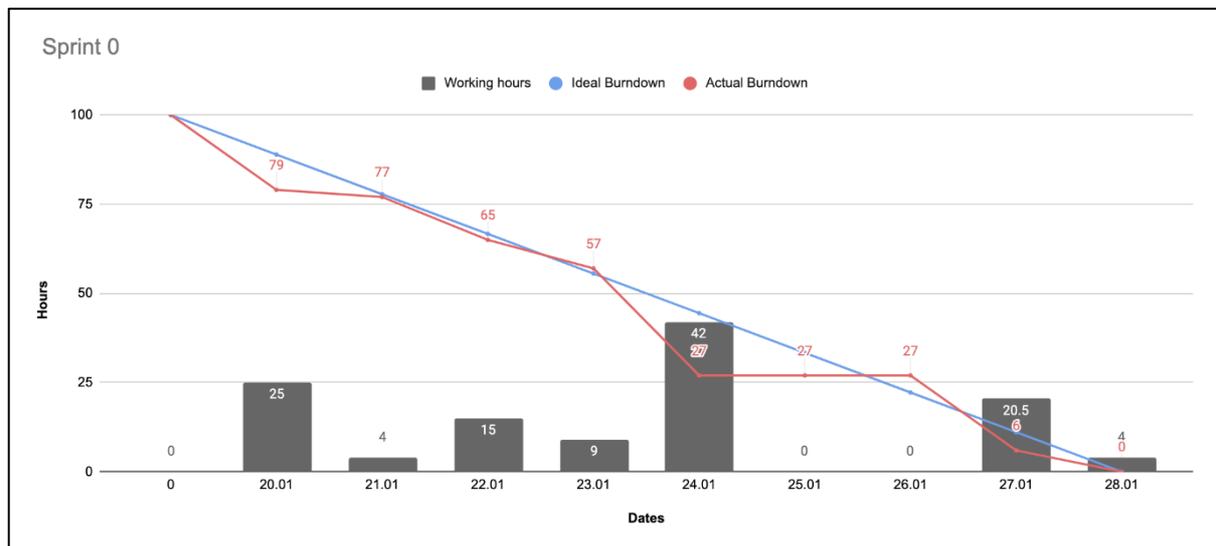


Figure 12 - Sprint 0, burndown chart

6.1.2 Retrospective

Hours spent

The sprint length was 9 days and the team estimated 100 working hours. Actual working hours spent on the sprint were 119.5.

What went well?

This sprint overall went well, and the team is on schedule.

What could have been better?

Nothing that team members could really control. However, it took time to get a meeting with a programmer at Registers Iceland; meanwhile the team was a bit in the dark regarding the technical environment of the solution. Physical environment was also a black box at the start, but as mentioned earlier the team members rented an office space by themselves.

Going forward to the next sprint

The team aims to follow the Scrum methodology closer. The next sprint will mainly cover documentation and design, as well as making decisions about technical environment and the database.

6.2 Sprint 1 – End Date: 11.02.2020

The focus in this sprint was mainly on documentation and database connection. The first status meeting was during this sprint so there were certain things that the team had to finish before the meeting, such as analyzing risks, improve the requirement list and finalize the status report.

6.2.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Database design	Hannes	Moved	7	
Database connection	Team	Done	30	
Project setup	Benedikt	Moved	80	
Backlog sheet setup	Þórný	Done	2	
Requirement list	Team	Done	20	
Progress overview	Hannes	Done	12	
Prototypes	Hannes	Done	4	
Status meeting report	Team	Done	15	
Work schedule	Þórný	Done	20	
Risk analysis	Team	Done	10	
Status meeting presentation prep	Team	Done	5	
Navigation diagram	Bjarki	Done	8	
Update prototypes&navigation diagram	Þórný	Done	8	
			221	

Figure 13 - Sprint 1, sprint backlog



Figure 14 - Sprint 1, burndown chart

6.2.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 221 working hours. Actual working hours spent on the sprint were 180.5.

What went well?

The database connection went much better than the team had estimated in the beginning. Following the Scrum methodology had improved, and documentation went quite well. The first status meeting went very well, and the team members agreed that it was very good getting the feedback from Stefán and Hildur.

What could have been better?

The team did not spend quite as much time on the project this sprint as estimated, and team members could have added more tasks to the sprint backlog. The burndown chart setup was not good enough and not being updated on daily basis.

Going forward to the next sprint

In the next sprint the team will try to do better regarding the burndown chart and come up with a better system so that it is updated daily. The sprint will cover more programming and the team will be using pair programming to get everyone started and feel comfortable in the development environment.

6.3 Sprint 2 – End Date: 25.02.2020

In this sprint, team members were very excited to start programming after working on reports and documentation in the previous sprints. Team members sketched up a rough look of the website, updated the prototypes and performed user tests and added automatic testing to the continuous integration. The team spent a lot of time on reading sources and getting started in the development environment.

6.3.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Connection to other systems diagram		Moved	4	
Update prototypes and Navigation Diagram	Þórný	Done	8	
Create shared layout (template layout)	Fjölínir	Moved	8	
Login view		Moved	2	
Front page view	Fjölínir	Done	2	
Form list view	Hannes	Moved	2	
Form creation view	Bjarki	Done	2	
Category creation popup view	Þórný	Done	2	
Create admin role	Benedikt	Moved	18	
User list view	Þórný	Done	2	
Setup automated coding rules	Fjölínir	Removed	8	
Prepare user tests	HK + ÞS	Done	16	
Perform user tests	HK + ÞS	Done	4	
Database design	HK + BRV	Moved	20	Started last sprint
Setup Database migrations	Team	Moved	60	
Setup automatic unit tests for Azure pipeline	BB + ÞS	Done	16	
Write unit tests for existing code		Moved	8	
Create dynamic views that change depending on user's role		Moved	8	
			190	

