An approach on designing gamification for a mobile application

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Abstract

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This report details a project which attempts to increase the activity of women, 15-25 years of age, in an application. The project explores how elements from gamification can be used in order to achieve this in an application for auctions of second hand clothes. The problem was initially processed by extensive research into the subject, and thereby the most relevant information for reaching the main objective was distinguished. With this as basis, discussions among the group members were done both separately and together with our external partner in order to develop a solution. The implementation deriving from this project utilizes specific elements of gamification, namely rewards for certain behavior in the application. These are optimized for the application and the target group in order to create a more satisfying and engaging experience, thereby both retaining users and increasing their activity in the application.
Sammanfattning

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1 Introduction

Applications addressing and facilitating every area of our daily lives have become commonplace. A lot of these applications do however see a decrease in user activity after the initial weeks of use [37]. In order to engage users and make them stay in an application, they must be motivated in some way. There has been a lot of debate surrounding this topic. Certain elements based on human motivation can be taken advantage of in order to achieve this, namely elements commonly found in video games such as leaderboards, levels etc. This approach is called gamification. However, the study of human motivation is an extensive topic with room for many different interpretations. Hence, there are examples where the perceived needs of users have been misinterpreted and the results have thereby failed to increase motivation and engagement. There are however also counterexamples, where companies have implemented successful gamification elements, and these implementations have resulted in increased motivation. Examples are presented more extensively under Related work, page 10.

Lately, gamification has begun to revolutionize the application industry and related fields, such as IT, education and training programs [17, 18]. If done right, it has proven itself to be a potential solution to the problems associated with user loss [28]. In this project the possibilities of utilizing thoroughly evaluated gamification, focused on increasing a target groups motivation, are examined. Also, how this can be implemented in the application called Plick [48] for the purpose of increasing user activity. Plick is an application for selling and buying second-hand clothes, where users also have the possibility to browse available products and give likes on items. The research done on gamification has until recently been generic and not towards a certain target group [13, 33]. This project hopes to highlight some possibilities and some potential obstacles with implementing gamification for a specific target group.

Acknowledgement: We have during this project worked with Anton Wikner.

2 Background

Engaging individuals using an application and encouraging them to keep using it is not an easy task. Whereas attracting new users can be solved by marketing, companies are struggling to discover ideas that could improve user retention. Currently, the average user retention of mobile applications is 20% after 90 days [37]. This means that even after the hardships of acquiring new users, 80% of them will not be using the application
after three months. In order to solve this problem, attempts of gamifying products have been occurring more frequently in recent years [28].

2.1 Gamification

Gamification is a term which only became widespread as late as 2010 [13]. Even though the term has recently emerged, the ideas behind it have been occurring in numerous studies from the Human Computer Interactions field when trying to understand the relationship between a user and a system, and how the two interact [14, 42]. From there it has evolved to the now common concept of gamification.

Although the definition of gamification is still being argued about, the underlying idea is that game elements are introduced in non-game systems with the main objective of increasing user engagement and motivation [38].

In an attempt at defining the concept of gamification, Deterding et al. [13] have characterized four components:

- Game: Similar to games, the design of gamified applications will often give rise to playful behaviors and mindsets.
- Elements: Gamification is not aimed towards creating full games but is instead using elements that are characteristic to games.
- Design: The definition of gamification can be described by five levels of game design:
  1. Interface design patterns.
  2. Game design patterns, or game mechanics.
  3. Game design methods.
  4. Design principles or heuristics.
  5. Conceptual models of game design units.
- Non-game context: Gamification uses games for other purposes than their normal expected use for entertainment.

2.2 Designing for gamification

When designing for gamification, Zichermann et al. [66] and Hunicke et al. [30] have come to the following conclusions. Game mechanics and game dynamics, together
with the aesthetics of the game, are considered the most important elements when it comes to design of gamification. Mechanics and dynamics are closely related, where the mechanics include points, levels, and challenges whereas the dynamics include rewards, status, and achievements. Aesthetics can be referred to as the emotions generated when interacting with game mechanics and dynamics, and can be viewed as the outcome of the two.

Gamification applies these cornerstones to get users to participate and engage with the application. It can drive participation of users in different kinds of activities such as viewing photos, creating content, rating products, voting on content, writing comments, visiting repeatedly and many others [66].

### 2.3 Types of motivation

Motivation in gamification is often split into intrinsic and extrinsic motivation. Intrinsic motivation is defined as doing an activity due to it being genuinely interesting and satisfying [51]. When intrinsically motivated, a person acts for the enjoyment or challenge of a task rather than for external regulations or rewards. It is associated with psychological prosperity and has been shown to benefit the degree and quality of effort that people put into given tasks, which results in enhanced performance and creativity, together with increased persistence and development [51].

Extrinsic motivation on the other hand is defined as when external pressure or purpose drives a person in order to gain some outcome [51]. This could be rewards or prevention of punishments, but can also be caused by personal importance or instrumental value. Extrinsic motivation is regarded as a solid approach for behavioral change and is effective when quick transitions between states are needed [22].

Since rewards or feedback could influence intrinsic motivation differently, the impact the event causes depends on the individual perception of competence and autonomy [10]. Feedback that is perceived as informative supports the competence of a person and raise intrinsic motivation. However, feedback that is perceived as controlling, obstructs the free will or autonomy of a person and decreases intrinsic motivation [10]. Examples of how intrinsic and extrinsic motivation can be used will be discussed in more detail under Method, page 11.
2.4 User types and their characteristics

Often when designing games, the creators try to map different players into different player types. These types have different characteristics which are important in order to understand the needs of the players and what could be expected of them within the game.

