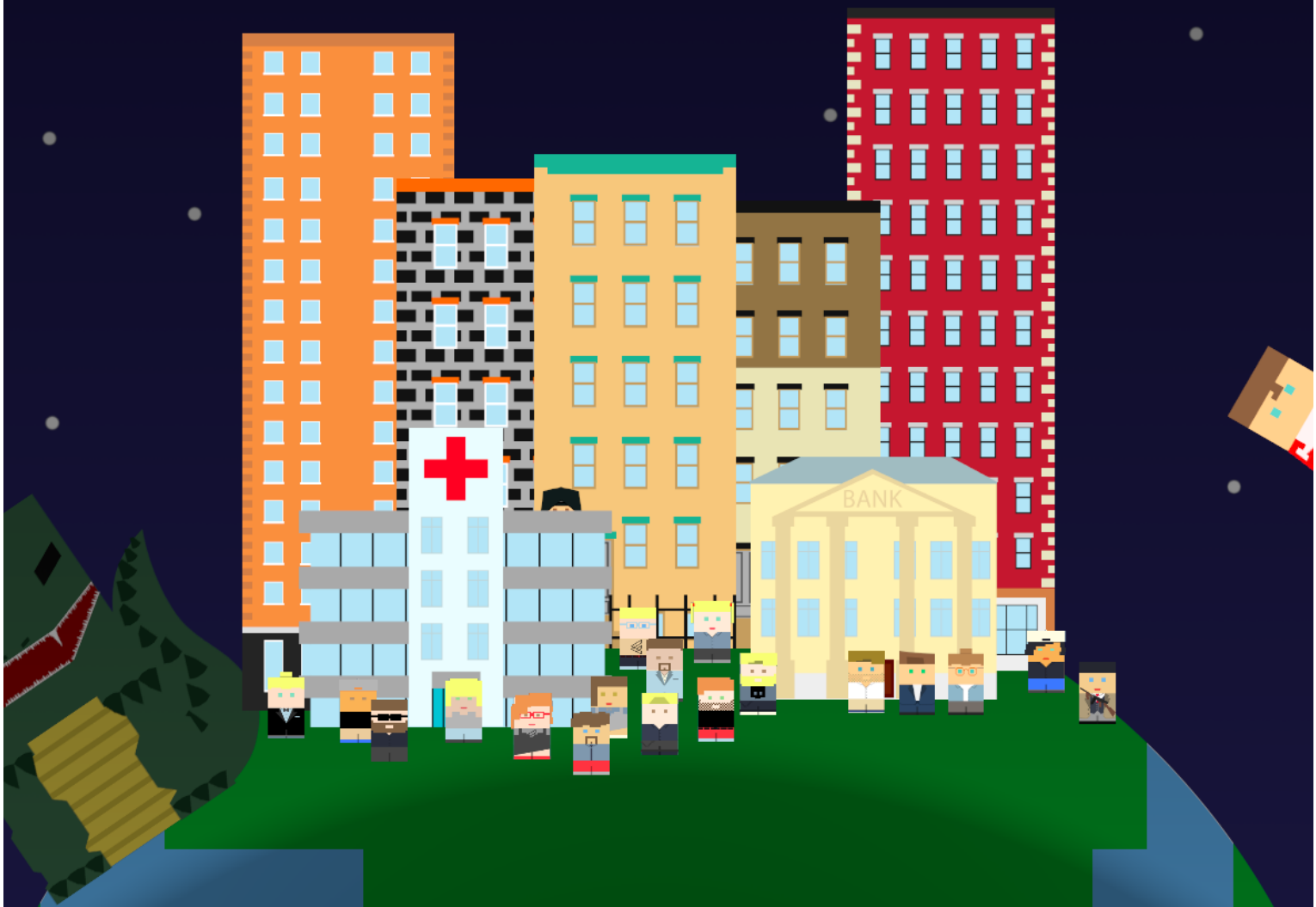
BLOCK PLANET

Increasing user engagement in personal finances, using gamification in a mobile banking application



A masters thesis by:

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Breaking new ground
Aalborg University

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STUDENT REPORT

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Block Planet -
Increasing user engagement
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Abstract

The cashless society have become more of a reality over the last years. Even though this improves convenience for the users, studies suggest that it does have negative side effects as well, such as people having a harder time keeping an overview of their financials. Many business applications have been developed to solve this problem, where some uses gamification. These applications solve some of the issues, by helping the user to get an overview of the financials. However, even though the applications provide the tools to get a better overview of their financials, they do little in terms of motivating users to log in frequently and use these tools.

The aim for this study is to investigate whether an application with a large focus on the gamification aspect, will help motivate the users to log in frequently, and thereby increase their financial overview.
As legal issues makes it difficult to access the users banking information for a test, we decided to use the Spar Nord Banks expertise in their customers, to evaluate whether our solution would be effective. This was done by interviewing three experts, one from Innovation, one from Business Development and a former bank advisor. We also tested our user group for usability in our application, using the System Usability Scale.

Through the experiments it was found, that many participants had issues using the application. Many different types of user interactions made it difficult for users to control the application, leading to decreased usability. Furthermore, while the experts did have many ideas for improvements, they generally saw a large potential in the application and its concept.

Preface

This report is a product of an 10th semester master's thesis, on Medialogy, by group MTA171037 at Aalborg University. The thesis has been done in collaboration with Spar Nord, with a focus on gamification in banking applications. The focus of this report is to describe process and conclude on the results from this thesis. The referencing method used throughout this report is the APA style.

Included with the hand-in is a ZIP-file, which contains the Spar Nord Target Group document in Appendix A, the questionnaire used for the target group research and the data collected in Appendix B, the data collected for the final tests in Appendix C.1 and C.2, the Events Questionnaire in Appendix D, the files and builds for the final version of the application in appendix E and the A/V production in appendix F.

The report includes Appendix 1 containing the personas, Appendix 2 containing the consent form used in the tests and Appendix 3 contains the tutorial sheet and the introduction guidelines for participants in the usability test.

We would like to thank our supervisor Nicola Morelli, and our co-supervisor Martin Kraus for their extensive help and excellent supervision through the semester. In addition, we would like to thank our test participants for their cooperation. Lastly, we would like to thank Spar Nord, including, but not limited to, Niklas Gedsted, Lasse Chor and Kim Østergaard, for accommodations and the effort they have put into making this project a reality.

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1. Introduction

Over the years, a cashless society has become more of a reality. Even though a cashless system is an easy system for the user, research seems to indicate that it has a negative impact. People have a harder time keeping an overview of their economy, and the relationship people have towards their physical money is lost when using the cashless alternative(Khan & Craig-Lees, 2009).
There exist several applications, that helps users keep track of their economy, including budget tracking applications, and e-banking mobile applications for easy bank account access and overview.

Gamification has over the years been used in many different applications(Hamari, Koivisto, & Sarsa, 2014). Some of the uses has been to enhance the user experience in business applications, including banking applications(Rodrigues, Costa, & Oliveira, 2013). However, even though the applications provide the tools to get a better overview of their financials, they do little in terms of motivating users to log in frequently. Due to this, we believe a combination of gamification and a banking application, with a large focus on the game aspect, could help motivate users to log in more frequently, and get a better overview of their economy and expenses.

For this study, we created a mobile application, where the player construct cities, and control events on a planet. Based on the transactions made on the player's bank account, the cities on the planet will either grow or be destroyed by different events. We developed this game as a concept for Spar Nord Bank, as a modern, engaging and entertaining way to help the customers adapt to the challenges, caused by the cashless society. We demonstrated the application to three experts, all employed at Spar Nord Bank, to find whether they could see, if such an application has a beneficial effect on their customers financial behaviour. Furthermore, we tested for the applications usability on users, using the System Usability Scale (SUS). The experts thought the application had potential, and showed interest in it and its concept. However, they mentioned several factors that should be improved upon, if the application is to be a success. Furthermore, the application got a less than average score in the usability test, which shows that there still are usability issues to be fixed in the application.

2. Terminology

To give a general understanding of the different terminologies, this chapter will give our definition of each of the important terminologies used in the report.

2.1. E-banking

E-banking, also referred to as online banking and internet banking, is a system allowing individuals to perform banking activities at home, via the internet. Some online banks are traditional banks which also offer online banking, like Spar Nord, while others, like Lunar Way, are online only and have no physical presence. Online banking through traditional banks enable customers to perform all routine transactions, such as account transfers, balance inquiries, bill payments, and stop-payment requests, and some even offer online loan, stock trading and credit card applications(InvestorWords, n.d.).

Since the term *E-banking* is used both for webpage and application based banking, two distinct terms are defined for clarity throughout the report. The webpage based banking will be referred to as *Net Bank*, and the application based banking will be referred to as *Mobile Bank*.

2.2. The Gamification Spectrum

Walz & Deterding defines *The Gameful World* as a two-axis spectrum. The first spectrum ranges between whole systems and qualities/elements. The second ranges between open, free, exploratory play as we find it in children's object and pretend play (*paidia*) and formalized, rule-based, goal-oriented play as we find it in games (*ludus*). Figure 1 is a recreation of an image, on page 8, in Walz & Deterdings book, The Gameful World. The image is a conceptual mapping of how they define *The Gameful World*.

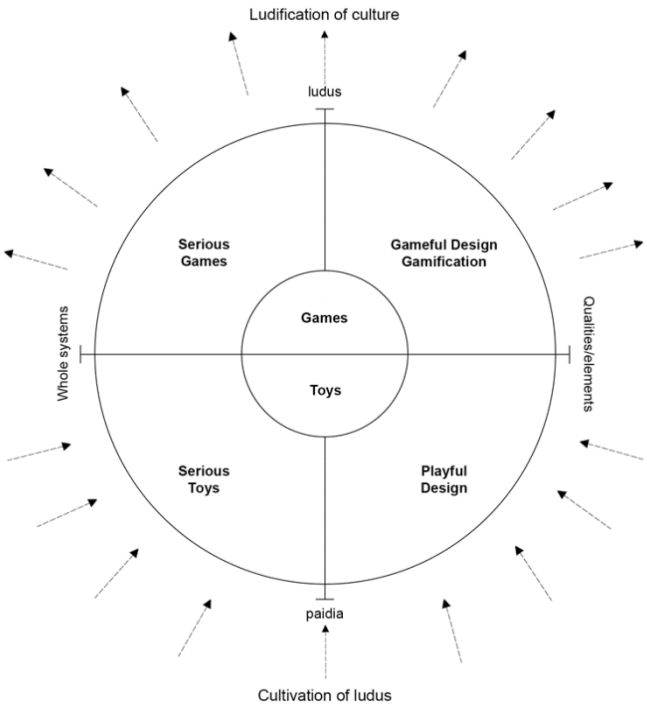


Figure 1: Conceptual mapping of The Gameful World

Since this report has a focus in games, we will focus on the *ludus* spectrum. Therefore, the following sections will define *Gamification* and *Serious Games*.

2.2.1. Gamification

In the book The Gameful World(Walz & Deterding, 2014), *Gamification* (or Gameful Design) is defined as ""ludic elements or qualities," or non-game objects and experiences that use design elements from games and/or are designed to afford gameful experiences". Deterding et al. also defined *Gamification*, they propose a definition of it as the use of game design elements in non-game contexts(Deterding, Dixon, Khaled, & Nacke, 2011).

These *Gamification* definitions, describe it as game design elements i.e. badges, leader boards, experience system etc., in a non-game context, like a fitness application. The most essential part to take further from this definition is the non-game part of the definition, meaning that *Gamification* is not games with non-game elements. Instead, it is making non-game applications, with game elements implemented into the design.

2.2.2. Serious Games

As opposed to *Gamification*, Deterding defines *Serious Games* as "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment"(Deterding et al., 2011). Furthermore, in the book The Gameful World(Walz & Deterding, 2014), the term *Serious Games* is defined as ""ludic wholes," or full-fledged games designed and/or deployed for non-entertainment purposes".

Both definitions define *Serious Games,* as a game that has been developed for more than just entertainment. Examples of this is educational games, brain fitness games, games with political messages like global warming etc.

2.3. Meaningful Play

In the field of game design, *Meaningful Play* is a concept that exists, as something every game should achieve. Without this concept in a game, it will most likely fail to captivate the player's attention and engagement(Tekinbaş & Zimmerman, 2003).
Tekinbaş and Zimmerman states that "the goal of successful game design is the creation of meaningful play". In defining *Meaningful Play*, Tekinbaş and Zimmerman explains that there exist two separate ways of defining it, titled *Descriptive* and *Evaluative*.