Figure 15 - Sprint 2, sprint backlog

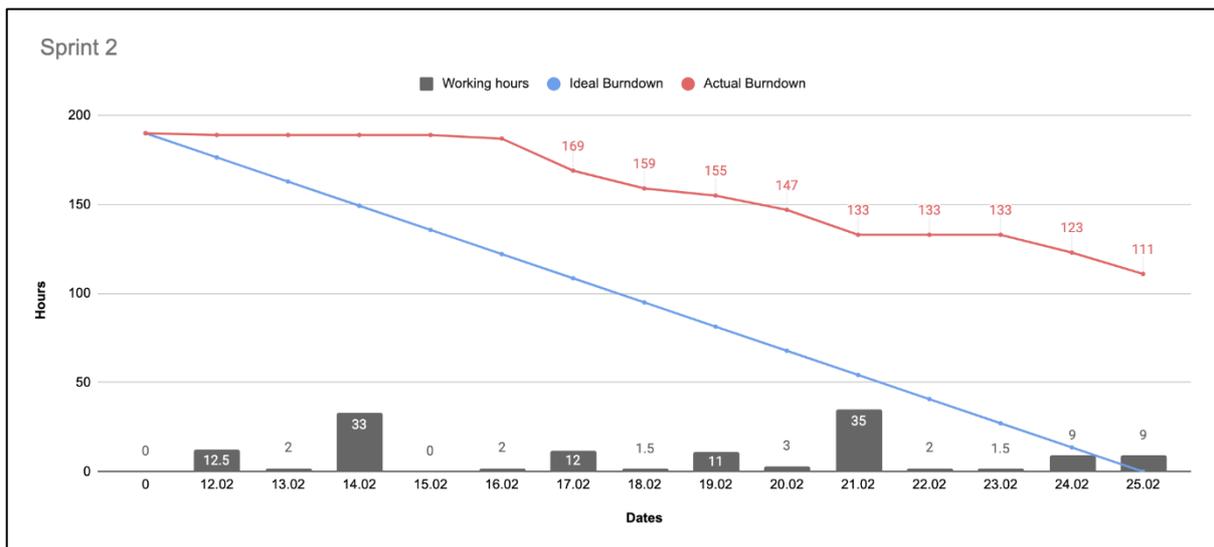


Figure 16 - Sprint 2, burndown chart

6.3.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 190 working hours. Actual working hours spent on the sprint were 133.5.

What went well?

Following the Scrum methodology improved a lot in this sprint and the team came up with a good setup for the burndown which was after that updated on a daily basis. User tests went well, and the team members will take the feedback from the user participants into account. Team members are positive regarding the development environment and are excited to start programming more.

What could have been better?

Everything took more time than expected, and the workload in other courses was burdensome in this sprint. The tasks were too big, and a lot of time was spent on things that were not defined in the sprint backlog. The team did not create new tasks for those things as they were mainly reading sources, getting familiar with the Blazor development environment and preparing for programming work.

Going forward to the next sprint

The team will decrease the number of tasks for the next sprint and try to focus on one thing at a time.

6.4 Sprint 3 – End Date: 11.03.2020

In this sprint, some team members continued programming the front end while others worked on the database design and migrations. The team also started preparation for status meeting 2.

6.4.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Connection to other systems diagram		Moved	4	
Create shared layout (template layout)	Fjölur	Done	6	Started last sprint
Login view	Bjarki	Done	2	
Form list view	Bjarki	Done	2	
Database design - integration of tables defined (rough)	HK + BRV	Done	14	
Setup Database migrations	HK + BRV	Moved	48	Started last sprint
Write unit tests for existing code		Moved	8	Still not much functionality that can be unit tested
Create admin role	Benedikt	Done	14	Started last sprint
Create dynamic views that change depending on user's role	Fjölur	Done	8	
Fetch data from database for user list view	Þórný	Done	12	
Add/delete category logic		Moved	25	
Status report 2	Bjarki & Þórný	Moved	20	
Documentation of usability testing	Þórný	Moved	7	
Let admin make another user Admin	Bjarki	Done	10	
Fix burndown charts and sprint backlogs	Benedikt	Done	9	
Draw an ER-diagram	BRV+HK	Done	2	
			191	

Figure 17- Sprint 3, sprint backlog

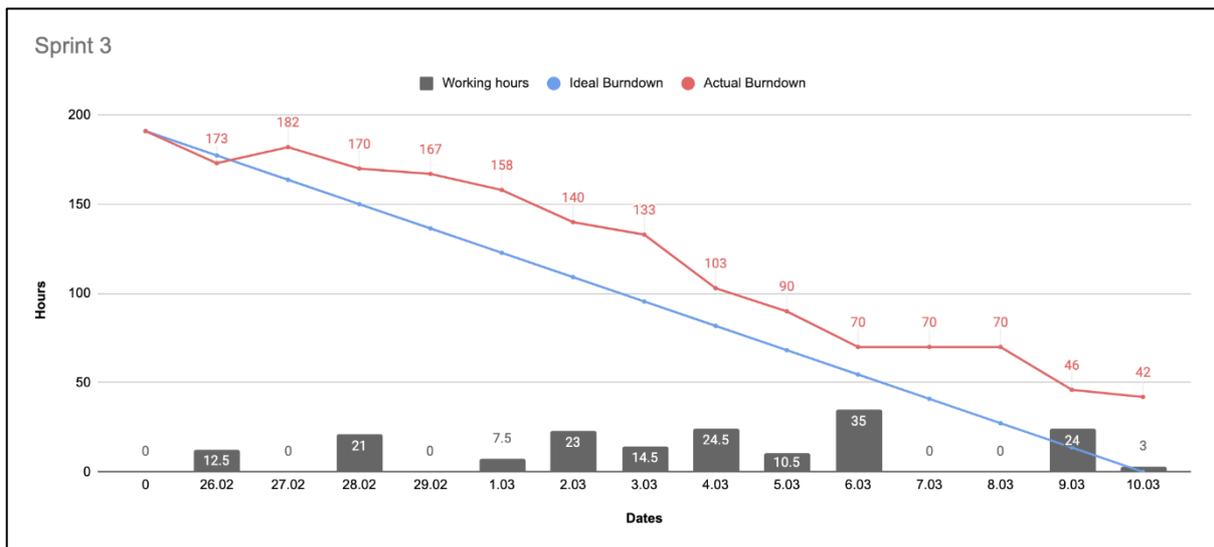


Figure 18 - Sprint 3, burndown chart

6.4.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 191 working hours. Actual working hours spent on the sprint were 175.5.