Andrzej Marczewski realized that, based on the motivational elements, gamified applications also have user types. He looked at intrinsic motivation and defined four user types that can be expected to appear in a gamified application [19]. These types are:

- **Free Spirits**: Free Spirits want to feel independent, not being controlled.
- **Achievers**: Achievers want to learn new things and improve themselves.
- **Socializers**: Socializers are interested in interacting with other users.
- **Philanthropists**: Philanthropists want to feel needed, that they are there for a purpose.

From the intrinsic user types and their motivation, Marczewski also derived RAMP [20], which is an abbreviation for the following:

- **Relatedness**: Social status and connections, belonging. Describes the socializer type.
- **Autonomy**: Freedom, creativity, choice, responsibility. Describes the type Free Spirit.
- **Mastery**: Personal development, learning, levels. Describes the Achiever type.
- **Purpose**: Meaning, altruism, a reason why. Describes Philanthropists.

These key elements illustrate the needs of every user type and can be used as a foundation when gamifying systems.
2.5 Plick

An increasing number of companies are turning to gamification as a way of creating a more entertaining and engaging experience compared to the one offered by traditional methods [28]. Our collaborator Swace Digital AB [54] is one of these, trying to compete with the growing market of e-commerce. Swace is a company that provides consulting and system solutions towards application and system development. They have designed and created an application called Plick [48], which is a digital market for second hand shopping.

Plick wants to combine the experience of buying or selling products with the social aspects that could be gained when buying from a physical market [49]. From a clear niche, where only clothes, shoes and accessories can be listed, they target a specific group of individuals. According to Swace, the majority of people using the application are women between 15 and 25 years old.

2.6 Demographic differences in gamified systems

It is not completely clear whether demographic differences exist in gamified systems. Research show that differences in the decision making process exist between genders [58], where information processing is the most substantial of these [53, 58]. However, in a study made by Cechanowicz et al. [6], all demographic groups responded similarly to gamification.

2.6.1 Gender differences

The differences in the decision making process imply that women are less task- and achievement-oriented than men [29, 44]. Women are instead prone to making social connections and networks [29]. According to Venkatesh et al. [56], women have higher demand for social relations than men, and thereby a larger social motivation [25, 46]. In some games women have longer playtime, and the key-factor in those cases are game environments [24]. The motivating factors are in this case again the social factor, together with the possibility of being captivated by the game [61].

Even though characteristic motivating factors for a gender can be defined, considerations must be raised to the possibility of differences within a gender group [5, 31].
2.6.2 Age differences

The usefulness of a technology is of greater importance for younger users than for older users when deciding on which technology to utilize [57]. Younger users are in general more comfortable with adopting to new technology than older users [57, 60]. This is due to younger users being more autonomous [45].

The reason for younger users being more autonomous and less keen to social influence in terms of technology is believed to be caused by the digital divide [58]. The digital divide is known as gap in technology proficiency between people born before and after the Internet was invented. Additionally, the digital divide cause older users to feel computer anxiety to a larger extent than younger users. Also, older users do not perceive themselves to be as proficient in digital technology as younger users [16].

If a system is perceived to be useful, older people will care more about the ease of use factor than younger users [2]. However, there exists examples stating that ease of use is not related to age at all [8]. What determines a system’s usefulness should probably therefore be decided based on what each system provides and its contents.

2.7 Reason for further research

Many try to implement their own solutions by looking at cases when gamification has worked, hoping it will do the same for them. There are examples of companies that have tried gamifying their already established applications and products, but have failed miserably as their approach to gamification was suboptimal [50]. According to Gartner [18], up to 80% of gamified applications will fail to meet their objectives due to a lack of understanding of how to best implement gamification.

With rewards distributed properly and with users engaged in an appropriate way, motivation can be strengthened, which will in turn lead to higher user satisfaction and devotion [39]. In order to successfully achieve the potential benefits gained from gamification, it must be applied in an appropriate way.

There are a great many misconceptions surrounding gamification, and the term is often used in general terms [13]. Therefore, further research into the subject is necessary.
3 Purpose, aims, and motivation

The project is based on an area that has limited empirical studies [7] but where companies are undergoing big projects of implementing gamification into their products. According to Gartner [17], 70% of the largest companies in the world would have had gamified applications by 2014. The rapid development is based on several factors such as new and cheap technology which enables tracking of daily activities, web analytics of individuals and their behavior, together with the current cultural acceptance of video games [12]. This project aims at coming a few steps closer to a more favorable method for acquiring means to gamify an application. It could therefore be beneficial for many outside stakeholders that have products they wish to gamify.

The purpose of this project is to lay a foundation on how current users of an application can be engaged and motivated to participate and stay in the application by the means of gamification. More specifically, this means that when our implementation based on gamification is complete, users can be expected to spend more time in the application while also attracting new and previous users [35, 66]. Furthermore, with users spending more time in the application, sales through the application will hopefully increase, as the implemented gamification will be designed to cause users to utilize these built in functions. The desired outcome of this is increased overall activity in the application, making it more appreciated and relevant on the market.

Since the main objective is to increase the average time users spend in the application, users must have a sense of satisfaction at the end of each session. In addition, if successful gamification elements are implemented, users of the application will better appreciate the act of reselling used belongings. Consequently, there will be a better circulation of second-hand clothes and items, which helps to preserve the environment.