Descriptive defines that if meaningful play is to emerge, there must be a meaning to a player's action. Meaning is given to an action, through the relationship between the action of the player, and the outcome of the system. If a player must do an action without a goal, meaning will never emerge. An example could be that a player wins by having the most points, and gains them by killing opponents. Killing opponents now has meaning in the context of the game, as it brings the player closer to victory.

Evaluative defines *Meaningful Play*, such that it is possible to determine levels of meaning. This level of meaning is determined by how *Discernable* and *Integrated* the relationship between an action and its outcome is. The relationship must also be integrated into the larger context of the game. In an example, the hero must defeat the big bad boss to free the kingdom from demons, and save the princess.

To do this he must defeat hordes of enemies to become stronger, and get closer to his goal. In this sense, the narrative fits the gameplay and as such creates *Meaningful Play*.

Discernable relates to the feedback a player receives about the games state. If a player has health points in a game, he will need to have some kind of indicator, that explains how many health points are remaining. If this kind of information is not properly communicated, the player will get frustrated.

Integrated is the concept of making a player's action not only have immediate effects, but will also have consequences later in the game. In a game of Chess, if you lose your queen in the early game, it will get harder to win the game in the later stages.

Where *Discernable* shows the player what happens, *Integration* explains the player how an action will affect the rest of game. Mastering these concepts, will help successfully create *Meaningful Play*, which is the goal of successful game design(Tekinbaş & Zimmerman, 2003).

2.4. The Motivational Types

To keep players returning to an application daily, motivation is needed. Two types of motivation, are *Intrinsic* and *Extrinsic* motivation. Both of them have the capability to stand by themselves, and the ability to complement each other. There exists a lot of research on these types of motivation, and a lot of discussion about the definitions of these two types. Sansone and Harackiewicz attempted to find a general and widely acceptable definition on them both, based on existing research(Harackiewicz & Sansone, 2000).

2.4.1. Extrinsic Motivation

Extrinsic Motivation is defined as an external reward to a task. An example used by Sansone and Harackiewicz is the schools grading system, where the better a student performs, the better the grade the student will receive. In this example, achieving a good grade, causes the *Extrinsic Motivation* since the grade is a tangible reward, added to the task of studying(Harackiewicz & Sansone, 2000).

2.4.2. Intrinsic Motivation

Intrinsic Motivation is a difficult concept to grasp, and as such, many different definitions exists. As a result of this, Sansone and Harackiewicz has attempted to find a common denominator for this concept. One of the commonalities that was found, is that *Intrinsic Motivation* always stems from a person's personal goals and aspirations. As such if a person is *Intrinsically Motivated*, the motivation comes from the person's own desire to fulfil a goal. If someone is *Intrinsically Motivated* while playing in a football tournament, they are not motivated by the prizes and perks gained by winning, but instead by the enjoyment of playing the game. With that said, *Intrinsic* and *Extrinsic Motivation* are not mutually exclusive, and as such this person can at the same time also be motivated by the rewards(Harackiewicz & Sansone, 2000).

2.5. Design Methods

When developing software, multiple methods can be used. Two of these methods are *The Stagewise Model*, and *The Iterative Design Process*. These subsections will give a description of the two methods.

2.5.1. The Stagewise Model

Near the end of the 1950's the general way of developing software was through *The Stagewise Model*. This model, shown in Figure 2, was generally used to structure the project into different stages, such that you can focus on one aspect of a project at a time. Using this model, you must plan before you can design, design before you can implement etc. (Boehm, 1988). This method is sometimes misconceived as

The Waterfall Model, as it has a strong analogy to a waterfall, where the flow is continuously moving downwards. Boehm, however, states *The Waterfall Model* as one of the earliest iterative models used for software development(Boehm, 1988).

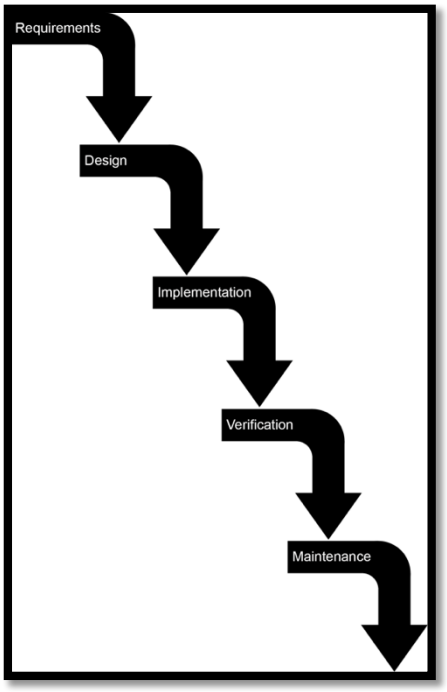


Figure 2: Example of The Stagewise Model

2.5.2. The Iterative Design Process

In the game industry one of the most powerful and most established game design processes is *The Iterative Design Process*. Using this method, design decisions are made based on experience of playing the game while it is in development. This puts emphasis on playtesting and prototyping, thereby iterating on the design(Tekinbaş & Zimmerman, 2003)

Iterative design is in general seen as a cyclic process that loops between prototyping, playtesting, evaluation and refinement, as seen in Figure 3.

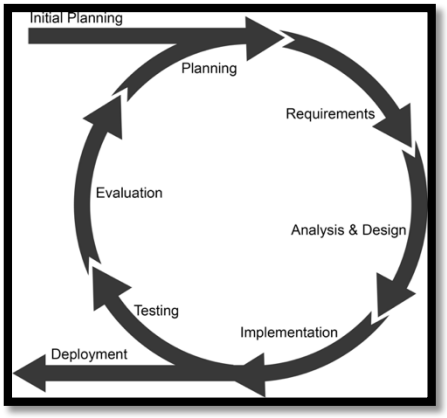


Figure 3: Example of The Iterative Design Process

2.6. The Cashless Society

A *Cashless Society* is as the word specifies: A society where cash is not in use. Instead all transactions are done through cashless payment methods, such as credit cards, mobile payments and wireless transactions(Khan & Craig-Lees, 2009). While no modern society have reached this level yet, we are steadily getting closer. This is due to cashless payment methods have a variety of tangible advantages to the individual(Soman, 2001). Dilip Soman defines these advantages as: "Convenience, Acceptability, Accessibility and Habit". If these advantages exist in a payment method people have proven much more willing to accept them as new methods of payment, which is one of the reasons we see contactless payments being used more often(Soman, 2001). However, a series of issues might arise from not using cash in society. Most importantly: people seem to have a harder time identifying how much money they spend(Khan & Craig-Lees, 2009). Furthermore, evidence also point towards that when people have access to credit, it becomes easier for them to use money, and as such they will(Trütsch, 2014).

3. Specification of Target Group

To find the target group for this project, a questionnaire was send out, and the data was analysed. From this data, different personas were created. This chapter will go into depth with the process of specifying the target group for this project, focusing on the parameters in the questionnaire, relevant to this project.

3.1. Questionnaire Data Gathering

The questionnaire was created with three major fields in mind. First, we were interested in the knowledge about usage of *Net Banking and Mobile Banking*. Secondly, we were interested in knowledge about the user's own perceived overview of their financials. Finally, we were interested in the user's usage of mobile gaming applications.

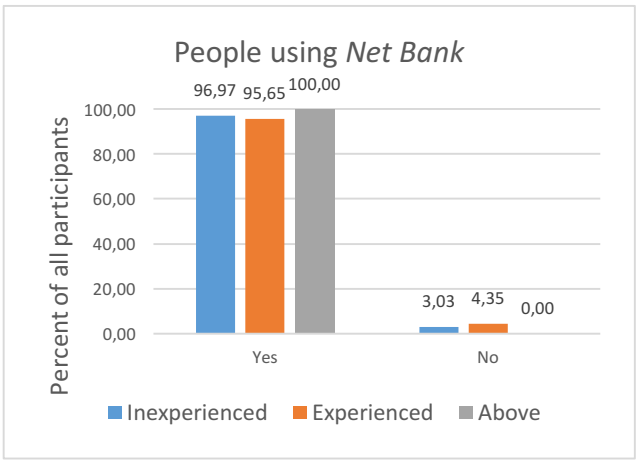
Before the participants could answer any of the questions at hand, they had to fill in basic information about age, gender, education level and occupation. This was done to keep participants anonymous, but still have some data that could help identify the different opinions people had. The questionnaire was placed online, and shared using Facebook. This was done to reach a broad audience across the country. While most data were gathered through polar questions, or Likert scales, participants were also asked to describe in their own words what they felt about the different subjects.

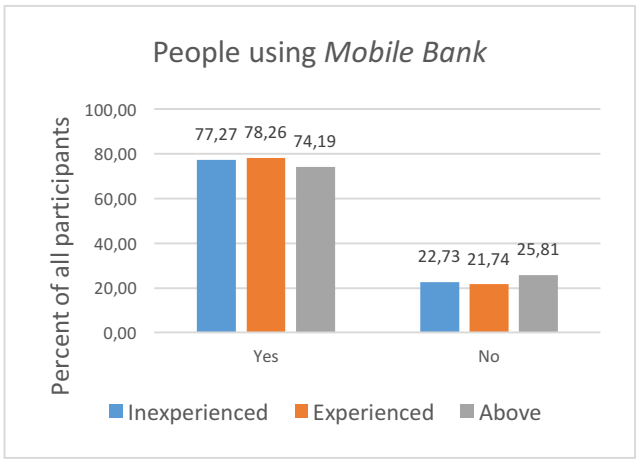
With this data, it was possible to identify a target group that would be interested in a gamified banking application.

3.2. Results

A total of 256 replies was received from the questionnaire. We based our analysis on Spar Nord Banks own customer segmentation found in Appendix A. Spar Nord Bank splits their student customer segment into two groups: Inexperienced Students and Experienced Students. As we received responses from people older than this group, we added an Above Target Group segment. Due to some duplicates, and some participants being younger than our target group, only 220 responses were usable. The three groups are henceforth referred to as *Inexperienced*, *Experienced and Above*. *Inexperienced* are everyone from the age of 18 to 23, *Experienced* is everyone aged 24 to 30, and *Above* is everyone older than 30 years of age. All the original data, and the questionnaire can be found in Appendix B.

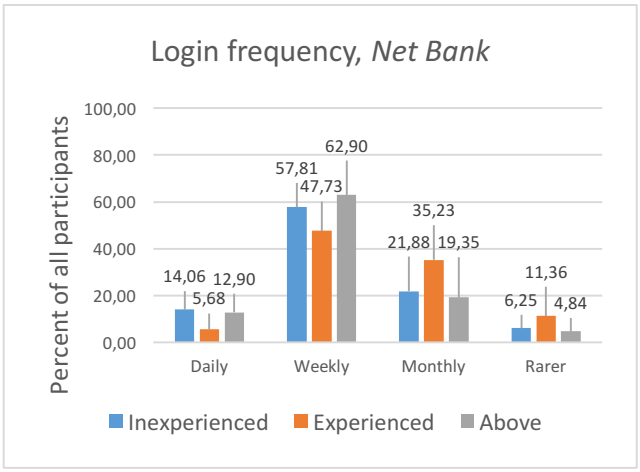
As seen in Graph 1, more participants in the *Inexperienced* and the *Experienced* segment use *Mobile Banking*, compared to the *Above* segment. It should be noted that no one used *Mobile Banking* exclusively. When participants were asked of what reasons they had to not use mobile banking, some stated they felt it was less secure than the traditional *Net Banking* solution.