What went well?

Designing the database went well and good progress was made on the migrations for the database. The report also came together nicely in this sprint and most of the comments we got have been addressed.

What could have been better?

The lack of a database halted progress in other areas of coding which were dependent on there being some database existent. Would have been better if we had created a dummy database earlier but since the database is nearly finished it made more sense to wait with assignments dependent on a database and focus on other things like the report instead.

Going forward to the next sprint

Get familiar with the database and get everyone up to speed with programming.

6.5 Sprint 4 – End Date: 24.03.2020

Status meeting 2 was held in this sprint, so in the beginning of the sprint the team focused on the report and presentation. Due to Covid-19 and the gathering ban in Iceland, the status meeting was on Zoom instead of being in the University of Akureyri. The status meeting went much better than expected and the team did not get many comments.

After the status meeting, the team continued setting up database migrations as well as experimenting with fetching data from the database.

6.5.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Connection to other systems diagram		Moved	4	
Setup Database migrations	HK + BRV	Done	8	Started in sprint 2
Write unit tests for existing code	BB	Moved	8	
Add/delete category logic	BB + BRV	Done	10	Started last sprint
Status report 2	Team	Done	16	Started last sprint
Documentation of usability testing	þórný	Done	7	
Connect the table SubmissionsInfo to the table AspNetUsers		Removed	0	Not necessary because we will use AD
Read up on how to connect to Trello		Moved	8	
Read up on how to connect to Jira	Hannes	Done	8	
Read up on how to send an email when a form is submitted	Hannes	Done	8	
Status meeting presentation		Done	15	
CRUD actions for the db	Benedikt, Fjölínir	Moved	30	
Create the page where the user fills out a form	Benedikt	Moved	43	
Create the category table	Benedikt	Done	3	
Show all category assignments behind every category	Fjölínir	Done	6	
Add/Delete/Update category assignment behind a category	Fjölínir	Done	12	
Improve category view	þórný	Done	20	
Add Admin functionality	Benedikt	Done	6	
Ability to add a new form	Fjölínir + HK	Done	10	
			222	

Figure 19- Sprint 4, sprint backlog



Figure 20 - Sprint 4, burndown chart

6.5.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 222 working hours. Actual working hours spent on the sprint were 226.

What went well?

Most of the tasks went very well and the team was happy with how this sprint went. Coding went well and the project is coming together nicely.

What could have been better?

Unit testing turned out to be more difficult than expected. The team will investigate this issue further with the team's instructor in the next sprint.

Going forward to the next sprint

The team will try to break the tasks down in greater detail, so it is easier for team members to take on new tasks. The goal of the next sprint is to get the form functionality up and running.

6.6 Sprint 5 – End Date: 07.04.2020

Most of the time in this sprint was spent on programming and it was very successful.

6.6.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Create the view for the page where the admin creates a form	Þórný	Done	25	
Read up on how to connect to Trello	Hannes	Done	8	
Add popup window when you remove a user from admin role on View Users page	Þórný	Done	4	
Make the view of the popup windows unified	Bjarki	Done	10	
Fix the view of the form list page	Hannes	Done	10	
Change sidebar to dropdown menu	Bjarki	Done	6	
Change database table connections so that it is easy to for loop through data when displaying the form	Bene, Fjölur	Done	25	
Implement logic to sort users in alphabetical order in userlistview	Bjarki	Done	7	
Data validation of multiple models in one form	Bene, Hannes	Moved	25	
Create the view for the page where the user fills out a form	Fjölur	Done	16	Started last sprint
Save submitted form to the database	Þórný	Done	20	
Add CRUD necessary to create a form	Bene, Fjölur	Done	25	Started last sprint
Make popup window close when you click outside of it	Bjarki	Removed	0	
Write unit tests for existing code		Removed	0	
Implement a UI test		Moved	14	
Search functionality on UserList	Bjarki	Done	5	
Edit and delete a form when creating it	Fjölur	Done	10	UI needs improving
Format the email with information about submitted form	Bjarki	Moved	10	
			220	