With this project we will explore the possibilities of targeting a certain group, namely women aged 15-25, since this is the majority of users currently signed up with Plick, as stated in section 2.5 on page 4. This is something that has not previously been done, as earlier surveys have not specifically targeted a certain age group and sex [33]. While targeting a specific group, other groups will not be excluded since different groups have common factors. Therefore the motivation of these other groups will not be negatively affected. However, targeting a specific group will make it more appealing to that specific group, granted that the proper considerations are made. By doing so we can make a more narrow implementation for which we can design a better solution in accordance to our criteria, and therefore gain a better result than applications aimed towards a wider target group.
Other than the fact that gamification is often treated in a general way, there are a lot of misconceptions about gamification that are responsible for many of the misfortunes surrounding it and making it appear undesirable. These include the concepts of bad gamification and fake gamification, which also have to be evaluated and taken into account in order to achieve a favorable end product. In short, these concepts are basically traps which developers fall into if the underlying psychology of human behavior is not thoroughly evaluated [10, 28]. This primarily means making the application appear more tedious than before the gamification was implemented, which in turn make the users feel unaccustomed with the application when the early effects and excitement from the gamified elements fade [11, 28]. There is need for these concepts to be clarified, and therefore acts as further motivation for this project to explore the most relevant information, and highlight which unfavorable methods and information should be disregarded.

Moreover, there have not been any significant studies regarding the correlation between gamification and purchase behavior, for example gamifying an application from a retailer to study its effects on its users [28]. Since our ambition is to implement this specific gamified element onto the mobile platform through the already existing application from Swace, we are forced to traverse uncharted territory. This is due to the limited research that has been done on incorporating gamification with the purpose of retaining users in applications designed for mobile phones [34].

To reach the purpose with the project we will implement a solution, based on the principle of gamification, in the application Plick. Our solution should aim to address the following:

- Encourage participation within the application.
- Increase the amount and quality of activities within the application.
- Increase intentions to use and recommend the application in question.
- Track behavior of users for further improvements of the application.

The line for when gamification is regarded unethical is usually drawn when people are used as tools for the purpose of profits, with no consideration given to improving the product itself [32]. As our solution strives to increase user satisfaction by improving the application, our approach of using statistics based on user behavior should not be considered unethical.

In order for our project to be successful we need to address and overcome the previously mentioned obstacles in gamification design, while at the same time determine how to best appeal to our desired target group. This means taking advantage and learning from
mistakes made earlier by others, while also using the resources provided by our collaborator Swace. Our solution could then give way for companies who wish to improve their products with gamification towards a specific target group. It could also be used by other developers as a comparison with similar attempts of gamification to see which approach works in favor of accomplishing their objectives.

3.1 Delimitations

When implementing our solution to the application, iOS was originally the targeted system and Xcode was supposed to be the IDE used when coding. However, since we were required to have Mac computers in order to code with Xcode, and only one was available, we were forced to switch to Android and Android Studio. This lead to the code being written in Java instead of Swift and that the system structure changed slightly. Another reason for using Android Studio was that the initial learning curve is not as steep as for implementing the application for iOS. As no group member had previous experience with application development, implementing for Android was therefore decided to be preferable. Since the time was limited this meant greater effort could be spent on the actual implementation.

Due to how Plick is constructed, some gamification elements that may have been favorable for our target group, or in general, could not be implemented. It was not possible to implement new additions to Plick as all desired mechanics already existed. The basis for the project was instead the different parts already implemented, such as the profile page. Also, according to the research available, some elements commonly associated with gamification proved in fact to be undesirable. As these elements made up a large part of possible implementations for Plick, this put further limitations on what was possible. This is something that had to be taken into consideration when doing further research and when deciding on how to implement our solution.

4 Related work

There are many examples of gamification that has been implemented in daily life applications. In some cases the reason for the gamification being present in the application is obvious, while in others it is more hidden and have motives that are harder to grasp. It is therefore possible that users have encountered gamified products but failed to notice the gamified elements present. Examples of implemented gamification include LinkedIn, Dropbox, Ebay and Zappos.
4.1 LinkedIn

LinkedIn is a business oriented network that uses a number of different gamification elements. When signing up to become a part of the community, a profile completeness bar displays the percentage of progress, where LinkedIn encourages members with short motivating statements to reach 100%. This works as a motivator for the individual but could also be an opportunity for LinkedIn to gather information which can be used for improving the platform.

Another element is the profile strength display, showing how members could reach a higher status. When a user build a profile he/she will see motivational quotes, such as “If you complete these tasks, you get a 40 percent increased chance at acquiring a job”. These quotes strengthen the intrinsic motivation by stating a clear goal towards something the user wish to gain, for which a reward in the form of a job is received. This helps to continuously motivate members to update their profiles and to remain active on the platform. Just below the profile strength display, the number of views the profile has generated is shown. This acts as a leaderboard where users can read their current rank within the community and encourages members to connect with other members in order to rise in the rankings.

The number of views together with the motivating statements relate to our project. However, in our application these will be used in a different way, described further in section 8.

4.2 Dropbox

Dropbox is a cloud service for storing and sharing files that utilizes gamification. When first registering as a new user there are several “levels” the user has the possibility to beat. To beat these levels the user must e.g. invite friends to use Dropbox, connect Dropbox to their Facebook account and other similar tasks that mostly help to spread Dropbox to new potential users. The rewards for completing these tasks are different amounts of increased storage available for the user. What makes this kind of gamification desirable is the fact that it is in direct line with the core purpose of using Dropbox in the first place, namely to store items in their cloud service. Therefore there is no real need for any other rewards in order to ensure motivation, as the promise of an enhanced application experience is enough motivation in itself.