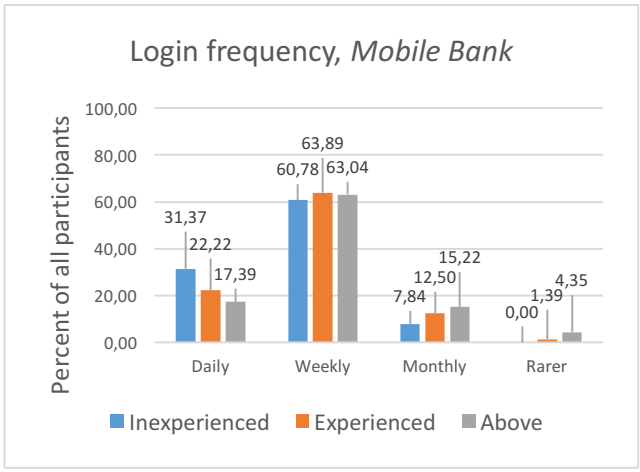




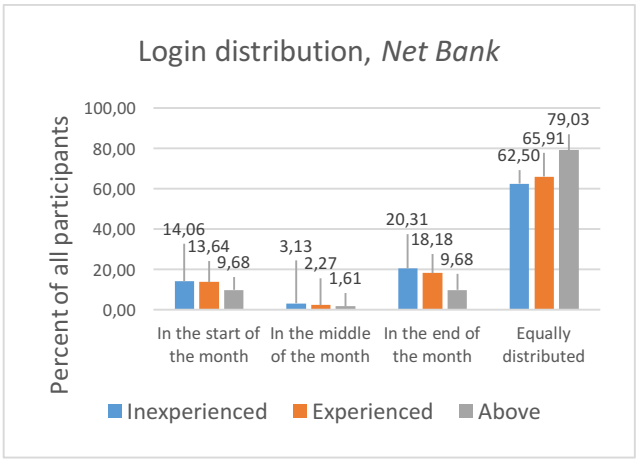
Graph 1: Peoples use of E-banking

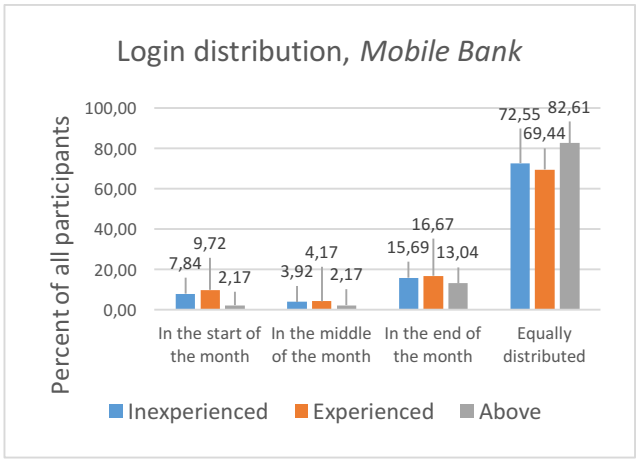
As seen in Graph 2 and Graph 3, the data also show that most of the participants log in weekly and equally distributed throughout the month. However, approximately 34% of the respondents in the *Inexperienced* segment, and approximately 31% of the *Experienced* segment, only log in to the *Net Bank* in the start or the end of the month. Similarly, it is 23% of the *Inexperienced* segment and 26% of the *Experienced* segment, of the *Mobile Bank* users.





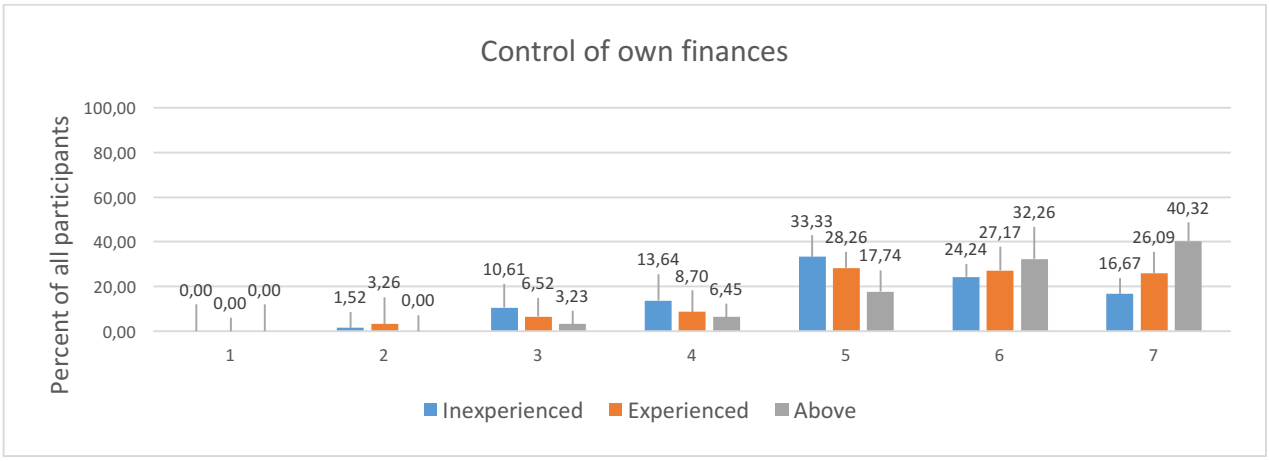
Graph 2: Login frequency, E-bank





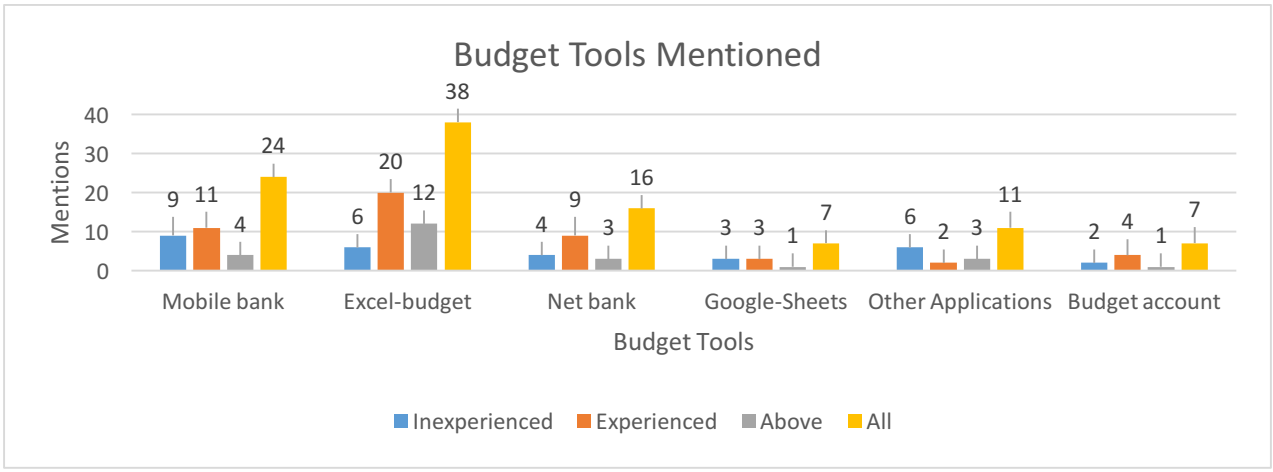
Graph 3: Login distribution, E-bank

As seen in Graph 4, most people are generally satisfied with the control they have of own their finances. However, *Inexperienced* seems to generally be less confident than their older counterparts.



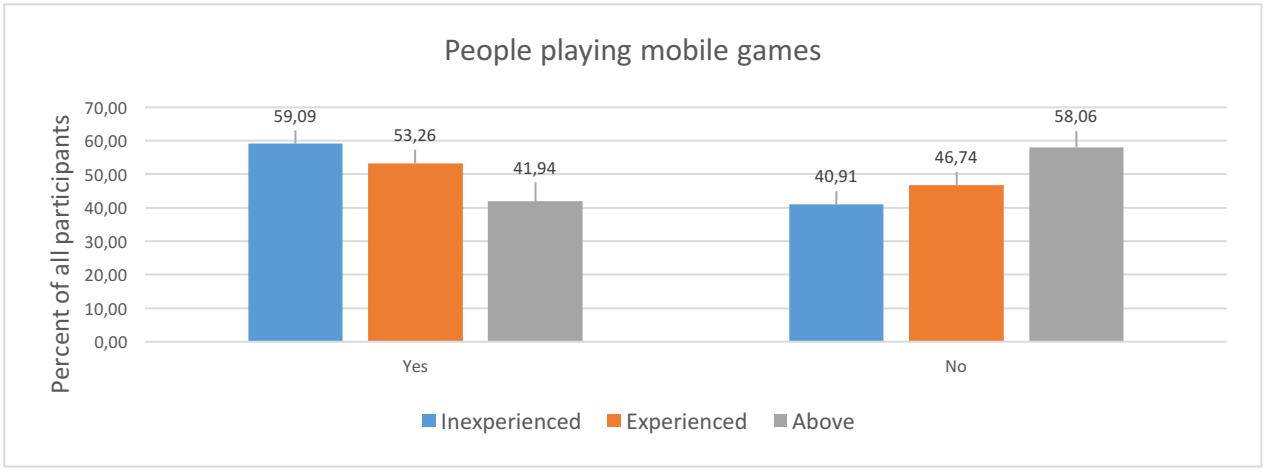
Graph 4: Control of finances. A score of 1 means no control at all, a score of 7 means high control.

We also asked which tools our participants used, to better control their finances. As seen in Graph 5, most people either create an Excel-budget, or use the features in the *Mobile*- and *Net Bank* applications. Each participant was able to make multiple mentions.



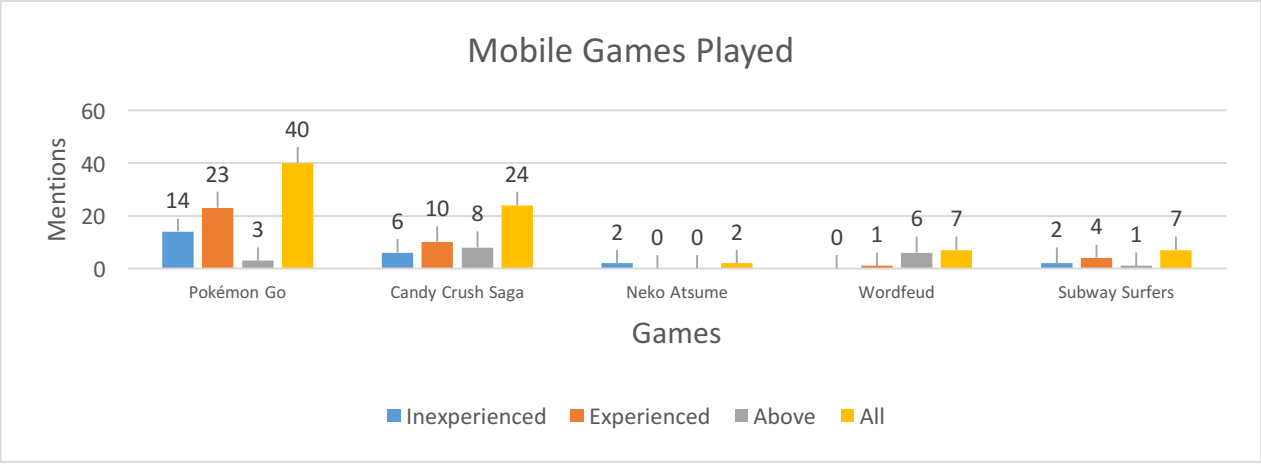
Graph 5: Mentions of different budget tools

In terms of mobile games, the split was a few percent off from half and half between playing, and not playing mobile game, as seen in Graph 6. However, in the *Inexperienced* and *Experienced* segments, the majority does play mobile games, while the *Above* segment does not.



Graph 6: Amount of people who play mobile games.

Out of the 114 responses received, for which mobile games the participants play, the five played by most is shown in Graph 7. It should be noted that some participants mentioned more than one game. In Section 4, we will go into depth with why we believe some of these games are popular.



Graph 7: Mobile games participants play

3.3. Persona

Based on the user data gathered, we decided to create personas, to help describe what factors result in certain actions for people in our target group. This was done through the process described in the persona sheets, from the Service Design Toolkit("Service Design Toolkit – Improve the quality of your service with this hands-on toolkit," n.d.)

As we want to appeal to as many people as possible, we created two distinct personas. One for the *Inexperienced Student*, and one for the *Experienced Student*.
The personas were based on six different characteristics: Economic Conscience, Responsibility, Worry, Adaptiveness, Thoughtfulness and Sociability.

The selection of these traits all influence how a person would act in an everyday situation, and more specifically how they would react to spending money. We selected a combination of these traits based on what we imagine a person would look like if he does not think about the consequence of spending money, and will gladly use them, even though he might not have any left. Where the opposite is thoughtful, and think everything through before committing to a purchase. Both personas must have the adaptable characteristic, as they otherwise would not be willing to try out a new solution to their problems, and as such we would not be able to reach them with our application.

Both personas are attached in Appendix 1.

4. Related Works

In this section, we will go through a series of applications existing on the market, looking at what they do well in their areas. Using *Gamification* in *E-banking* has previously been attempted, but by looking at the core of what makes popular games good, and what other gamified *Mobile Banking* applications has done, we will be able to assess what design choices to make. All the reviews of the applications are based on our own research into these.

4.1. Gamification in E-banking

Rodrigues, Costa, & Oliveira investigates how willing people are to accept a gamified *E-banking* application. Furthermore, they investigate what benefits a bank will gain from developing gamified *E-banking* applications. They compared a traditional mutual funds application, against a gamified application called FuteBank. They sent out an online survey to 183 customers, who had mutual funds in their portfolio. Their results showed that the game had a positive impact on customers. They also found a positive impact on the business, in terms of customers' participation and the business values. They conclude that banks should develop gamified business applications, as it can both increase the loyalty of customers, and engage customers to buy complex products in a different and simple way(Rodrigues et al., 2013).