Figure 21 - Sprint 5, sprint backlog

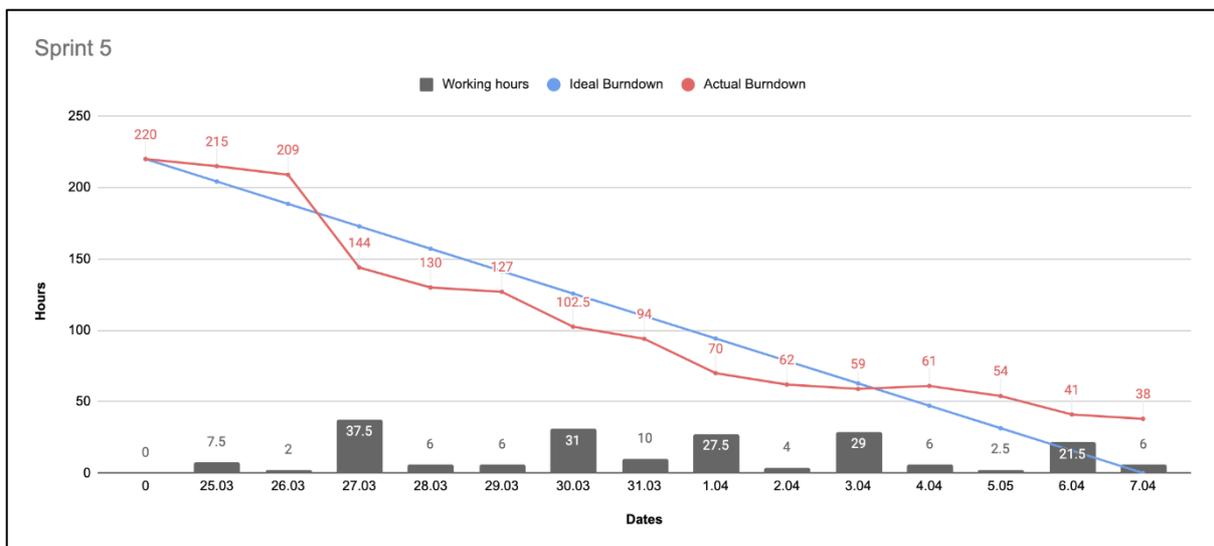


Figure 22 - Sprint 5, burndown chart

6.6.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 220 working hours. Actual working hours spent on the sprint were 196.5.

What went well?

This sprint went very well, this was the most important sprint so far and the team was expecting some difficulties. Fortunately, the team did not face many problems and the bigger tasks such as 'submitting a form' went much better than expected.

What could have been better?

The team could have done better regarding commenting the code, handling exceptions and such. The workload in UNAK courses was quite heavy in this sprint so the team member could not spend as much time on the project as they would have wanted.

Going forward to the next sprint

The next sprint includes Easter break and should have included the RU exams as well, but due to COVID-19 the RU students are not required to take final exams. The team will keep up the good work for the next sprint, but still take time to enjoy Easter.

6.7 Sprint 6 – End Date: 21.04.2020

According to the original plan, this sprint was supposed to include the fewest hours of all the sprints because of Easter break and final exam preparation in RU courses. It turned out to be the team’s most extensive sprint so far in terms of hours spent and results. This was mainly due to the fact that, RU students were allowed to skip the final exams because of COVID-19.

The focus in this sprint was on data validation, handling exceptions and formatting the email with information about a submission.

6.7.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Data validation in all forms	Pórný, Bene	Moved	15	Started last sprint
Format the email with information about submitted form	Bjarki	Done	15	Started last sprint
Implement a UI test	Fjölínir	Moved	17	
Create components for pop up windows on index and userList page	Benedikt	Done	25	
Delete submissions older than 7 days from database automatically	Hannes	Moved	20	
User gets a confirmation after submitting a form	Fjölínir	Done	7	
Exceptions caused by user action should be handled	Bjarki	Done	20	
User can submit a form anonymously	Bjarki	Done	10	
Admin can access a list of all submissions	Fjölínir	Done	5	
User can access a list of his submissions	Fjölínir	Done	5	
Create a PDF of a submission of a form	Fjölínir	Done	15	
Fix the form creation view	Pórný	Moved	15	
			169	

Figure 23 - Sprint 6, sprint backlog

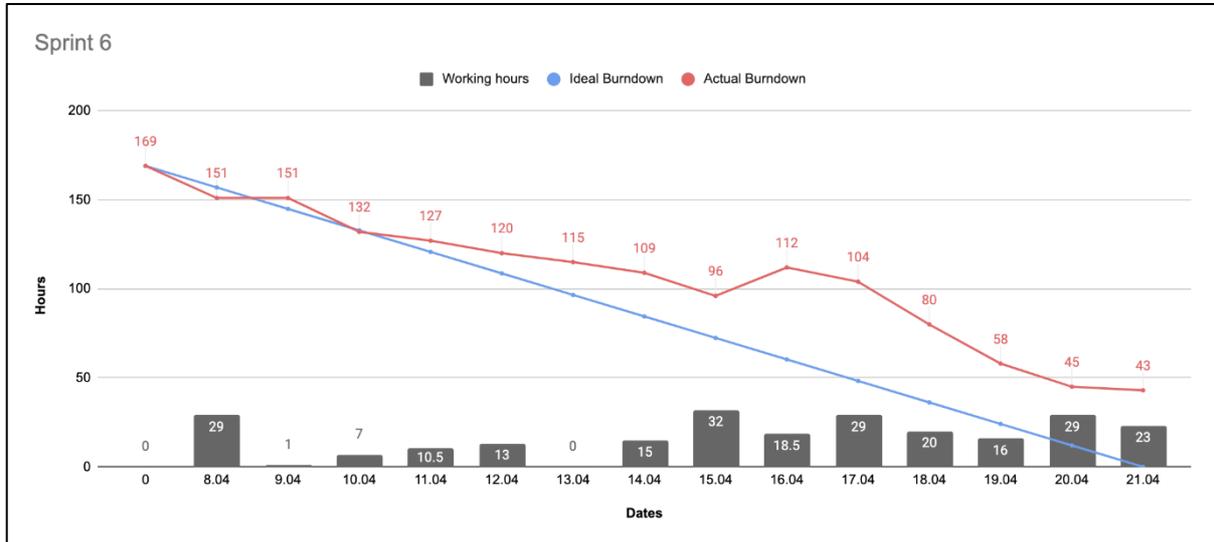


Figure 24 - Sprint 6, burndown chart

6.7.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 169 working hours. Actual working hours spent on the sprint were 243.

What went well?

The team managed to spend more time on the project than originally estimated.

What could have been better?

The database maintenance job, i.e. how to delete 7-day old submissions from the database took more time than expected. Azure, where the database is hosted, does not have the option of using SQL Server Manager to schedule tasks on free accounts. How to test continued to be difficult and was moved to the next sprint.