Our implementation in Plick will also highlight elements of gamification specifically in line with the core purpose of using Plick, namely to sell or buy clothing. The solution implemented in Dropbox could therefore be an inspiration for this project.
4.3 Ebay

An increasing number of companies in the e-commerce field are implementing their separate gamified solutions. However, one of the largest e-commerce companies in the world, Ebay, might have been one of the first to achieve a positive result. With their strategy of having a bidding system, potential buyers compete to outbid other buyers where the highest bidding user wins and can claim their item. The bidding system acts as extrinsic motivation when the purpose is to become the top bidder, receiving a reward in the form of the item bought.

Sellers also receive rewards in the form of feedback as a star rating system with positive (+1), negative (-1) or neutral (+0) feedback which all adds to the feedback score. Based on this score the sellers get a certain colored star that is displayed beside the username. If a seller satisfies certain requirements it can become a top seller. A top seller badge is then displayed along with the username on the items the top seller tries to sell. This motivates the seller to provide products of high quality which in turn leads to higher ranking and with that also a more trustworthy name.

Ebay’s feedback system attract the intrinsic motivational user types since the feedback is informative and the user is not obliged to give feedback when buying items. Although, since the seller receive rewards in the form of stars and top seller status, extrinsic motivation is targeted as well. Our implemented gamification will also implement a similar approach to the certain requirements needed in order to receive a badge.

4.4 Zappos

There are also examples of companies with less successful implementations of gamification. One of these is Zappos [64], a retailer focused primarily on selling shoes. Zappos use the concept of zappos rewards, where users are rewarded with points when buying items, logging in or leaving product reviews. However, this implementation is far from perfect. Depending on the points earned, users can spend these to be categorized as Silver, Gold or Platinum. A user can also reach Elite but only by doing an invite, and what invite actually means is not stated. Silver gives the least and Elite the most, in terms of benefits. The points are valid for one year. Points that are not spent are automatically exchanged as one dollar per 1000 points [65].

This implementation is suboptimal since it is to a large extent based on extrinsic motivation which was not in line with the purpose of the application. Furthermore, the purpose of attaining the different statuses was unclear, further diminishing the intrinsic motivation. Our application will take advantage of the available research on the subject.
to avoid the mistakes made in the case with Zappos, and work to foremost strengthen intrinsic motivation.

5 Method

From the research material we gained knowledge regarding what gamification actually is and which different parts it involves. As we earlier stated, game mechanics and dynamics are important aspects when designing for gamification [66, 30]. These consists of a variety of elements and are needed to get users to participate and engage with the application. Furthermore, depending on how they are implemented, different behaviors can be shown from the participants [66]. Hence, our design could use these aspects to achieve our aim of encouraging participation together with increasing the amount and quality of activities within the application.

Thus, in order to understand which elements should be used, we have looked at several studies [3, 4, 22, 26, 27, 36, 40, 41, 62] which highlights the pros and cons of the elements in question. From these studies we can see the effects of game mechanics and game dynamics when designing for gamification. We have then collected and brought together a table with the combined results. The table shows the fields where the studies were made together with purpose and which motivational elements were used. It also shows the outcome of the studies, together with results in terms of positive or negative.

Only the studies with a purpose similar to ours are shown. However, we were careful not to exclude any options too hastily, as this would mean a potential loss of essential data in our attempt of designing a solution. If development would continue with vital options ruled out, it could lead to the target group not being fully entranced by the resulting application. Hence losing the majority of users. Due to the gravity of such a potential mistake, we will keep most alternatives open for discussion during the majority of the project.
<table>
<thead>
<tr>
<th>Type of service</th>
<th>Purpose</th>
<th>Motivational elements</th>
<th>Studied outcome</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer-to-peer trading service</td>
<td>Measure amount and quality of user activities</td>
<td>Badges, clear goals</td>
<td>Significantly more activities in service. Could not find support for gamified features alone increases activities</td>
<td>Partially positive</td>
</tr>
<tr>
<td>Online communities and social network</td>
<td>Measure intention to use and intention to recommend service</td>
<td>Badges, leaderboards, levels</td>
<td>Attitude toward service is a strong determinant of intentions to use and recommend</td>
<td>Partially positive</td>
</tr>
<tr>
<td>Tracking behavior of user</td>
<td>Points, badges</td>
<td>Badge allocation allowed behavior tracking</td>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td>Encouraging honest participation</td>
<td>Points, badges</td>
<td>Potential increase in engagement and collaboration</td>
<td>Positive</td>
<td></td>
</tr>
</tbody>
</table>
5 Method

Figure 1: Table showing outcome of studies made with different motivational elements.

