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Gamification Elements in Developing Mobile Application

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Abstract

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The main objective of this thesis was to determine some of the major elements developers need to consider when applying gamification in developing mobile applications. In addition, this study points out what technical sides should be included in a gamified mobile application based on the data collection from a test case product.

As a result of this thesis, some impacts of the main factors gamification have on non-game activities were found and discussed. The study also indicates some potential features of gamification implementation when developing mobile applications.

Keywords	gamification, mobile, React Native

Contents

List of Abbreviations

XP	Experience Points
RP	Redeemable Points
B2B	Business to Business
B2C	Business to Customer
IDE	Integrated Development Environment
UI	User interface

1. Introduction

Gaming is getting more and more attention not only from the gamers but also from those who find business in gaming industry lucrative. Gaming and gamification have two kinds of definitions. The differences between these two terms depend on their definitions and how they apply to different activities. Therefore, gamification can be understood as the way people apply gaming elements into activities that help increase the engagement and enjoyment of the users [1, pp. 17-22]. Thanks to its advantages, gamification has been gaining more popularity, and people start to acknowledge that it would be one of the essential factors in designing and developing an application. Nowadays software applications, especially mobile applications, are attracting newcomers with a reward system and keeping customers using the application by providing badges and achievement tokens. These are some main elements of gamification which have been applied successfully in recent years.

Firstly, the thesis discusses the foundation of gamification. It consists of three main sections: definition, elements, and benefits. In the definition section, the thesis explains the development of gamification in human history. Additionally, answers about what gamification is will be introduced along with the explanation. The main elements to create gamification are also discussed in the second section. At the same time, the reasons to choose key factors are considered in that section as well. Finally, the last section will focus on introducing the underlying theories that are essential to understand when applying gamification framework in developing mobile applications.

Secondly, the thesis will discuss the main technical side of a gamified mobile application. The test case application aims to answer how gamification can be applied to developing a mobile application. Additionally, the researchers explain the possibility of positive outcomes from the gamified elements. The guidelines for applying gamification into the application are also covered in the practical part of the thesis. The test cases are from popular applications that have been using gamification as its main method from different fields.

To conclude, the thesis indicates some potential features, which can be applied to mobile application development and the direction of gamification shortly.

2. Foundation

2.1. Definition

2.1.1. History of gamification

The gamification concept is not a new term and it has appeared throughout human history [2, pp. 119-133]. Until now, it has been presented in diverse forms, and the form varies in different kinds of forms and fields. This section will introduce briefly some pieces of evidence to prove the existence of gamification in human history.

In religious practice, the term “play” was recognised so early that it appeared in old myths and lore [2, pp. 119-133]. The Greek gods were said to play with themselves and humans with their tricks and deceptions. Similarly, Loki, a Nordic mythology god, was known for his cheat and deception. Likewise, to describe the Jewish-Christian God’s refusal to play, Einstein said: “God doesn’t throw the dice”. As a result, the term gamification or “play” in the religious field, is often prohibited. However, in 1769, Christian politician Gerhard Tersteegen invented a new way to apply gamification into religious practice: Pious lottery. It was a card game that had 365 wisdom quotes in a form of cards and inspired people to develop their Christian thoughts.