Going forward to the next sprint

Two of the team members have now completed their other RU courses and can therefore finally take on the project full-time. The other three team members still have a few final exams left but will still take time to work on the project. The main tasks of the next sprint are testing, data validation and improving the form creation page.

6.8 Sprint 7 – End Date: 05.05.2020

In the beginning of this sprint, the team was starting to see a lot of progress and most of the major requirements were finished. The main goal in this sprint was to finish the data validation of all forms, add a feature that allows admins to add options to questions dynamically and write tests for the application. By the end of the sprint, team members were mainly working on the user interface and making the website more user friendly.

6.8.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Wrap everything in a container	Bjarki	Done	1	
Data validation in all forms	Þórný	Done	36	Started last sprint
Testing	Fjölínir&Þórný	Moved	20	Started last sprint
Refactor form creation page and add dynamic options.	Benedikt	Done	36	
Add dynamic questions to FormCreation page	Benedikt	Done	0	Added after sprint started
User can submit notificaton to JIRA (via email)	Hannes	Done	20	
Admin and user activities logged into a log file.	Bjarki	Done	30	
Add instructions for admin when the index page is empty	Bjarki	Done	11	
Add instructions for admin when the form list page is empty	Bjarki	Done	11	
Change the form list page view	Bjarki	Done	18	
Fix index view	Bjarki	Done	10	
Fix the look of the Nav bar	Bjarki	Done	1.5	
Clear validation when edit popup modals are closed	Benedikt	Done	3	
Update the status report for status meeting no. 3	Hannes&Þórný	Done	16	
Delete submissions older than 7 days from database automatically	Hannes	Done	20	Started last sprint - issues with limitations of Azure subscription
Fix and adjust the look of each page for normal user	Bjarki	Done	10	
Add instructions how to send the submission to jira and trello		Moved	11	
Make category automatically selected when a form is created inside a category		Moved	4	
Fix the userList page		Moved	18	
			276.5	

Figure 25 - Sprint 7, sprint backlog



Figure 26 - Sprint 7, burndown chart

6.8.2 Retrospective

Hours spent

The sprint length was 14 days and the team estimated 276.5 working hours. Actual working hours spent on the sprint were 290.

What went well?

The team managed to spend a lot of time on the project without interruptions. The sprint was very successful.

What could have been better?

Nothing in particular, the sprint went well.

Going forward to the next sprint

For the next sprint tasks need to be prioritized well before the feature freeze on Friday the 8th of May. That sprint is the final sprint of this project and therefore includes the final deadline. The team will put effort into the look of the website and making it more user friendly.

6.9 Sprint 8 – End Date: 18.05.2020

This was the final sprint of the project. After the final status meeting, the team was not allowed add new features. Therefore, the focus was on improving the user interface of the website, fixing bugs, refactoring and finalizing the report. By the end of the sprint, the team was very satisfied with the final product.

6.9.1 Sprint Burndown Chart and Backlog

Task	Developer	Status	Estimated hrs	Comment
Activate that user can view his own submissions	Fjölínir	Done	3	
Edit existing forms (EditFormComponent)	Benedikt	Done	11	
CreateForm page - Admin can choose whether anonymous submission is available	Þórný	Done	8	
Fix the userList page	Þórný	Done	18	
Make category automatically selected when a form is created inside a category	Bjarki	Done	4	
Save search string on input	Bjarki	Done	2	
Fix the view of a Form when it is being filled out by a user	Bjarki	Done	18	
Address comments on report and proofread it	Þórný, Hannes	Done	35	
Update slide show and rehearse it	Team	Done	18	
Add instructions on how to send submissions to jira and trello	Hannes	Done	6	Started last sprint
Make category automatically selected when a form is created inside a category	Bjarki	Done	4	
Bug: Anonymous submission availability does not update on FormEdit	Benedikt	Done	4	
Bug: Anonymous is not selected when editing form that allow anonymous submissions	Benedikt	Done	2	
Scroll to first invalid element of a form	Þórný	Done	3	Changed to scroll to top of page because EditForm doesn't support autofocus yet.
Yfirfara logs	Bjarki	Done	2	
Fix the view of a Form when it is being created by a Admin	Þórný&Bjarki	Done	6	
Create instructions for the readme+ install the solution on an clean pc	Hannes	Done	16	
Make confirmation sites automatically redirect to front page after an x time	Þórný	Done	1	
Add ellipsis trick to CategoryName on front page	Þórný	Done	1	
Bug: Fetching pdf breaks when forms are edited	Benedikt	Done	10	
Comform FormCreation preview with FormSubmission	Bjarki	Done	3	
Testing	Þórný	Done	2	Started in sprint 6
Add filter functionality on relevent tables	Fjölínir	Done	16	
Instructions for tests in Read me file	Hannes	Done	3	
Refactor Code	Team	Done	8	
Add bread crumbs		Removed	0	Not estimated to give enough value
Make Index page and FormList page responsive for users		Removed	0	Not implemented before feature freeze
Add the questiontype picture/file?		Removed	0	Not implemented before feature freeze
Add that admin can choose whether questions are required		Removed	0	Not implemented before feature freeze
			204	