<table>
<thead>
<tr>
<th></th>
<th>Encouraging participation</th>
<th>Points, status, badges, leaderboard</th>
<th>Improved response speed and quality</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowdsourcing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve participa-</td>
<td></td>
<td>Game elements not consistently</td>
<td></td>
<td>Mixed</td>
</tr>
<tr>
<td>tion</td>
<td>Points, leaderboard</td>
<td>effective or well received</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encouraging</td>
<td>Points, badges, leaderboard</td>
<td>Gamification increased performance but not significantly</td>
<td></td>
<td>Mixed</td>
</tr>
<tr>
<td>participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td>Engage customers</td>
<td>High usability and user experience ratings</td>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td>Encourage</td>
<td>Avatars, achievements, rewards, points</td>
<td>Improved awareness but no statistically significant results</td>
<td></td>
<td>Mixed</td>
</tr>
<tr>
<td>behavioral change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Another important aspect that had to be considered was who the gamification was directed towards. Since we aim to target a specific group, we needed to understand which elements of gamification create the best results for that group. Thus, in order to figure out which elements should be used, we first had to distinguish what kind of user will be using our application. To better grasp which users we are targeting and therefore get a better understanding of what should be implemented, we looked at Marczewski’s user type model [19]. From the model, every user can be mapped to a type which makes it easier to interpret their needs and what to expect from them. However, since the user types include both intrinsically and extrinsically motivated types, determining which motivation should be used was vital. In order to do so, we looked at our criteria for the project and compared them with the different motivational types.

While extrinsic motivation lack endurance and permanent influence on behavior [22, 51], intrinsic motivation could create a strong engagement on a long-term basis when a gamified element is designed and implemented correctly [63]. Furthermore, if the gamification based on extrinsic elements is stopped or removed, the users' motivation
could decrease or even vanish [22, 55]. Since we want to have long-term engagement with our users, intrinsic motivation is what we should aim to achieve.

From our criteria and what has been stated above it could be perceived that intrinsic and extrinsic motivation are the good and evil when designing for gamification. However, this is not entirely true. In Figure 1 we show studies of how motivational elements had positive effects when implemented and that they could lead to improved and more encouraging participation. These elements are all external rewards or events, which we labeled as extrinsic motivation. However, according to a study performed by Mekler et al. [43], extrinsic elements do not harm intrinsic motivation when implemented correctly. The difficulty when designing our solution is therefore to implement external events in a way that triggers intrinsic motivation, while also taking the target group into consideration.

Our solution is then implemented by using Android Studio, which is the official Integrated Development Environment (IDE) for Android application development [1]. We chose Android Studio since it includes all necessary features for building Android applications, such as frameworks for Graphical User Interface [9] (GUI), testing tools and an emulator that runs the application. It also has an environment where development for all Android devices is possible, together with GitHub [21] integration which helps when more than one person works on a project. The programming languages used in this project when coding in Android Studio are Java [47] and XML [59]. Java is used for programming the source code for the backend, while XML is used for programming the GUI.
6 System structure

Figure 2: An overlaying view of the system structure. Different parts of the image having the same color does not indicate shared functionality. It is merely to differentiate between parts.
The system structure of Plick is quite complex since the application is available both on Android and iPhone, together with a web-based counterpart. Since we are working with Android, the structure of the Android application will be explained. However, the different platforms all work in similar ways.

When opening the application, user information is fetched from a database via a server which directs the data to the users phone. This information must then be translated in order for the application to comprehend the data. An API is therefore used, which acts as a tool of communication between the application and the database. The API include a set of definitions and protocols, which converts the data object from the database into information understood by the application. Communication between users on different platforms is also handled by the API, since different platforms use different protocols.

While the user performs certain actions within the application, e.g liking an ad or putting up an item for sale, information about the action is sent to the database. The API then converts the information into a data object and give instructions on where the data should be stored, and is then transferred via the server to the database. This data could then be used to analyze a users preferences, or to make personalized content and recommendations. Handling large amounts of data in this way is something called Big Data Analytics [52].

In order to see the performance of the application, Google Analytics [23] is used. Google Analytics records the traffic in the application and keep statistics over transactions, revenue, sales activity and much more. By reviewing the data collected, improvements on the application can be made in order to give the users what they like and want.

6.1 Structure of implemented solution

The implemented solution resulting from this project base its behavior on users actions in the application. When a user performs an action, information regarding the action is stored in the database and utilized by the system. The implementation is divided into two different modules. This was done as it was perceived to be the natural division in terms of functionality of the application and labor for the group.

The first module is responsible for checking and evaluating the statistics gathered from the users actions. The statistics are stored as data objects in the database, and is upon a check first fetched via a server. It is then converted by the API into information understandable for the application. If the statistics satisfy certain criteria, the user relating to the checked statistics is to receive a reward. In that case the first module sends data to the second module to be used as input.
The second module is responsible for displaying the reward and everything related to these on the profile page in Plick. The data received from the first module contains information about which reward to display, and the second module acts according to these instructions.

7 Requirements and evaluation methods

The requirements on the system were divided into two distinct parts, namely testable and non testable requirements. This was done as different requirements affect the development of different parts of the system. Furthermore, depending on which subcategory the requirements belong to, the methods for evaluating them differ.

7.1 Testable requirements

The following section give a detailed description of the testable requirements. These are all related to the performance of the system.

Requirements for the system are mainly regarding optimization and compatibility of the end product. Actions requiring users pressing the display will be emulated by unit testing.

The key requirements for the system are:

- The badge must display info about itself when pressed on, at least 9/10 times.
- When pressing the Badge View, all currently earned badges must be displayed 9/10 times.
- Our solution must be compatible with Android API 21 and below. This will be tested by using the application with a device using API 15, since 99% of all devices are then compatible with our solution [15].
- The system must not crash more than 1 out of 10 times upon launch. This will be tested manually by launching the application 50 times.
- The system must handle corrupt data when interacting between backend and frontend. This is evaluated by manually testing the system with data that is corrupt.
- Save statistics about user activity. This will be tested by unit testing.
7.2 Non-testable requirements during this project

This section details the requirements that are not possible to test during the duration of this project, since the time required to properly evaluate them extends the project’s deadline.