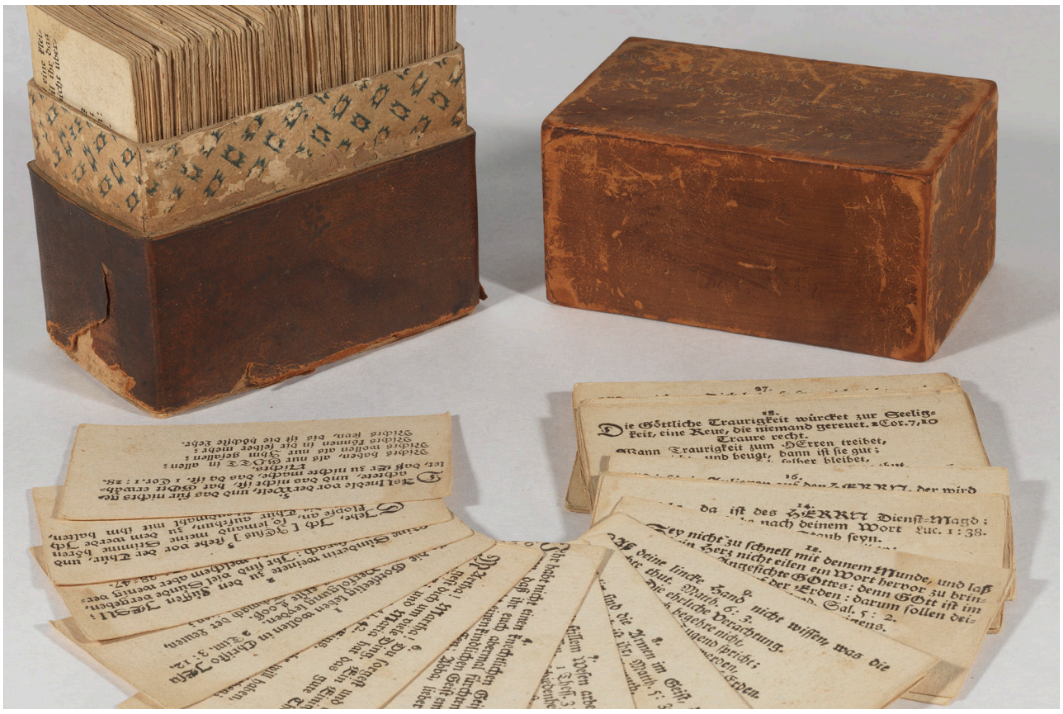
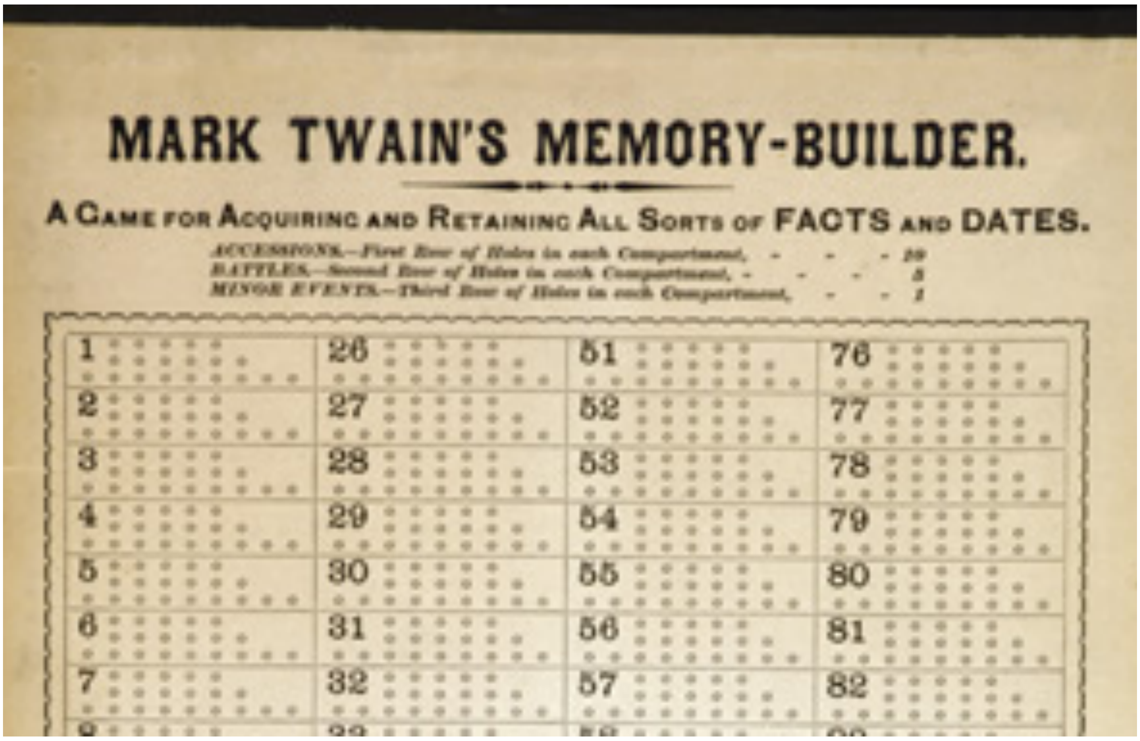