Figure 27 - Sprint 8, sprint backlog

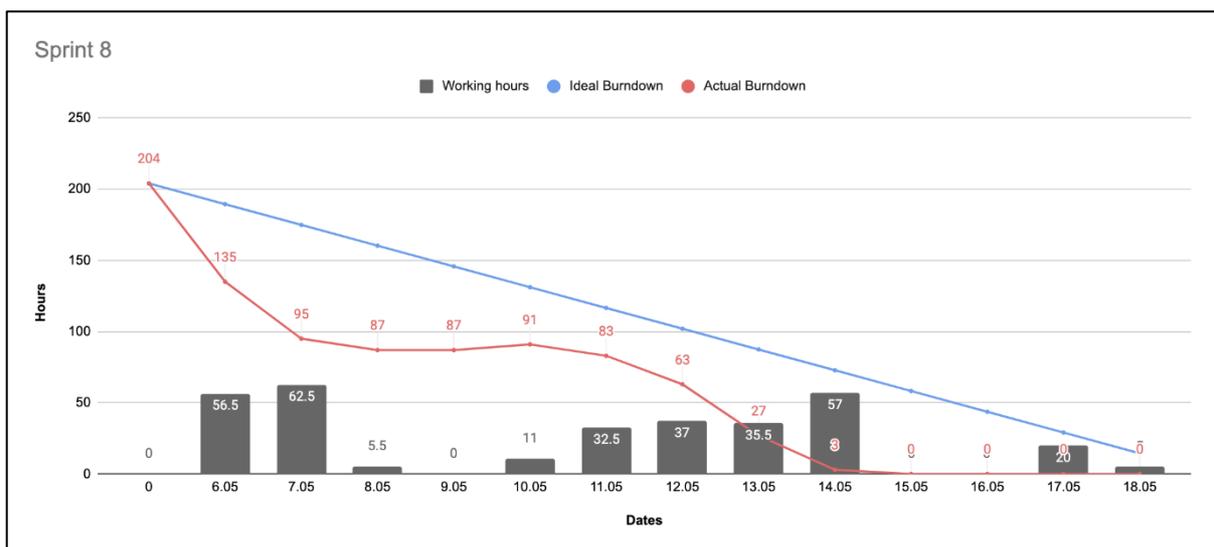


Figure 28 - Sprint 8, burndown chart

6.9.2 Retrospective

Hours spent

The sprint length was 13 days and the team estimated 204 working hours. Actual working hours spent on the sprint were 322.5.

What went well?

The team experienced this sprint's work to be efficient. Usability testing with the website was performed and the team received very good and useful comments. The third and last status meeting was held during this sprint and went very well. The final product exceeded expectations of both the team and the team's contacts at Registers Iceland.

What could have been better?

The team encountered a few unexpected bugs that came up during changes but managed to resolve them in time. Besides that, the sprint went very well.

Going forward to the next sprint

This is the final sprint of the project. The product owner will now receive the solution and Registers Iceland can use it as they like.

7 Project Retrospective

This chapter serves as a retrospective for the whole project. When the team had finished the project, they discussed what they thought had gone well and what could have gone better. The project overall went very well, and the team acquired knowledge and experience from it. However, there are some things that the team would have done differently as expected, but nothing major though.

7.1 What Went Well

Working with the Blazor framework was new to the whole team and two of the team members had never used the .NET Core framework. Therefore, the team initially assumed that it would take some time to get used to the environment. However, team members quickly felt natural in the development environment.

Initially, the team presumed that being a team of 5 could be challenging. Nonetheless, the team's collaboration was very good, and it rarely came up that team members were short on tasks.

Communication is a large factor of projects like this. The communication within the team was very good, even when team members were not in the same place. The communication between the team and Registers Iceland's contacts and the team's instructor was good. The team had weekly meetings with instructor Hildur as well as Tryggvi, the product owner, and Bjarni, the programmer at Registers Iceland. In addition to the meetings, the team could easily reach out to them.

Working on the project along with other courses, the team managed to maintain good organization and met at least 3 times a week throughout the whole project. Three of the team members have children and had to stay home at times due to COVID-19 but managed to work remotely and put in extra work when needed.

The Scrum methodology was a good fit for the project due to its flexibility. Having continuous integration and continuous deployment helped in coordinating the team since everybody could see where the product was at in real time.

Usability testing turned out to have a huge benefit on the project, as the team, together with potential users and administrators of the system managed to get rid of things that were unclear and confusing

7.2 What the Team Would Do Differently

The team could have made more use of the requirements' list as a guidance during sprint planning. Although testing was on team members' mind from the beginning, it came together uncomfortably late in the project due to limited knowledge of testing in the Blazor framework. The team could also have gathered more information about a few Scrum related things earlier in the process, such as burndown charts and sprint retrospective meetings.

It was quite late in the semester when the team decided what the final product should look like. It might have been better to do it sooner, but the team is very satisfied with the final look and the application in general.

7.3 Future Development

The project is open sourced, so anyone is free to add to the project and use it freely. Multiple additions could be made to the project and the most obvious one would be the biggest requirement that was removed, connecting the project to Active Directory.

Currently, the application can send messages to external systems. Receiving answers to submissions from external systems could be a possible addition.

The current PDF converter of the application is a freeware solution with limited capabilities. The output could easily be enhanced by purchasing a PDF converter with more features than the currently provided with the application.

The application can currently handle various question types, such as short text, long text, date etc. Additional types of input could be added, such as pictures and files.

Another addition could be to allow an administrator to specify whether an answer to a question is required.

7.4 Special Thanks

The team would like to give special thanks to Tryggvi Rúnar Jónsson, the product owner, and Bjarni Konráð Árnason, programmer at Registers Iceland, for their commitment and positive attitude towards the project. Additionally, the team would also like to thank its instructor, Hildur Andrjesdóttir for her help and involvement in the project. Lastly, the team members want to thank the local society of the Independence party (i. Sjálfstæðisflokkurinn), for the use of their rental office to which the team had access to 24/7 throughout the semester.

Appendix A

This appendix covers all the prototypes that were not covered in [chapter 5.2](#).

A.1 Prototypes

Figure 29 shows the sketch of a very simple login page. Presumably, this page will be unnecessary once a connection to Active Directory has been established, automating the login process.



The image shows a browser window with a dark title bar containing the text "Velkomin á mótökuátt tilkynninga og beiðna". The main content area is white and contains a login form. The form consists of two input fields: the top one is labeled "Netfang" and the bottom one is labeled "Lykilorð". Below the input fields is a button labeled "Skrá inn".