The main requirement is that the activity in the application is increased over a period of 30 to 90 days. The activity should preferably be measured as an average over this period, since user activity naturally fluctuates from one day to the next. Even though the activity may have increased overall, only measuring for a specific day would thereby give inaccurate results, and therefore a measuring interval is used. An interval with a duration of 30 to 90 days is chosen since it is then comparable with the application benchmarks made by Localytics [37].

Additionally, the user base should not decrease. However, an increase in the total number of users in the system is more considered to be a benefit rather than a requirement. Statistics over the amount of activities done in the application will be stored so that Swace can evaluate the effectiveness of our solution.

7.2.1 Code

The requirements on our code are mainly based on the code convention used in Plick, in order to ensure compatibility. As the code is to be used by our external stakeholder Swace in the future, i.e when we are no longer involved, it must meet certain criteria regarding understandability. Otherwise Swace will only be able to use the theory derived from this report and not the actual implementation. Furthermore, possible programming errors in the further development of Plick should be minimized.

The specific requirements are:

- The code must follow the code convention used in Plick.
- There should be no unnecessarily redundancy in the code, e.g methods should be reused whenever possible.
- Explanatory documentation comments must be included for every class.
- Usage of immutability wherever possible. Since it adds an extra layer of security and clarity, the attributes for the user types can only be changed from the user itself.
7.2.2 User experience

Since a GUI, Graphical User Interface, is used in our solution, user experience should meet certain requirements. We will therefore look at the system as a whole, in order to measure user satisfaction of the system.

The key requirements for the users are:

- Majority of users must intuitively know that the Badge View should be pressed when wishing to view the badges.
- Majority of users must intuitively know that badges in the Badge View should be pressed when wishing to see information about them.
- At least 90% of users must realize that in order to close the badge notification, the display should be pressed.
- Majority of users must report being positively encouraged to continue using the application when awarded a badge.

8 Design

Looking at our objectives and requirements, combined with what was possible to implement in the already existing application, a design was made. We will in this section explain in detail how and why we made our decisions, accompanied with a thorough explanation of all components in our solution.

8.1 Badges

When designing our solution, several aspects have been considered. From our studies we gained knowledge on how various elements in gamification affect users differently. Since multiple elements have been proven useful when designing gamification (see fig. 1, page 13), we looked at which element best mapped with our aims and requirements. This element was badges. By using badges, all of our objectives could be met. This includes increased intention to use and recommend the application, increased amount of activities within the application, together with the possibility to track user behavior.
Since the visual appeal of the application is important, we have decided together with Swace that the design of all badges and icons will be done by professionals. However, in order to provide visual perception of the layout, we have created temporary badges which will be demonstrated later in this section. It is important to understand that these badges are in no way associated with the future design and have no real meaning other than providing a foundation for demonstrating our solution.

8.2 Profile interface

When starting the application, the user can view current ads that are put in the system. In order to make any other kind of interaction, the user is prompted to login. After logging in, the profile view (see fig. 3a) is visible, where the user has the possibility to see and edit their profile, together with a summary of various information about the user. Here we decided to put a button for displaying badges (see fig. 3b), labeled Badge View.

The badge view is clickable and, when clicked, informs the user about current badges earned. However, while a user has not acquired any badges, this view is kept invisible. We have decided to hide the view in order to not disappoint users who currently possess no badges. Additionally, by keeping the badge view as informational as possible, the intrinsic motivation of earning badges is preserved. If the view would be kept visible at all times, it could lead to accelerated extrinsic motivation by having the user feel less autonomous and instead controlled or forced to collect badges to fill the empty badge view.

It is also for this reason that the badge view is only visible for the current user, meaning that no user can see another users badges. If this would be possible, competition between users would be a factor when a user can see that more, or less, badges have been earned by someone else. Furthermore, when also considering that our target group is women between 15-25 years old, competition is less of a factor compared to if the target group would be men, as described in section 2.6.1, page 5.
8 Design

8.3 Badge view

By clicking the badge view, an AlertDialog is displayed to the user. AlertDialog is a dialog window, floating on top of the current activity, and is here used to present the badges the user currently possess. We chose AlertDialog over Dialog since it is easier to make custom dialogs which we need for the different badges.
When building the dialog, we first set the necessary parameters for the window, together with a button called “close” which closes the dialog when pressed. A ListView is then used as layout since this provides the ability to include several badges in the dialog. Furthermore, ListView is scrollable which yields the capability of having all badges earned presented in the same window. When the view is set, a custom Adapter is used to fill the list with all badges collected by the user.

(a) Badges are displayed when the button is pressed.

(b) Information shown when badge is clicked, in this case socializer.

Figure 4: Badge view

Our Adapter acts as a link between the ListView and the underlying data for the view. Moreover, the Adapter accesses this data and makes a view for each item in the data set, which is then put in the ListView. The Adapter contains all badges implemented, together with informational texts about each badge. The text should be made informa-
tional and explanatory in order to ensure that intrinsic motivation is accelerated. This
text is presented as a Toast, which is a notification message, when the user click on a
badge (see fig. 4b). The Toast only displays information about the badge clicked, and
currently last 5 seconds before disappearing. Considering that the target group of the
application is familiar with using technology (see section 2.6.2, page 5), we have not
added any tips on how to display this text.