4.2. Effectiveness of Gamification

Hamari, Koivisto and Sarsa has investigated many different researches on *Gamification*, to find out if it generally has any benefit, in terms of motivating its users. Certain criteria were set up to narrow the search. Studies included had to be peer-reviewed publishing's, had to be empirical studies, research methods should be explicated, the studies should have identifiable motivational affordances and the studies should be based on *Gamification* and not full-fledged games. 24 studies were found that all satisfied these criteria. All with the common research question: "Does gamification work".
The conclusion Hamari, Koivisto and Sarsa arrive at is that *Gamification* does seem to work. A series of positive effects is found throughout the papers, most notably that *Gamification* does seem to increase motivation, and engagement in the systems. What must be noted is that most of the studies investigated has been during a very short timeframe, and as such this might have impacted the results on motivation(Hamari et al., 2014).

4.3. Pokémon Go

Pokémon Go, seen on Image 1, gained millions of downloads on the App Stores, when it was first released. The peculiar thing is that the game design only offers very little in terms of *Meaningful Play*, which is also something that can be seen on the metacritic score of 68/100 ("Pokemon GO," n.d.). The game itself is extremely simple, with the main focus being on moving around in the real world. By doing this, random monsters called Pokémon will appear. In these random encounters, these monsters can be caught through a small ball throwing mini game. The game offers its players to join one of three different teams, all competing for gyms to show which team is the best. The rewards given in-game for playing, is relatively small. The game will quickly ask you to collect hundreds of thousands of experiences points, while catching a Pokémon will only yield you a few hundred. The game does however give you two daily quests that, when completed, will give extra experience and items for use in the game. If these quests are completed seven days in a row, the rewards will be greater, aimed at making the player login for a short duration every day.

Image 1: Screenshot from Pokémon Go

4.4. Candy Crush Saga

Candy Crush Saga, seen on Image 2, has for many years been a very popular game, and has a metacritic score of 79/100 ("Candy Crush Saga for iPhone/iPad Reviews - Metacritic," n.d.). Early on, the game does not require much from its players, hence the puzzles the player is faced with, are very easy. Slowly as the game progress, the challenge become larger. At some point the player will encounter levels that in our assessment, are so difficult that it requires luck to beat these levels. If the player is defeated in a level, a life is lost. When this happens, a timer starts. When this timer reaches zero, a new life will be gained. If the player is all out of lives, they will have to wait for lives to be replenished, or they can spend real-life money to buy extra lives. This along with the difficulty curve, might be enough to discourage some from playing the game, however, these features also excel in its ability to keep motivating its players to come back with relatively short intervals.

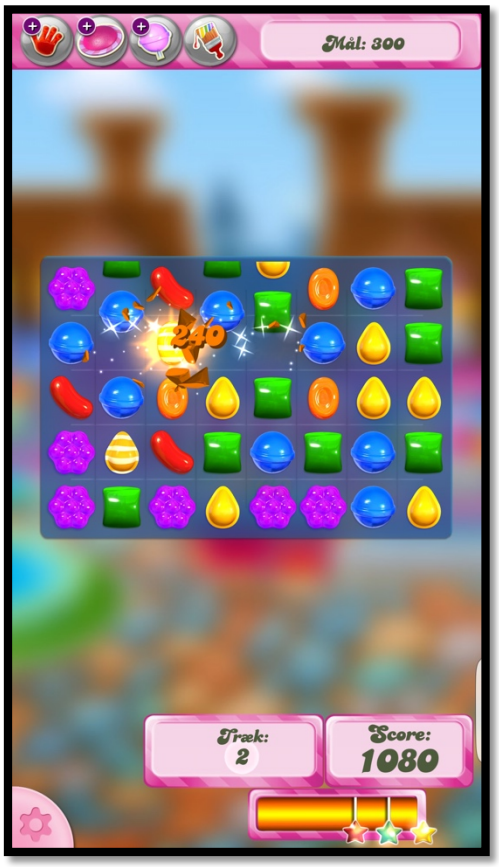


Image 2: Screenshot from Candy Crush Saga

4.5. Neko Atsume

Neko Atsume, seen in Image 3, focus on a very simple gameplay. Despite this, it has still received more than 31.000 downloads in the Apple Store, with an average rating of 4,5 stars (“Neko Atsume,” n.d.). The game focus on the excitement of opening the application, and seeing something new has happened. The player must attract kittens to their garden. This is done by placing different objects in the garden, and then waiting for something to happen. The tutorial even deliberately tells you to restart the application, to introduce you to this experience. Different items have some impact on the different kittens that you will attract, but there is a large random element to it, ensuring that it is always exciting to open the application, and seeing what has changed since the last log in.

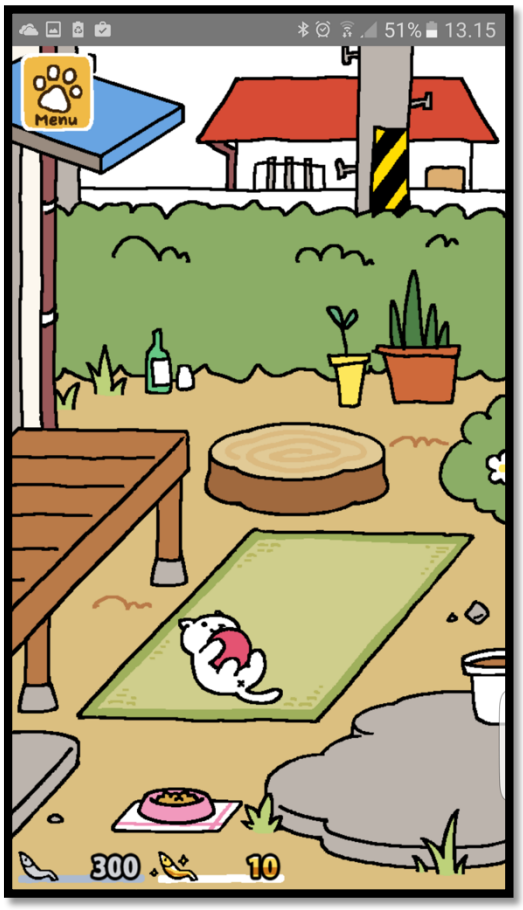


Image 3: Screenshot from Neko Atsume

4.6. Spiir and Lunar way

Spiir is a Danish mobile application, focusing on informing the user about how they use their money, with the use of visualization. Instead of having to go to your *Net Bank,* to check your financials through text and numbers, Spiir tries to present the data in a more graphic way. This is done by showing graphs, figures and other abstractions of your income and spending's. However, this requires the application to be able to read data from your bank account, thus you must allow it full access to your bank information.
Contrary to this, the application Lunar way, creates a whole new bank account for you. It then reads from this account, and in some sense, tries to replace your other bank account. Just like Spiir, Lunar Way takes in hard unmanageable numbers, and presents it to the user as easily understandable graphs and figures.
Both applications receive good ratings from the users, many commenting on their stylish visuals and their ease of use. These two applications seem to be the best alternatives on the Danish market, compared to traditional *E-banking*, and have therefore also received a lot of attention("Spiir – budget & penge i App Store," n.d.)("Lunar Way - Make Money Matter on the App Store," n.d.).

4.7. ODBC Bank Singapore

In Singapore, the webpage PlayMoolah targets the younger generation. The aim of the webpage is to get them engaged in their financials from an early age, by teaching them through classes, focusing on developing a good relationship with money and incorporate daily habits. PlayMoolah is owned by ODBC

Bank of Singapore, who with this *Serious Game,* have their focus on two design criteria. The first criterion is to create a good relationship with money, which they do by clarifying the role of money their life. This is done by examining our narratives and beliefs around money. The second criterion is to motivate the player to change their habits, by incorporating daily habits, and practices, to the player.("PLAYMOOLAH," n.d.) ODBC Bank of Singapore expands on this concept, with another game called WhyMoolah. In this game, the player takes an avatar through different stages of life, including making financial decisions about buying a house, administrating daily expenses, and administrating a marriage budget.("WhyMoolah - Play out life in Singapore! Practical information, none of the jargon!," n.d.)

While these games try to teach the player about their financials, the games do not use any information about the user's real financials, and are instead working with fictive data.

5. Problem Statement

Through the previous sections, we looked at the existing solutions and methods that already exist in the field of *Mobile Banking* applications. We also looked at which target group that is most likely to be affected by a mobile solution.

These sections show that while the differences are small, younger people tend to have a harder time creating an overview of their financials. As such, we believe that people aged 18-23 will be a suitable target group. Most of these people are in the early stages of their lives, where they have money to spend, but not enough experience to prioritise them, with financial awareness. Furthermore, as more payment methods become cashless, it becomes increasingly difficult for people, to remember the amount of money used for each transaction.

With the emerging technologies, especially in the financial sector, it seems there are a lot of different solutions to the problem. However, most solutions that move towards motivating the user through game design, only look at gamification. We imagine that having a game design, with a focus on *Meaningful Play,* will help in motivating people to keep returning to the application. As such, our aim is to create an entertaining game, placed on the border between a *Serious Game* and *Gamification*, as described in Section 2.2.1 and 2.2.2.

With this information we can form our problem statement:

How can we gamify the mobile banking experience, to motivate students aged 18-23, to get an overview of their financials, on a more regular basis than they are used to?

6. Design

This section will go into depth with the design of the application. We will also go into which trade-offs have been made to the design, in terms of usability and speed of implementation, to have a working prototype in the end.

6.1. Design Criteria

From the start, we had certain options that we would like the application to give to the user, such as the application should help the user get an overview of their financials.

The design criteria were selected, based on what the users had of issues with usual *E-banking* applications, what motivates them in games, and what we believe is necessary to fulfil the needs of the users.

1) Use the player's bank information in the application

The application should use the players own banking information, to create gameplay. As such, the application should react to the financial status of the player. If the player is overspending, the application should react in a negative way, and if everything in their financials is going well, the application should also reflect this.

2) The user is rewarded for daily log-ins

A system should be implemented, which rewards the user for logging in daily. This is done to ensure that the player will log in more often, to check up on the financials.

3) Inform about changes since last log in

For the application to be most effective, it should show how much has changed through your last log in, and not just the current day. If the changes through last log in is not used, skipping a bad day in your financials, might suddenly be the most rewarding solution.

4) Overview over usage

The design should give the user an easy way, to get an overview over their current financial status. This should be visualised in an interesting way, instead of the user having to resort to looking through pages filled with numbers.

5) The application must be usable

The design should be something that the user find joy in using, and that they will easily learn. A good usability will be extremely valuable, if the application is to be a success.

6.2. Initial Design

The initial design with the working title *Pirate Pete,* was a concept for a gamified application that would task the player with expanding and building his own island. The application focused on making the player do every day *E-banking* tasks, that had several reward systems build up around them, to make it interesting for the player to do each different task. The tasks that the player would have to do were primarily focused on "good habit" tasks, such as: Checking your financials, paying your bills on time, planning your weekly food budget etc.

We designed and structured a full game loop as a paper prototype, where the user would encounter several different tasks to complete, which would each yield different rewards. To prototype as fast as possible, we found images on google that could roughly resemble what we imagined the game to look like, as seen in Image 4. We then printed and assembled it.

Image 4: Example of the main screen in the Pirate Pete application. The island, in the middle of the screen, is the buildable space, and the button in the left corner, is the build menu. Clicking on it will reveal all current build options allowed.

Through the test the player would have to construct buildings on an island, and do certain tasks in the gamified *Mobile Bank,* to unlock new rewards. This was done by building a bank on the actual island, and through that building, access to the bank data would be granted. To account for security concerns, most of the game would be easily accessible at any time, but when clicking on the bank you would be asked to enter a PIN-code, before accessing the bank information screen, as seen in Image 5.