Figure 29 - Login page

Figure 30 shows what happens when an admin user clicks the plus icon to add a category. The admin user is prompted with a pop-up window where he/she can write the name of the new category and either save it or cancel.

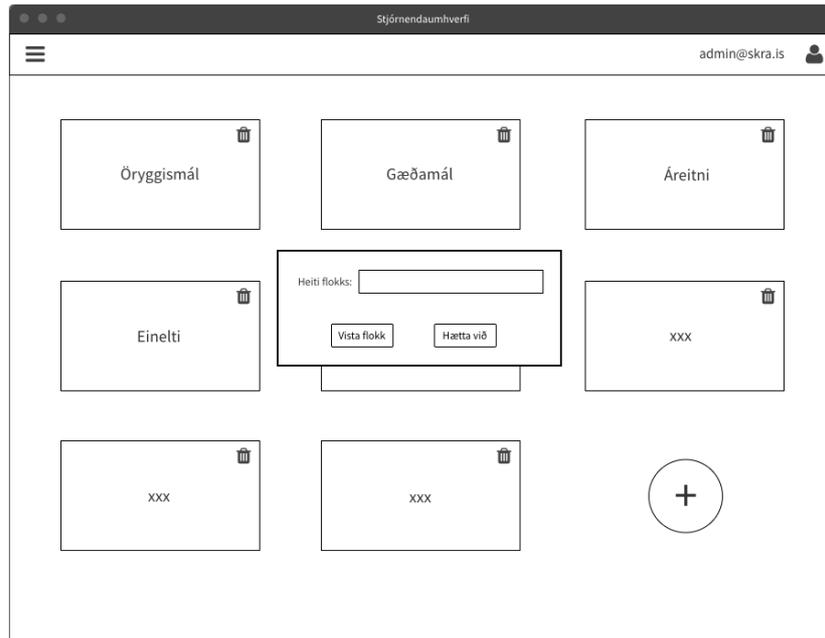


Figure 30 – Pop-up window to add a category

Figure 31 shows what happens if an admin user clicks the trash can icon to delete a category. The admin user is prompted with a pop-up window asking if he/she is sure to delete the category.

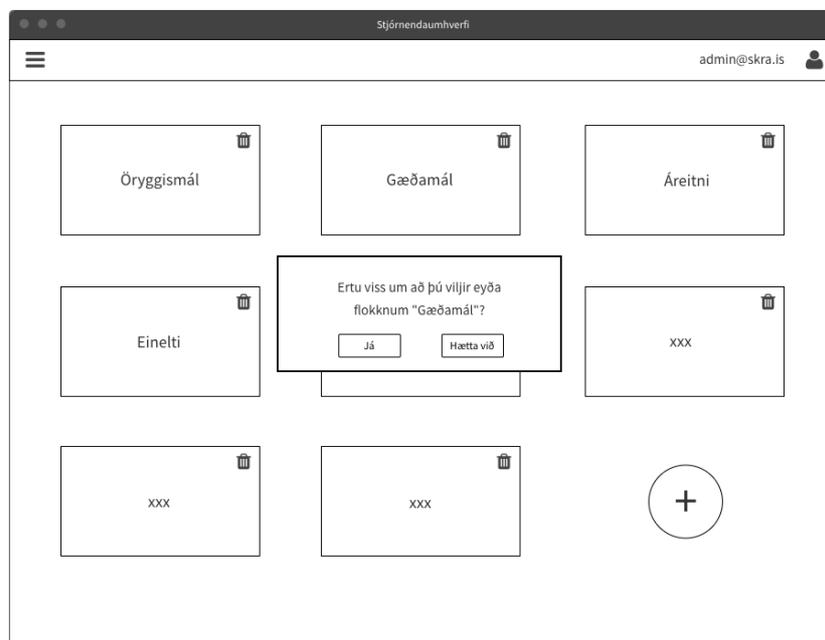


Figure 31 – Pop-up window to delete a category

Figure 32 shows what happens if an admin user clicks the trash can icon to delete a form type. The admin user is prompted with a pop-up window asking if he/she is sure to delete the form type.

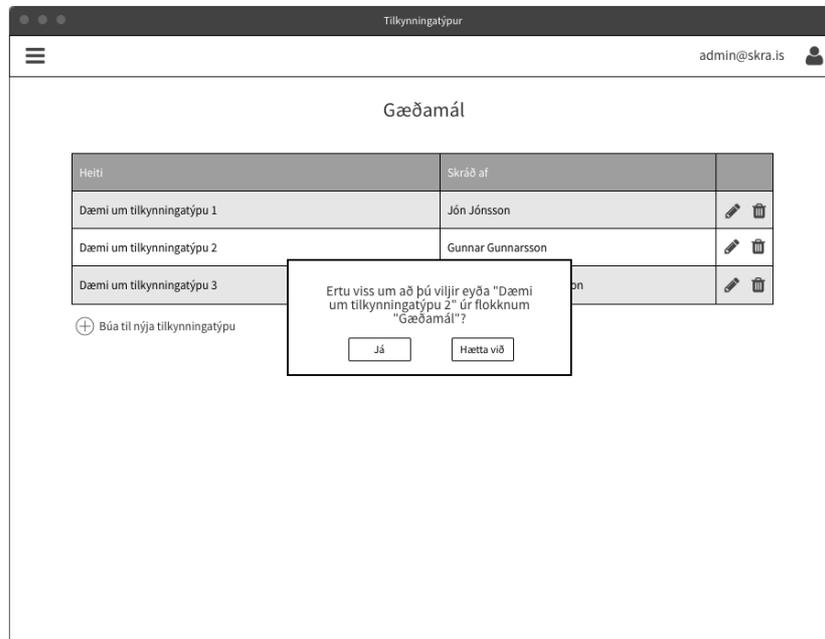


Figure 32 - Pop up window to delete a form type

Figure 33 shows an example of a confirmation page. All the confirmation pages look the same, but the text is different depending on what is being confirmed.