Since our Adapter contain all possible badges that could be given, it is necessary to
distinguish which badges should be added to the ListView. For this reason, a set of
attributes are made for each user, which consist of Booleans for every badge in the
system. When the Adapter is called, it checks the set of Booleans and only add the
Views for which the Boolean is true. This ensures that only badges collected by the user
are visible in the BadgeView. If a user could see all badges possible to collect, e.g by
having badges transparent and highlighting them when rewarded, extrinsic motivation
would increase as users would wish to collect them all.

### 8.4 Badge notification

If a user completes activities for a specific badge, the badge is given as a reward. The
reward is displayed as a dialog (see fig. 5), much like the BadgeView. However, instead
of using an Adapter, the method uses a switch statement which determines which badge
should be displayed. The dialog is presented with a title that informs the user that a new
badge has been earned, together with the name of the badge.

When the user click on the screen, the dialog disappear. While the dialog is dismissed,
the Boolean for the specific badge is set to true for the user, and the badge is added to
the BadgeView. If no other badges had been collected before, the BadgeView is also
made visible on the profile view.
Figure 5: Dialog shown when criteria for a certain badge has been met. In this case socializer.
In order to hold a badge the user must continuously uphold the requirements of the specific badge. The requirements for the badges are based on the user type associated to these requirements. Determining this association was made by comparing user behavior in the application with the characteristics of a user type. The requirements are tested every seventh day for each of our user types: Achiever, Socializer, Free-Spirit and Philanthropist. The user types were chosen based on Marczewski’s intrinsic user types as explained in section 2.4, page 4. From the statistics stored in the database, different attributes were assigned to different user types. Deciding which attribute should be assigned to which user type was determined by having the RAMP model (see section 2.4) as a foundation, together with a joint discussion on where to assign attributes.

When designing the part of our system that handles the logic and requirements of our user types, the natural choice was to implement one class for each of these. Each user type has different requirements that must be satisfied in order for a user to achieve a
badge corresponding to that type. Therefore, it was decided that the requirements should be handled by each user type class. Since some of the requirements for a user type is the same as for others, all requirements were stored as attributes in a superclass called Badge. This was to make all the requirements accessible in one class and eliminate the need for multiple inheritance.

To make tasks and badges valid for precisely seven days the time needed to be calculated and checked. The choice of seven days has no statistical meaning, other than it being a natural cycle for performing a check, and could be changed if a more desired interval is requested by Swace. A global timer is then used to check every interval of seven days and for every user type, to ensure satisfaction of all their requirements. If all requirements of a user type is met, a badge is rewarded and the attributes are reset.

However, consideration must be made to the fact that attributes could be fulfilled or commenced on different days. Therefore each attribute need a separate timer as attributes that have only been active for e.g. three days, would be reset by the global timer. Therefore each attribute need to be timed and when the lifetime of the attribute reach seven days the status of the attribute is reset. The status of an attribute is checked once every day. If an attribute is reset, all user type classes that have the attribute as a requirement will fail their checks and the corresponding boolean variable will be set to false.

The usage of Reflection eliminated the need of many redundant methods. Reflection makes it possible to change a classes attributes from within the class and thereby change the value of all user type attributes through only one method.

9 Evaluation results

9.1 System

- The badge must display info about itself when pressed on, at least 9/10 times.
  The unit test shows that the implementation fulfill the aforementioned requirement.

- When pressing the Badge View, all currently earned badges must be displayed 9/10 times.
  The unit test shows that the implementation fulfill the aforementioned requirement.
10 Results and discussion

- The solution must be compatible with Android API 21 and below.
  All components in our implemented solution works properly when using a
device with Android API 15.

- The system must not crash more than 1 out of 10 times upon launch.
  The application did not crash upon launched 50 times in a row.

- Save statistics about user activity. This will be tested by unit testing.
  The unit test shows that statistics are stored properly.

9.2 Non-testable evaluation

When the code was written, consideration towards our requirements were taken. We
have therefore followed the code convention used in Plick and included documentation
comments for every class made. Also, redundancy in the code has been eliminated,
where methods are reused instead of rewritten when needed. Consideration has been
take to ensure immutability in the code wherever possible.

The requirements for the users have not been tested, since the implementation has not
been launched for the public and many design aspects are not finished. It is however
likely that most of the requirements will be met, since the design of the solution was
implemented with a focus on simplicity and understandability.

User experience and the performance of the application must be tested in retrospect by
Swace. This include the increase or decrease of user activity over a longer period of
time.

10 Results and discussion

In this section the final result of the project is presented and discussed. It is divided
into subsections where each subsection present a part of the finished system separately,
including discussion.

10.1 Badges

Four different badges called Free Spirit, Achiever, Socializer and Philanthrophist have
been implemented in the application. These are based on the four intrinsic user types
defined by Andrzej Marczewski, as described earlier in section 2.4 on page 4. The system is constructed to reward users with a badge when certain behavior is detected. The behavior reveals which user type the user is, and the badge corresponding to said user type is then displayed. As the system takes into account all four different user types, it ensures that badges relevant to all users corresponding to these types are included in the finished system.

The implementation of the four badges is the result of taking into consideration three factors. These are the requirements for addressing the target group as described in section 2.6, the aims described in section 3, and a focus throughout on stimulating intrinsic motivation as described in section 2.3, on page 5, 6 and 3 respectively. Combining these factors lead to the insight that badges was the optimal choice of gamification to be implemented.

10.2 Criteria for being rewarded a badge

Everything in the system is based on some fundamental statistics gathered by Swace, in order to establish the behavior of individual users. From the statistics, parameters of different measured data can be derived. This is in turn used in order for the system to determine whether a user should be rewarded a badge. This will further into the report be referred to as a badge check.