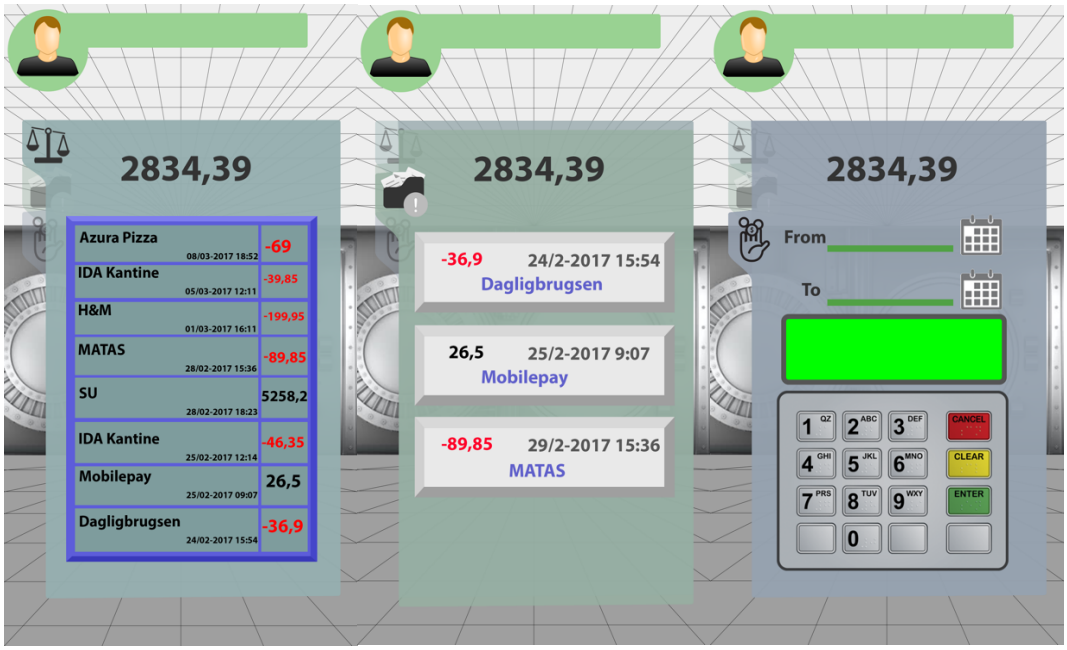


Image 5: Example of the bank information screens

However, we never got to test this, as we realised that these tasks would leave the application without any *Meaningful Play,* if the user was not *Intrinsically Motivated*. As such, giving *Extrinsic* rewards for a boring and trivial task, would most likely not engage the player. In this case, the tasks would in the end not serve any purpose. Further, giving relevant rewards would also require extensive development time, and as such the concept would not be expandable.

6.3. Final Design

After realising that the application *Pirate Pete* was of no use, we scrapped the design and came up with *Block Planet*. In this design, we focused more on the gameplay aspects. We tried to weave the banking information into the gameplay, to get an application that people want to use, and still gives them the information they need.

Block Planet is inspired by the *Sim City* games("SimCity 4," n.d.), where the player must manage a city, to keep its inhabitants happy. A trope of *Sim City* has always been that disasters can happen. These disasters can be terrible destructive when they randomly happen, and can be a real challenge to deal with. The game however also supplies its player with the ability to call in the disasters themselves.

6.3.1. Core Gameplay in Block Planet

In *Block Planet,* the player is in charge of a small planet. On this planet buildings will slowly appear, and citizens will move in. These buildings can be of three main categories: Residences, Stores and Public Services.

- **Residences will allow citizens to live on the planet.**
- **Stores will give the citizens a place to use money, and thereby gain happiness.**
- **Public Services will be used to prevent disasters from happening.**

Happiness serves as a boost for the public service citizens, making them work more effectively, and thus averting disasters more effectively.

The player will be able to intervene using *Energy Points* at any point in time. This will allow the player to build new buildings, upgrade them, or summon disasters. It is however, not a requirement to do this, as the planet can survive on its own, if you can manage your finances.

6.3.2. Events and Disasters

Whenever a transaction is detected on the users account, an event will happen on the planet. This event can either be of beneficial or disastrous nature. The event is calculated partly from how much money the user has disposable for each week, how large a transaction has been made and how much money is left on the users account. If the user still has plenty of disposable money left in a week, the application will not punish him for using money. However, if the user spends more than the weekly disposable amount, negative events will start happening.
These events will become progressively worse the more money the user spends, during a week. This will result in a continuously declining curve of the user's disposable money. This is visualised in Figure 4.

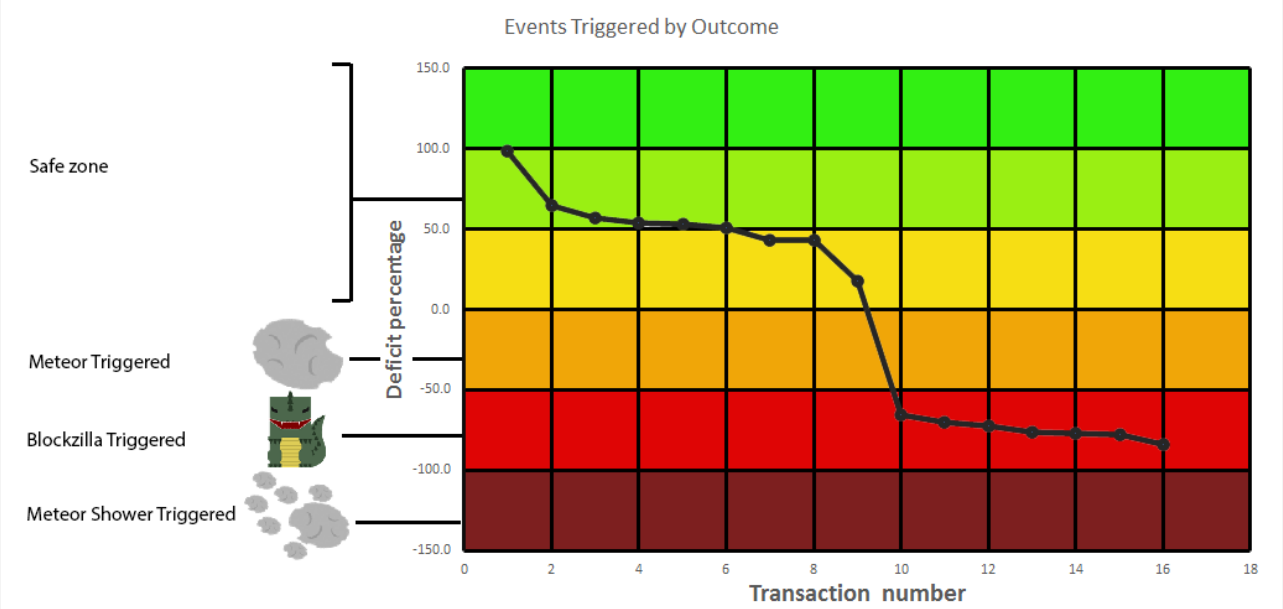


Figure 4: Example of how negative events are distributed through a series of transactions. Each new transaction is dependent on the previous one, which makes events progressively worse. Note that event values in the figure are not correct and only used for reference.

The weekly disposable amount is set by the user. Every time a transaction happens, the size of the transaction is deducted from the weekly disposable. An event is then calculated, based on the formula below.

$$Result = \frac{Disposable_{Remaining}}{Disposable_{Weekly}} * 100$$

The result is then used in a look-up table, to find out what the resulting event is, which can be seen in Table 1.

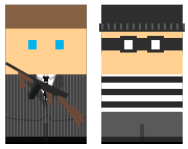
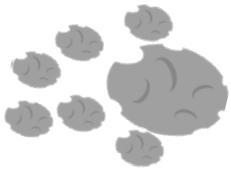
Event:	Deficit:	Description:
Criminals Spawn 	Robber: -15% Mafia: -25%	Spawn a robber at a residential building. Spawn a mafia at an Italian restaurant.
Meteor 	-30%	Spawns a meteor that will fly towards a random position on the planet.
Blockzilla Spawn 	-100%	Spawns Blockzilla in the water on the planet. Blockzilla will move across a continent, until it hits the next pool of water, where it will disappear.
Meteor Shower 	-300%	A meteor shower is a series of meteors showering down on the planet. The showering area will cover approximately a full continent.

Table 1: Showcasing negative events

All these events have counters, which force the player to prepare for the rough parts of the month. Whenever a new month starts, a large number of events will usually happen due to the bills of the month being paid, if the player however did well during the month, the planet will have been able to bolster its defences, and survive the “onslaught” with ease. The counters and events can all be seen in Table 2.

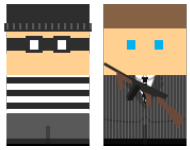
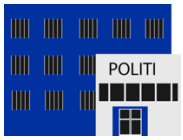
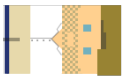
Event:	Countermeasure:	Description:
Criminals 	**Police Station** 	Robbers and Mobsters might appear. If a police station is present in the city, however, police officers will run out and take care of the criminals
Fire 	**Fire Department** 	If a building gets damaged too much it might catch on fire, if a fire department is present, however, firefighters will be dispatched to save the building
Injuries 	**Hospital** 	Sometimes a civilian might get injured. If this happens and a hospital is present, a paramedic will rush to the aid of the person.
Meteor Strike 	**Missile Silo** 	Meteors might sometimes strike the planet. However, if a missile silo is present, a missile will be fired to intercept and destroy the meteor
Blockzilla Attack 	**Blockman** 	One of the worst possible events that can happen to a city is a Blockzilla attack, however the player might have done well enough to have Blockman ready to defend the city.

Table 2: Showcasing counters to events

However, if you earn money at any point, the planet will react positively to this. The event from earning money is calculated as a fraction of the weekly disposable, as seen in the formula below.

$$Result = \frac{Transaction}{Disposable_{Weekly}} * 1000$$

This ensures that if a large income is received, relative to how much money the user have disposable for a total week, it will result in a huge benefit for the planet.

A visualisation of what this will look like over a week, can be seen in Figure 5.

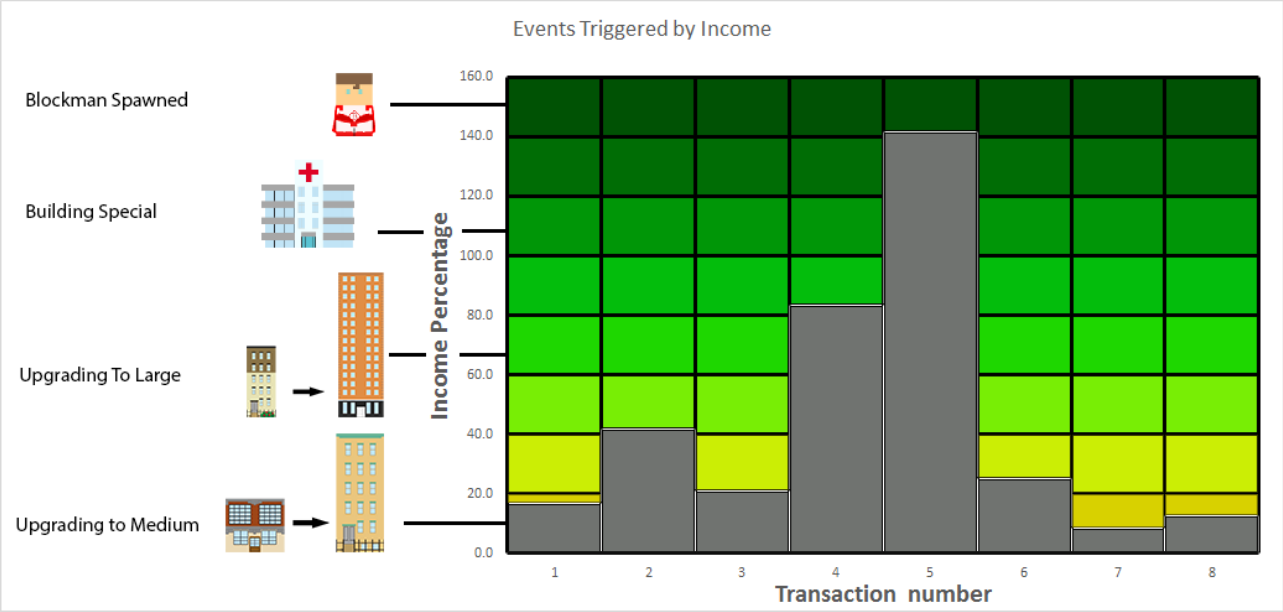


Figure 5: Example of how positive events are distributed through a series of transactions. Each transaction is independent of other transactions; therefore, the event will only be dependent on how large the current transaction was. Note that the event values are not correct and only used for reference.

As the positive events does not consider how a user's account balance currently is, and as most people will get their salary at some point during a month, no matter how badly the planet has been struck by bad events, new buildings will eventually appear.

The distribution of when buildings spawn can be seen in Table 3.

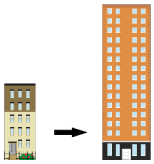
Event:	Surplus:	Description:
Upgrade Small Building 	Build small +5% Upgrade small +10%	Spawning a small building and upgrading a small building to a medium building.
Upgrade Medium Building 	Upgrade medium +15% Build medium	Upgrading a medium building to a large building
Build Special Building 	+75%	Spawning a Special building. These are randomly selected between a hospital, police station, fire department, missile silo, and shops.
Spawn Blockman 	+150%	Spawning Blockman to defend your city.

Table 3: Showcasing positive events

A gap is introduced in the positive events. This gap is placed between constructing extra residential buildings and constructing special buildings. This is to make sure the player must still interact with the application to get these special buildings, instead of passively making the transactions do all the work.