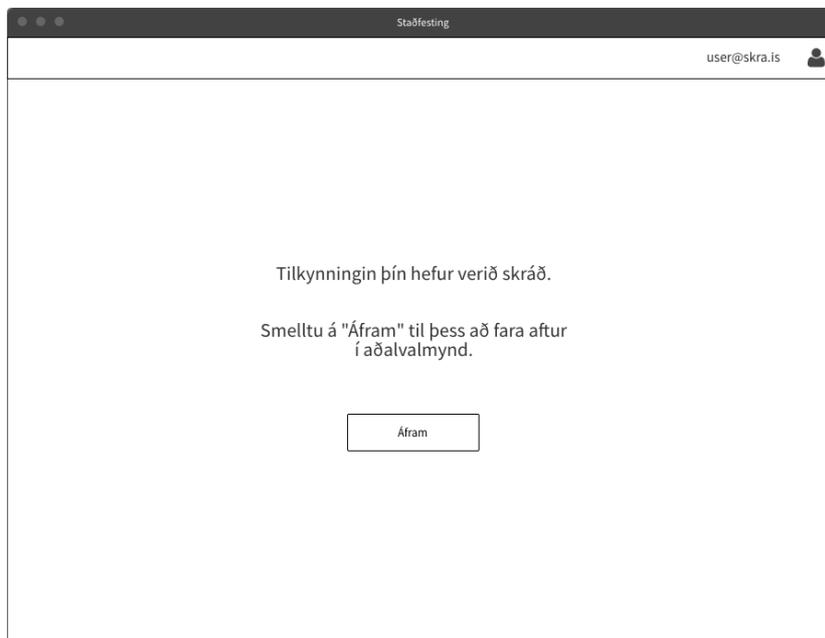


Figure 33 - Confirmation page

Appendix B

This appendix includes the forms the team used during the usability testing covered in [chapter 5.3](#) and [chapter 5.4](#).

B.1 Introduction

Following is the introduction that was read to participants to explain how the testing would be performed.

“Thank you for participating in usability testing for the system that we are developing in cooperation with Registers Iceland for our final project. We are students in the University of Reykjavik and aim to graduate this summer.

Estimated time for the testing is 10 minutes. First, we will ask you a few questions about your background. Then, we will ask you to solve tasks while thinking aloud about what you need to do in order to solve the tasks. We will observe how easy it is for you to use the system to solve the tasks, but it is important for you to know that everything we do is to test the system, not you. There is no time pressure as we are not testing your skills, but only how well designed the system is. We encourage you to comment as much as you can during the testing, especially if there is something you think that could be better. This testing is completely anonymous.”

B.2 Data collection form

Figure 34 shows the form that the team used to collect the data necessary. The form also includes questions about participants' background and a few questions they were asked after solving the specified tasks.

Background			
Nationality			
Age range	<30	31-50	51-67
Gender	Female	Male	Other
Computer usage (hours pr day)	>8	4-8	<4
Computer usage (location)	At home	At work	Other
Computer knowledge	Expert	Average	Beginner
Data for data collection	Finished	Time	Comments during testing
Task 1			
Task 2			
Task 3			
Task 4			
Questions after tasks			
Can you tell me what you think about the website?			
Can you tell me what strengths and weaknesses you think the website has?			
Can you rate the website on the scale from 1 to 10?			
Do you think the website is easy to use?			

Figure 34 - Form for data collection

B.3 Tasks for prototype testing

B.3.1 Tasks for general user

Table 13 shows the tasks that participants testing as general users were asked to solve. The table also includes a time goal that the team had estimated.

#	Task	Data	Goal
1	Submit a form regarding safety	Time (sec)	<= 60 sec
2	View your profile	Time (sec)	<= 10 sec

Table 13 - Tasks for participants testing as general users

B.3.2 Tasks for admins

Table 14 shows the tasks that participants testing as admins were asked to solve. The table also includes a time goal that the team had estimated.

#	Task	Data	Goal
1	Create a new category	Time (sec)	<= 10 sec
2	Create a new form type	Time (sec)	<= 90 sec
3	Delete a form type	Time (sec)	<= 15 sec
4	Give another user admin rights	Time (sec)	<= 10 sec

Table 14 - Tasks for participants testing as admins

B.4 Tasks for web app testing

B.4.1 Tasks for general user

Table 15 shows the tasks that participants testing as general users were asked to solve. The table also includes a time goal that the team had estimated.

#	Task	Data	Goal
1	Find and fill out the form A	Time (sec)	<= 60 sec
2	View your own submissions	Time (sec)	<= 20 sec
3	Go back to home page	Time (sec)	<= 15 sec
4	Fill out form B in category C	Time (sec)	<= 40 sec
5	Find form D from the home page	Time (sec)	<= 30 sec
6	Send in a request on the website	Time (sec)	<= 35 sec

Table 15 - Tasks for participants testing as general users

B.4.2 Tasks for admins

Table 16 shows the tasks that participants testing as admins were asked to solve. The table also includes a time goal that the team had estimated.

#	Task	Data	Goal
1	Create a new category	Time (sec)	<= 15 sec
2	Create a new form with 1 question	Time (sec)	<= 90 sec
3	Edit the name of the form	Time (sec)	<= 20 sec
4	View all submissions	Time (sec)	<= 15 sec
5	View your own submissions	Time (sec)	<= 15 sec
6	Add a new user to the system	Time (sec)	<= 20 sec

7	Give the new user admin rights	Time (sec)	≤ 10 sec
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Table 16 - Tasks for participants testing as admins