We chose the parameters relevant to our specified user types. However, the badges represent different types of behavior, where some of the parameters relate to one, or some, badges but not to others. This means that for some badges the system take more parameters into consideration when a badge check is performed. Also, some badges may be a more common occurrence than others since some behavior occur more regularly. Additionally, the specified requirements in order to be rewarded a badge might be unfavorable, meaning no user will meet them. These factors may all cause the system to award some badges more often than others, resulting in a perceived unbalanced system. However, if some badges are more rare than others these might be seen as more sought-after, which might not necessary be a negative aspect.

As previously stated we could only map the badges to statistics gathered by Swace. Due to the nature of Plick some types of statistics were gathered more extensively than others, leading to some badges utilizing more parameters upon a badge check compared to other badges. If the statistics to be gathered were chosen by us instead, we might have been able to map each badge with an equal number of parameters. Although this might have been impossible due to the delimitations within Plick and for what purpose it is used.
11 Conclusions

Which parameter that was mapped to which badge was entirely decided by us. We based our decision on the research regarding the user types explained in section 2.4, page 4, as well as our own intuitive perception. It is possible that some parameter should either be removed or added to one or more badges, and in that case it is purely due to human error.

10.3 Profile interface

On the profile page in Plick a button for displaying badges has been implemented. This button is however only visible if the user has received a badge. Also the reason for the user receiving a badge is not explained, and the user will never be informed about this. Moreover, the badges are only visible to the user themselves, and users will not be able to see which badges other users have received. These choices were made on purpose by us to ensure a perceived balanced system. This is since the motivation for all four user types had to be increased, and not primarily motivation of the achiever user type, as would have been the case otherwise. The statements above were based on the research on user types further described in section 2.4, page 4.

Displaying all badges directly on the profile page would make it appear cluttered as most of the available space is reserved for ads and other mechanics. Also, some users might not be interested in seeing which badges they have achieved. Therefore, even if a user has four badges, they are only shown once the user press the button for displaying them.

11 Conclusions

While the average user retention of mobile applications is 20% after 90 days [37], an increasing number of companies are turning towards gamification. However, there are a lot of uncertainties companies stumble upon when implementing gamification in an application. In particular when targeting a certain group of individuals. The purpose of implementing gamification in an application is in most cases to increase user engagement and activity, especially in individuals who would otherwise leave the application altogether. Therefore, this project is an attempt at achieving that, by exploring and implementing gamification in Plick for female users 15-25 years of age.

This project shows that it is possible to implement gamification targeting a specific group of individuals. Users can based on their behavior be divided into different user types, which in turn can be used to understand their needs and what increases their moti-
12 Future work

In this section, possible additions to our solution will be discussed. We will here showcase smaller extensions to our existing design, together with attachments that could work well in the system and in combination with our solution.

12.1 Extensions on current solution

While our design works as intended, some extensions or supplements could be added in order for the system to work smoother and feel more authentic. We will here give some examples of possible changes or additions.

- When dismissing the badge notification whenever a new badge has been earned, an animation could be added to help the user understand where the badges are stored. The animation would point to the profile-tab at the bottom of the screen while also displaying a notification that an event has occurred in the profile view.

- A scrollbar in the BadgeView, that displays all badges currently earned, could be included. This would help the user scroll through the different badges, while also informing the user that the view is in fact scrollable.

- At the moment, attributes for badges are calculated with a fixed amount of completions before the attributes are fulfilled and a badge is rewarded. In order for our solution to be scalable, these attributes could instead be calculated by percentage of the total amount of completions by all users in the system.

- In our solution, 4 different user types have been included. However, in order to utilize all possible attributes in the system, more user types could be implemented. This would ensure that more users fit into a certain user type, while also keeping the interest and excitement of earning new badges. Additional user types may
however be undesirable, and further research into the possibilities regarding this is recommended before an attempt at implementation is made.

12.2 Completing profile

An element commonly found in other widespread applications, e.g LinkedIn as described earlier in section 4.1, is the possibility to complete a personal profile. This usually includes a progress bar filling up every time another step towards completing the profile page is done.

A similar implementation would be appropriate in Plick as well. Such an implementation would preferably contain a progress bar, and tasks with clear goals associated with it with explanations of how to complete these tasks in order to make progress. Furthermore, motivating statements such as “Uploading a profile picture increase the chances of other people wanting to buy your product”, or “Writing a description about yourself increase the chances of people wishing to sell their products to you” would appear at different times on the profile page. These elements would all be included to ensure that the urge to complete the profile page is due to intrinsic motivation, which is a key factor as previously mentioned.

12.3 Feedback

As the core purpose of using Plick is to buy and sell clothes, implementing gamification stimulating user to utilize these mechanics would also be desirable.

An implementation stimulating intrinsic motivation in this case would be the possibility to review users. The user would receive feedback on the products they sold from the buyer, and also have the possibility to give feedback on the users from whom they bought items. The feedback could be given in different categories, e.g quality of product, shipping time and friendliness. Every category could be rated 1-5, and all categories added together would result in the final rating. Such an implementation would create a desire to have a good personal image, thereby having some users strive to gain the highest possible rating. Also, a sense of being part of a community would follow, making people wish to contribute to this community by giving feedback.

Additionally, the final rating or the amount of times ratings have been given or received could be used as an attribute towards receiving a badge, as it reflects behavior of certain user types.
References


References