6.3.3. Motivations for Daily Log In

Whenever the user logs in, he will see changes happening on the planet unfold, depending on what transactions have been detected on the users account since last login. A short delay will be added between the events, such that they won't all happen instantaneously.

Further, the first login each day will reward the user with three extra energy points, to use on any action the user would like to do.

6.3.4. Iterating on the Final Design

During the design phase of the project, multiple iterations were done through paper prototyping. After the core concept had been developed, we designed a prototype of the application. This prototype was intended to show of the concept of the applications connection to the user's financials, to see if they understood the connection. However, the prototypes did show some issues with the design.

During the play-through for each participant, the participant had to give an estimate for how much they spend, and what transactions they would make each day through a typical week in their life. They were also asked to give an estimated total budget. Through this information, we calculated the different events that would transpire each day.

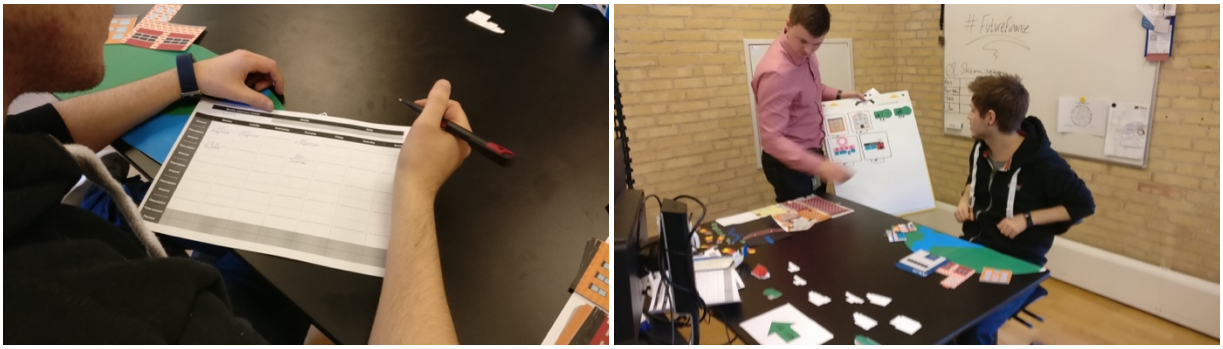


Image 6: Examples of how the participant was asked to write down transactions, and how he played the game

At the time of the paper prototype, the application was a visualised simulation of your bank account transactions. You could select and build buildings, but none of them did anything to change the state of the planet. This resembled the original idea, which was to make the planet resemble the status of the account as close as possible. However, people did not enjoy this, and wanted more interactions with the planet. As such we tried to make sure that all the events present in the game had counters as described in Section 6.3.2.

The test also revealed that the events simply was not clear enough. To make it clearer we added an information box at the top of the screen to show the amount of money currently on your account, this box would also show whenever a transaction was made.

Image 7: Example of what the paper prototype looked like.

7. Usability Test

The following section will describe the method behind our usability test, and the results of the analysis.

7.1. Method

To get an assessment of how well people will be able to use the application, and how engaging it is for them to use, we decided to test for the usability. This is done using the SUS, which assess various criteria of an application and the users' opinions towards these. Each response is then weighed and a final score is calculated. This score is a number between 0-100, where a higher number means better usability. A score of 68 is usually considered an average score. (Brooke & others, 1996)

A total of 12 respondents were invited to the test, who were all students, aged 20-28. All participants were asked to state how often they use *Mobile Banking*, where most participants stated that they used the service monthly. Further, we asked respondents for their gaming experience, ranging from playing games daily, to never playing at all. This response was plotted on a 5-point Likert scale, and the respondents had an average result of 3.6.

We also gathered information about the participants on their *Mobile Bank* login frequency to see if this would match our target group and personas. As seen in Figure 6, most participants' only login monthly, and as such they show some of the same behaviour we expected from our targeted audience.

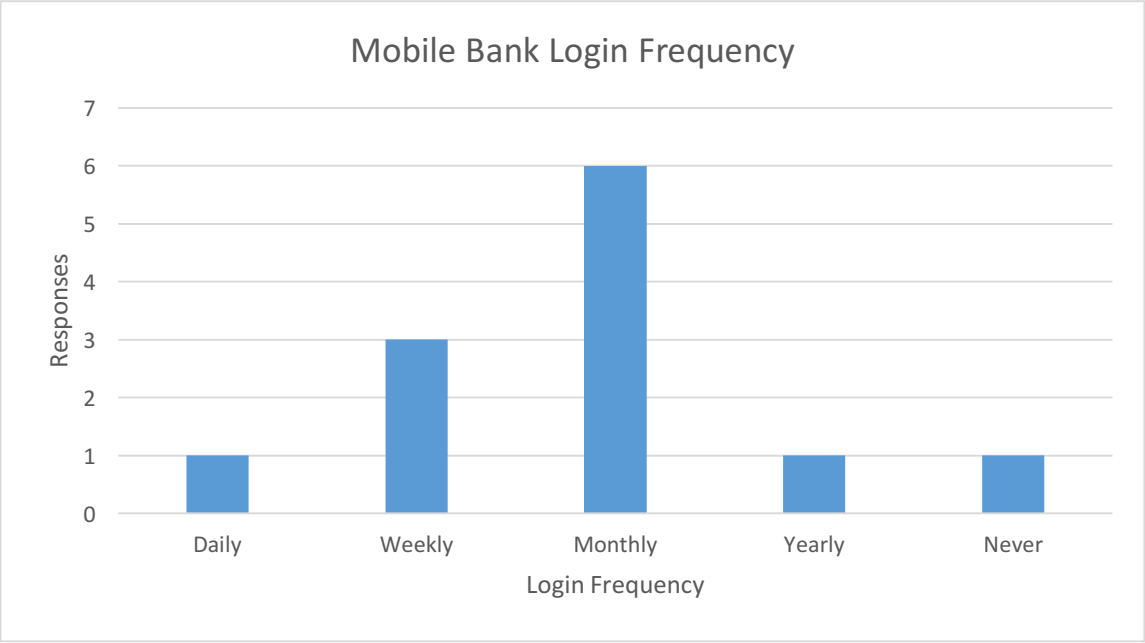


Figure 6: Login frequency on mobile banking systems for the respondents used for testing

Before the test was conducted, the participants were introduced to the test. To make sure that each participant had received the exact same information before the test started, we followed some strict guidelines of what to say at the introduction. After the participant had been introduced to the test, a consent form was handed to them. After giving consent, the participant was handed a tutorial paper, which they could use as a reference throughout the rest of the test.

During the test, an observer was present to write down any interesting behaviour or comment that the participant might make, and a facilitator was present and ready to answer any questions the participant might have. The full setup can be seen in Figure 7.

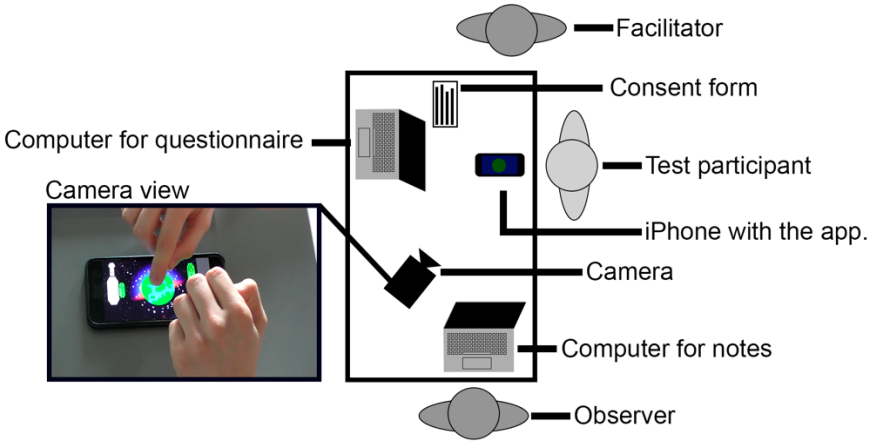


Figure 7: Usability test setup

The consent form can be seen in Appendix 2, while the sheets used for the tutorial and introduction can be seen in Appendix 3. Finally, all data gathered can be found in Appendix C.1.

7.2. Results

As each question in the SUS yields a result of a value between 1-5, the total result is 40. The "perfect" answers differ between each question, as the best value in some is 5, while it is 1 in others. To find the score contribution of each answer, the results must be normalized such that the lowest score for all questions will be 0 and the highest will be 4. This is done through two calculations.

Question 1, 3, 5, 7 and 9 must be calculated as such:

$$Contribution = Response - 1$$

Question 2,4,6,8 and 10 is calculated as such:

$$Contribution = 5 - Response$$

After these calculations, a higher score will mean a better result on that question. Plotting the averages of all participants on each questionnaire item, gives us the graph, seen in Figure 8. The labels given to each category relates to the questions asked from the SUS.

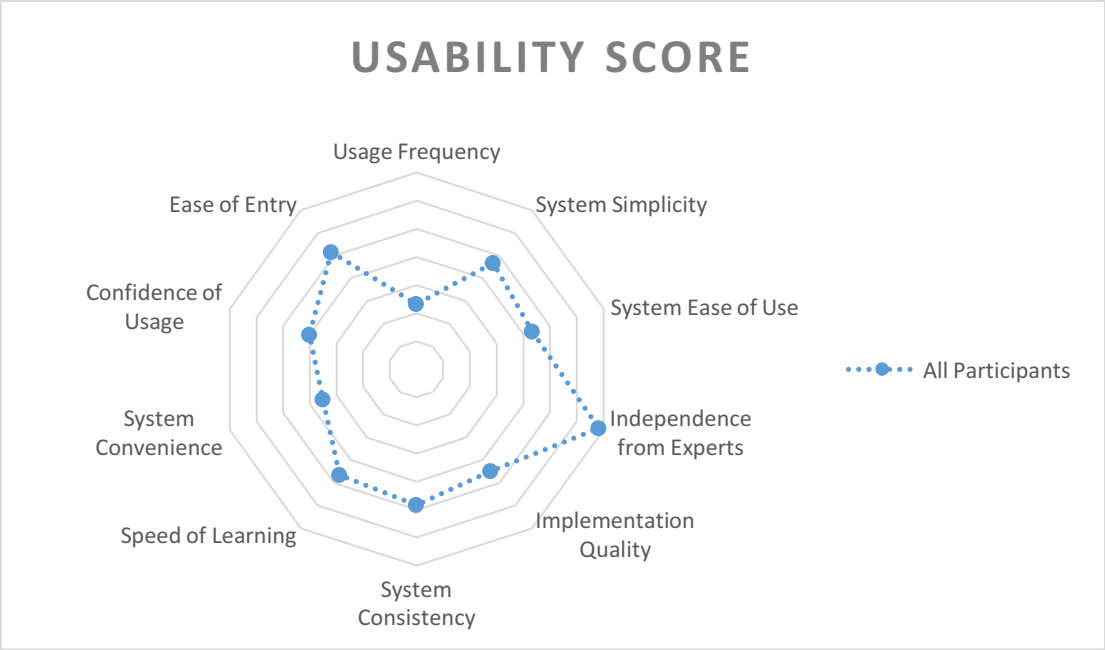
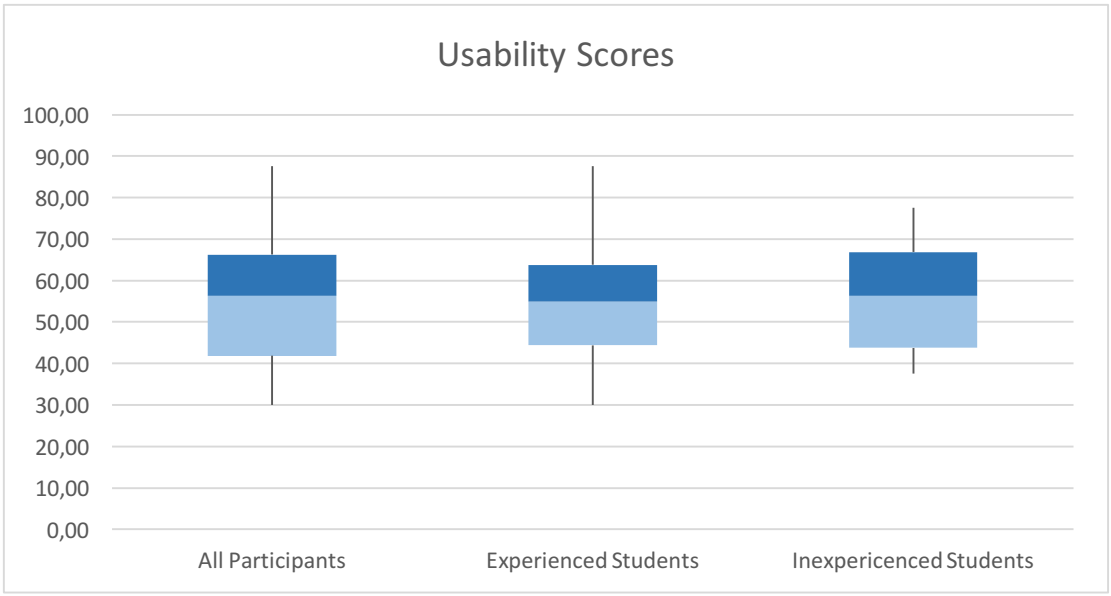


Figure 8: Radar chart showing the average scores of each question, over all participants. The chart is based on the score contribution, thus higher is always better. All participants have been included in this chart, as a good system should be easy to use for everyone.

This graph shows that overall, we have hit about an average score. From the graph, it is notable that the respondents do not feel that they needed support to use the functionality of the system. Furthermore, the participants did not feel like they want to use the application frequently.

To get an overview of how the participants overall scored the system, the score contributions for each participant answer, are added together and then multiplied by 2.5, to get tangible values between 0 and 100.



Graph 8: Boxplot showing the overall usability score, of the participants.

The boxplots have been created for both *Experienced* and *Inexperienced* students, and one has been created that includes all participants. The *Experienced* students seem to vary quite a lot in how they score the usability, but their median is still about the same as for the *Inexperienced* students. Most notable is that the overall score seem to be about 12 points below the mark. As such there are still a lot of things that we should be able to improve on the interaction side of the application.

8. Expert Reviews

In this section, we will analyse the data gathered from the expert reviews. We did an expert review, since we could not get real user data into the application, and thereby test it on customers. Based on this we used a qualitative research method to analyse the data from the interviews.

8.1. Method

The expert review was conducted as a face to face semi-structured interview, with three different experts. The experts where chosen by their speciality in Spar Nord Banks infrastructure. A mail was send out to each of the experts, approximately a week before the interview was conducted, to ask for a date befitting their schedule.

When the experts arrived, they were seated at a table, facing towards the interviewer, as illustrated in Figure 9. Besides the interviewer and the expert, a camera man was present, who could ask the expert follow-up questions, if needed.

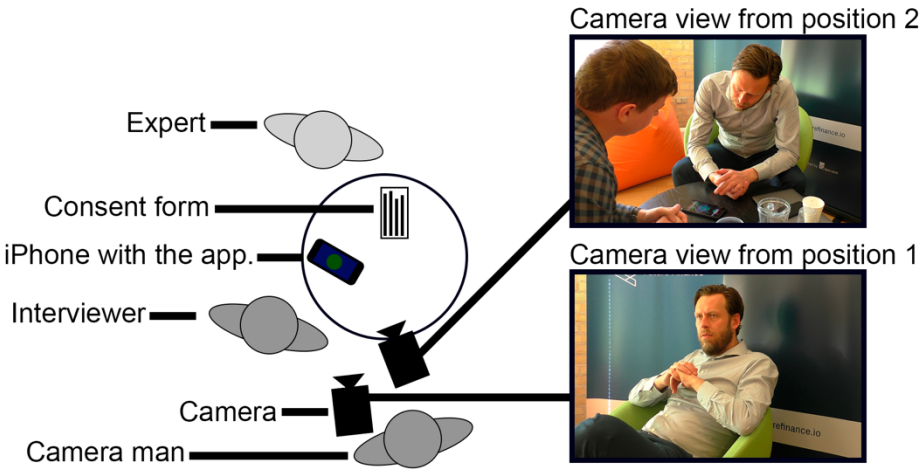


Figure 9: Expert interview test setup.

They were then presented with a consent form which can be seen in Appendix 0.

The first thing that happened at the interview, was an introduction of the project group, a brief description of the work done during the semester, and an explanation of the problem this project tries to solve.
Next, the expert explained about who they are, and what they do in their daily work time.
After that, a demonstration of the application was performed, showing the implemented features, using simulated data. All the experts had a chance to try the application after the demonstration, if they felt like it. After the introduction, the interviewee asked some general question, and some expert relevant questions, about the product.

The questions were:

General Questions

- Do you like the application and the concept?
- Can an application, such as this, help the bank in any way? If yes, how?
- Is there anything you find lacking in the application?

Business Development

- What are the classic methods of marketing in banking?
- What examples are there of what Spar Nord is currently marketing with?
- What behaviour in your target group are you usually targeting with different strategies?

Advisor

- Would you ask your costumers, who fit the target group, to use this application?
- Do you think your customers would be interested in using an application such as this?
- In what areas, if any, do you see this application helping your customers?

Innovation

- What is the potential in a product such as this one?
- How does this compare to competing solutions in the industry?
- How does this compare to Spar Nord's own solutions for solving this problem?

8.2. Results

To obtain results from the expert review, a transcript was made for all the video data. These transcripts can be found in Appendix C.2. The interviews were made in Danish, and as such the transcripts are also in Danish. However, all quotes used in the analysis has been translated to English. We compared the most notable answers and feedback from the experts, with our design criteria. This is to get an understanding of what features are good in the application and to find out if we succeeded in fulfilling our design criteria.

Referenced from Section 6.1, our design criteria are:

1) **Use the player's bank information in the application**
2) **The user is rewarded for daily log-ins**
3) **Inform about changes since last log in**
4) **Overview over usage**
5) **The application must be usable**

8.2.1. Design Criteria 1

The interviewees found that the idea of connecting your money to an application in this manner, is something interesting, and something they can relate to. This is seen in quotes like:

"I believe that one of the things that make the game fun, is that it is not just a game, but a game which relates personally to my money, instead of being a planet where I can log in and use my points. There is a relation, since it is my money, and is therefore personal". (Advisor)

While some success is achieved with the current system, the interviewees also gave examples of how we could improve on the system. By for instance adding a social element.

"I can see that my 14-year-old son, it (his financials) is not doing very well, so I have an insight in this, and I can maybe fire a missile towards him, or I can help him by sending a parachute down with some aid in it, so he can get balance back in his system." (Business Development)

We were also given an example of how subscriptions could be interacted with throughout the application, such that you can see everything you are subscribed to and interact with it.

"… you have different subscriptions, and you could do without some of them, so you can act upon the environment, so I send a missile against this HBO subscription, and it gets cancelled, to maintain the peace in this universe." (Business Development)

8.2.2. Design Criteria 2

The application tries to motivate its user to come back by making numbers, into a visual event. The idea is to bring people back repeatedly, to see new exiting events. This however did not convince our interviewees as a strong enough point.

"… there should be something else that makes me want to log in again, because else it ends like a normal mobile bank, where you only log in at the first and last (day of the month)." (Advisor)

The advisor did however also note that:
"… there should be something that trigger me to log in, and that is of course that you can see your planet and build it up" and *"the good thing about you set it (the money disposable) up on a weekly basis, therefore you have an interest in logging in during the week, to check up on how it (the financials) looks"* (Advisor)

8.2.3. Design Criteria 3

While the events are based on what happened on your bank account, they are not specific enough. The interviewees would have liked to see more specific connections to what the money was used on to convey the information better.

"If there appeared a Netto logo, oh okay, I used 300kr there. Or when I was at Heidi's in the weekend, did that really cost 1000kr? Then there could be bottles thrown around, or something, just so it is a little closer to the economy." (Innovation)

This is also enforced in the fact that it is currently difficult to understand exactly why an event is triggered.

"… this is a translation of numbers, an objective reality, where if I do not know about it, and I just look at my planet, then I cannot truly know how it goes, since I cannot decode that when a meteor strikes, it means that I have overspent 5000kr of my budget this month." and adds that *"… you should know your universe really well, and the parameters that lies behind the actions that happens."* (Business Development)

The idea behind using events is however positively received, as it is seen as an entertaining representation.

"… it is also something that helps to make it fun, and the advantage is of course that you build up points to protect your planet." (Advisor)

8.2.4. Design Criteria 4

We got feedback that the application was comparable to the classic *Sim City* game, in the idea that you try to manage and build a successful city.

"The idea is really good, since it has the thought of being used to get more people engaged in their economics, but in a fun way, and that it uses a Sim City like build up." (Advisor)

It is also stated that this might help people be more considerate before buying, as people might have throwbacks to what consequence a purchase has on the city.

"… it can help give me a better overview of what it is I use my money on, and how many money I use the next time I stand somewhere, and is about to buy something, then you might associate it with this application and think that if I buy this, then a monster will destroy my city." (Advisor)

The application does however have a strong potential in terms of expanding into the territory of classic banking applications and as such, improving the potential for keeping an overview through the application.

*"… it starts to take over for your normal e-banking application, and take over for your budget. I think that is interesting, because then it is the place you log in, and then you could in principle do without the numbers." (*Business Development)

8.2.5. Design Criteria 5

The consensus was that the design was very convoluted and hard to understand. For instance, more descriptions should be added to clarify what each button and interaction does, as the application currently does not have anything of the sort.

"It should maybe be made more simple or understandable. There were a lot of things to press, on the bottom." and *"… there should be more explanations on what is what."* (Advisor)

While certain things were lacking in the design, it was appreciated that the application was designed with the user in mind, and tailored to what they would enjoy, instead of designing for what would save the bank the most money.

*"There has been thought about what the customers want. This is not the case in ours, when we developed the net bank, it was in principle made to make the bank save money. There has not been thought of the customer at all. It is not until you start putting some design over it that you start to realise how bad it really is." (*Innovation)

9. Conclusion

The aim of the project was to solve the problem statement:

How can we gamify the mobile banking experience, to engage students ages 18-23, in their financials?

For this we set up a series of design criteria, that was focused on informing the user about banking details, and giving the user a good experience while receiving the information.

The criteria were as follows:

1. **Use the player's bank information in the application**
2. **The user is rewarded for daily log-ins**
3. **Inform about changes since last log in**
4. **Overview over usage**
5. **The application must be usable**

Through a usability test conducted using the System Usability Scale, and through three interviews with experts from the bank in each their distinctive profession, we evaluated these criteria.

The first criterion was successful. We have proven that an interactive visualisation of the banking information is something that resonates with people. The idea is intriguing. However, our design still has large issues in communicating the translation from numbers to visuals.

The second criterion was not successful. There is a lack of features that will retain the players in the application for longer than a few minutes at a time. And as such the application faces the same issues that regular *Net Banking* applications do.

The third criterion was not successful. While the application does react to the changes since last login, it is not specific enough for the user to understand.

The fourth criterion was successful. The visualisation is very intriguing, in the way that your planet can evolve or get destroyed, based on how your financials are. However, the balance of what is treated as a good or a bad financial situation might not currently be perfect.

The fifth criterion was not successful. Too many different control elements are introduced, but not explained properly. This makes it very hard to understand how each implemented system works.

The usability test also backed these conclusions. Many users had difficulties learning the system. But they did not feel the system was difficult enough to need the help of an expert. Many also voiced concerns about how the different events worked, and what they had to do with their financials. This all lead to users not having a proper understanding on how they interacted with the system, and how the system responded to the interactions. Therefore, the usability test result that was slightly below average.

Overall, our design solution using gamification shows potential in engaging students aged 18-23, in their financials. However, poor implementation and lacking features resulted in the application not fulfilling its potential.

10. Discussion

While the product showed potential, it still has some severe limitations in its implementation. This is both due to errors on our part, and on limitations of what help the bank could provide us with. General clarity in questionnaires and interviews also became an issue, as we were not thorough enough with these.

10.1. Using User Data in the Prototype

The initial plan was to use actual customer data in the application, such that the data would be the test participant's own data. However, a lot of legal issues are included in doing this, and as such this solution was not appropriate for this project. As Spar Nord Bank, recently had held a so called "hackathon", they had created an API for generic bank information. This API provided access to mock-up data for thousands of customers with thousands of transactions each. All this data was also structured in a manner of what would usually be to find in a *E-banking* system.

While access to this data is good, it is not an optimal solution due to a couple of reasons. For one, the data is unrealistic. No salary is given at any point in time, instead each account gets transferred huge amounts of money at random points in time. Spending are also way off on most accounts, with multiple hundreds of thousands of kroner being transferred in only a few transactions. This makes it harder for test participants to understand and relate to the transactions being done, and as such makes the whole system much less powerful.

Secondly, as all transactions already existed in the data, extracting it with realistic time frames would have to be a workaround. This would also have made testing much more cumbersome, and as such we decided not to use real time for the data. There was however also a huge downside to this, as the participants can browse through the events much faster than the simulation can handle. As such, an event that the planet might have been upgraded enough to handle, might suddenly become destructive, since fourteen other events are also active at the same time.

10.2. Issues with Feature Creep

Feature creep is well known issue in game development. It is known as the problem that can occur when new features are continuously added to a game, when the focus should be placed on improving the existing.

We became somewhat prone to this issue at some point during the process. This was largely due to us having the idea to make the simulation as complete as possible, with new types of events and characters that continuously had to be added. While this would be necessary to create the full experience of the application, for a proof of concept prototype, it is not. As we developed more systems, the interaction between them became increasingly difficult to bug test. Due to this, some was removed just before the final usability experiment as they simply bugged out too often, to have any kind of reliable experiment.

10.3. Fail Early, Fail Often

As mentioned in Section 2.5.2, iterating on your design is very important in game development. While we did go to some length to fulfil this goal, we were not doing it often enough. A popular saying in software development is "Fail Early, Fail Often" where we somehow manged to follow a "Fail Late, Fail Often" structure instead. Our prototypes took too long to develop, and as such was tested too late in the process, to have any meaningful impact on the development of the application. Many issues that were discovered in the end, could have been resolved early.

10.4. Log Everything

Another general issue we had during this semester, was the data logging. When doing internal testing of mechanics, we could have documented it by recording the testing on a video. We also had several issues with questionnaire questions simply not being clear enough. An example of this, is through the demographic questionnaires, where we ask for what education level a respondent had. Some choose to interpret this as latest study completed, while others interpreted it as current study. Our target group questionnaire was shared on Facebook, and as such people might have responded to it from all over the country, therefore it would have been useful with a question, to get the location of participant, to see if there is a difference in response between city and countryside etc.
We also created a full questionnaire that was aiming to figure out what levels of severity the different events would have, and how this should connect to real world financials. However, the responses we were looking for were not suited for a questionnaire, and as such we got very confused responses back, which were not useful for the study. We did not manage to do anything instead of this, and as such this became an unsolved issue. While the response turned out useless for the study, the questionnaire can be found in Appendix D.

10.5. Error Corrections

A series of issues was found in the usability test setup and the control system of the application, just as we started testing. This meant that we had a few details to fix, before we could gather any useful data.

Moving the in-game camera was initially very cumbersome for the participants, as the tested implementation relied on a slow-moving finger drag. The sensitivity was tweaked, and both swiping and dragging were enabled as controls for moving the camera. A coupled of bugged features were also found in the application. To avoid unnecessary confusion, these features were removed. Instead of changing the colour of an object between red and green, when the player can/cannot afford it, we added a cross-symbol instead. This was to better visualise that the object is currently unavailable.
Extra events were also added in each category, to make the effects of each transaction more noticeable. Finally we added a notification for each time a negative event happened, to hopefully make a better connection between when a transaction gives a negative result on the planet.

The initial test was also run with the application running the simulation for a full three weeks, which took about 15-20 minutes each play-through. However, as the application is designed and intended to be played for sessions of about five minutes, the longer sessions bored the participants. As this might have influenced the usability results, we decided to cut the test down to a simulation of one week, to make the session more realistic.

11. Future Work

Many integrations are still needed, to make the application a success. All the issues found in the discussion section, should be fixed, while more gameplay elements should also be added.
The more variety in events that the application can present itself with, the more interesting it will also be to use the application over a larger period of time.
Many features could also be tweaked to empower the player. This could be swiping across the screen to destroy buildings. Shaking the planet to knock people over. Drag people around to help them reach their destination, pet them on their head to increase their happiness etc.
These features would make lingering in the application a more enjoyable experience, instead of only logging in to observe the events.

Participants in our initial target group study, were concerned about the security of *Mobile Banking* applications, and as such felt less inclined to use it. A new research could be conducted to see whether this concern could be addressed, in a gamified *Mobile Banking* application, or not.

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Appendix

1. Personas

PERSONAS 2
PERSONA

PERSONA

NAME Freya Sørensen

OCCUPATION
Student

OTHER *Other element that has an influence on your service.*
Has multiple smart devices

SERVICE ATTITUDE
Is your persona someone who figures everything out on his or her own, or not?

DO-IT-YOURSELFER	ADVICE SEEKER	DELEGATOR
X	○	○

DESCRIPTION

Describe your persona. Describe who he or she is in the context of the (future) service. What are his or her objectives, both rational and emotional? Be sure to use the characteristics that you indicated in the dimension poster.

Freya is 25 years of age, she is currently on her last year of studies. She has the last couple of years lived by herself in her own apartment. Every week she updates her budget to keep up to date with her spendings. She plans out her entire month, but also he weekly spendings. This helps her keep an eye on he overall spendings, and how much money she has disposable. However she uses a lot of time on these budgets that otherwise could be used on her studies, socialising with friends etc. Currently Freya plans out the budget on a bulletin board in her apartment, which requires her to be at home before she can get updated.

MOTIVATING
What can make your user happy when using the service?

When the app provides her with entertainment

When the app saves her time

When the app Supplies her with an overview anywhere and anytime

When the app wastes her time

When the app does not give her enough information

When the app does not present with numbers and facts

DEMOTIVATING
What can deter your user from using the service?

Portrait image retrieved from: https://www.flickr.com/photos/125303894@N06/14365668676

PERSONAS 1
PERSONA DIMENSIONS

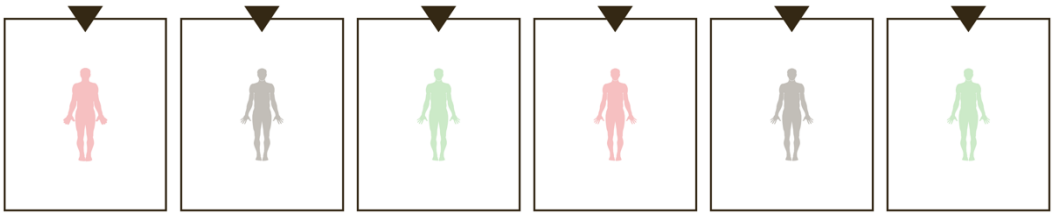
CHARACTERISTICS OF THE USERS

Decide on the most important characteristics that have an influence on your service.

EXTREME	CHARACTERISTIC	EXTREME
Economically Concious	X	Economically Unconcious
Thoughtful	X	Impulsive
Responsible	X	Irresponsible
Worried	X	Careless
Stubborn	X	Adaptable
Extroverted	X	Introverted

PERSONAS

Determine realistic combinations of characteristics that together could form a single fictitious person and link these (vertically) on the poster. Determine the combinations so that you use each extreme at least once.



P3 PERSONAS 2
PERSONA

PERSONA

NAME Thor Jensen

OCCUPATION
Student

OTHER *Other element that has an influence on your service.*
Just Moved Out, Uses his smart device multiple times a day

SERVICE ATTITUDE
Is your persona someone who figures everything out on his or her own, or not?

DO-IT-YOURSELFER	ADVICE SEEKER	DELEGATOR
○	X	○

DESCRIPTION

Describe your persona. Describe who he or she is in the context of the (future) service. What are his or her objectives, both rational and emotional? Be sure to use the characteristics that you indicated in the dimension poster.

Thor is a 20 year old boy. He recently just started his studies on full time. Thor enjoys the company of his friends and often goes drinking, which at times, cost him a lot of money. Despite this spending habit he only rarely checks his account, and when he does it is only to check if he got his monthly student grant. Thor once attempted to create a budget but he always forgets to keep updated on it, whenever he uses some of his disposable money.

MOTIVATING
What can make your user happy when using the service?

When the app helps him fulfil goals

When the app supplies him with an overview

When the app entertains him

DEMOTIVATING
What can deter your user from using the service?

When the app fails to give him stimuli

When the app does not give him clear feedback

When the app supplies him with negative game feedback

Portrait image retrieved from: https://commons.wikimedia.org/wiki/File:2009-03-07_Nate_Dizo_drinking_beer.jpg

PERSONAS 1
PERSONA DIMENSIONS

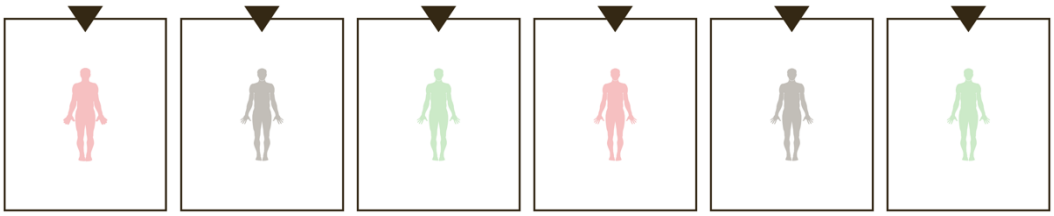
CHARACTERISTICS OF THE USERS

Decide on the most important characteristics that have an influence on your service.

EXTREME	CHARACTERISTIC	EXTREME
Economically Concious	X	Economically Unconcious
Thoughtful	X	Impulsive
Responsible	X	Irresponsible
Worried	X	Careless
Stubborn	X	Adaptable
Extroverted	X	Introverted

PERSONAS

Determine realistic combinations of characteristics that together could form a single fictitious person and link these (vertically) on the poster. Determine the combinations so that you use each extreme at least once.



2. Consent Form

Consent Form

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. I understand that my answers will be kept confidential and that I will only be identified by a pseudonym in the publications arising from this research. I have been informed about the procedure of the test and understand it. I have had the opportunity to ask questions.

I give my permission to the test facilitators to video record me, during the test process.

Yes ☐ No ☐

I give my permission for the video recordings from the test to be made public, in conjunction with AV and publication.

Yes ☐ No ☐

Name:		**Date:**	/ /
Signature:		**Test nr.**	

3. Usability Test Sheets

Introduction Sheet:

Welcome and thank in advance

Please take this seat

We are working with gamifying the e-bank experience.

We want to motivate users to log in more often, by increasing the engagement in the app.

This will be done through making classic e-banking applications into a game.

The game will simulate events on a planet based on your real-life financials.

The better your account balance is, the better and more helpful event will happen on the planet and the worse your account balance is, the worse and more harmful event will happen on the planet.

This version of the application uses simulated data and as such does not use any personal banking information from you.

In a moment, you will be given a consent form followed by a questionnaire, from which you should follow the instructions.

Then an information sheet about interaction with the application will be given and from here you will be given time with the application until you have been through the simulation. The simulation will have a span over 1 weeks.

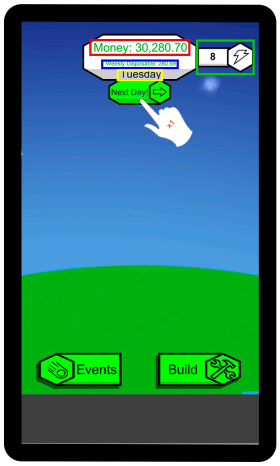
When the time with the application is up, there will be a continuation of the questionnaire.

Do you have any questions?

You should answer the following questions with your immediate response.

Use as short time as possible thinking about the answers.

Tutorial Page:



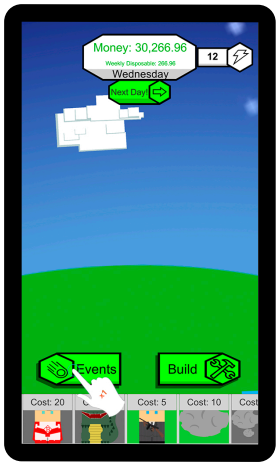
Money you have available for the week (marked with Blue)

Money currently in your bank account (marked with Red)

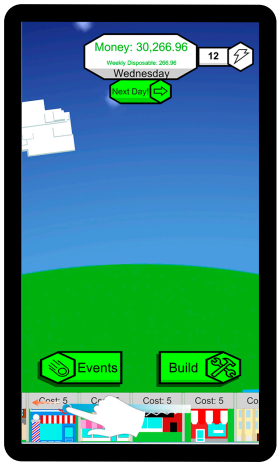
Day of the week (marked with Yellow)

Amount of action points (marked with Green)

Tap to press next day button

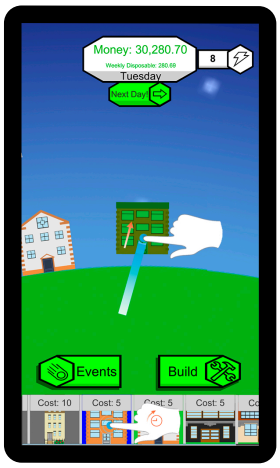


Tap on the event or build button to open or close the menus located at the bottom of the screen.



Hold the finger down and move left/right to move the screen.

Drag your finger left or right on the menu to scroll through the menu.



Hold and drag an object to place it in the game world.

Click on a building to interact with it.
- You can add extra units to certain buildings
- You can upgrade certain buildings
- You can demolish buildings

Pinch in/out to change zoom levels.