Figure 1: Gerhard Tersteegen Holy Lottery (1769)

Additionally, gamification was also noticed in the music and dance field as Fuchs M discusses [2, pp. 119-133]. In the seventeenth century, music composers realized that they could shape and manipulate music based on chance processes. Thereafter, Gerhard Tersteegen, Johann Philipp Kirnberger, Carl Philipp Emanuel Bach, and Maximilian Stadler introduced Kirnberger's Ever-Ready Minuet and Polonaise Composer - a musical gamified composition, in 1757. Years later, Maximilian Stadler, with his set of dice, published a table for composing minuets and trios to infinity, by playing with two dice. Besides, in 1792, Wolfgang Amadeus Mozart also established Musikalisches Würfelspiel system. The main purpose of those systems was to introduce that game rules and the element of chance could be applied to create music.

When it comes to the field of learning, gamification became one the most efficient methods [2, pp. 119-133]. By helping his daughters remember the English monarchs and their ruling dates, Twain discovered a new teaching way by applying gamification and published the Memory Builder (1895): A Game for Acquiring and Retaining All Sorts. It was a gamified system that included pins to mark the right date and points to reward according to correct events. Mark Twain's invention consisted of two elements applying play elements into teaching and learning relationships. The board game could be understood as an entertaining activity rather than traditional classroom lectures. On the other hand, data and history information were gamified as spatial information.



MARK TWAIN'S MEMORY-BUILDER.

A GAME FOR ACQUIRING AND RETAINING ALL SORTS OF FACTS AND DATES.

ACCESSIONS.—First Row of Holes in each Compartment, - - - 10
BATTLES.—Second Row of Holes in each Compartment, - - - - 5
MINOR EVENTS.—Third Row of Holes in each Compartment, - - 1

1	26	51	76
2	27	52	77
3	28	53	78
4	29	54	79
5	30	55	80
6	31	56	81
7	32	57	82

Figure 2: Mark Twain's memory builder (1895)

This section cannot provide enough information about the history of gamification in the human world. Yet by showing evidence in diverse fields, the role of gamification is undoubtedly important and gamification has been transforming the world since then [2, p. 135].

2.1.2. Main concept

Several definitions exist for this concept. According to Deterding et al. [3, pp. 10-15], gamification can be understood as applying game elements into a non-game context. The definition soon became one of the most basic definitions not only for newcomers to follow this phenomenon but also for many authors to be inspired. Yet some missing points should be pointed out from the previous explanation. It shows only vital key concepts and a simple understanding of gamification. On the other hand, the definition does not mention either the possible results or the objectives gamification wants to achieve.

Therefore, Huotari and Hamari [1, pp. 17-22] introduced this new concept, which is related to the purpose of gamification: “Gamification refers to a process of enhancing a service with affordances for gameful experiences in order to support user’s overall value creation”. This definition features the process of producing a gamified service, and it highlights the outcome of applying gamification, which is to create a valuable experience for end-users. Thus, Huotari and Hamari [1, pp. 17-22] point out that the methods or game mechanism cannot be set as a key point for defining gamification, yet it should be the practice of attempting to boost the gameful experiences for building users’ value.

However, gamification means different things to different people. In recent years, there has been an increasing number of applications, which utilise gamification as an essential tool. A product, or a brand, will be especially advertised by making gameful features related to its business. Besides, trainers or teachers can provide training systems or adjust users’ behaviours through a complex-gamified combination of actions and commands. All of the examples above lead to Zichermann and Cunningham’s [4] definition of gamification. They state that gamification is related to the gaming process of engaging users to deal with complications and to attract customers. Gamification is so powerful that it can be easily applied to any problem which can be solved using human motivation and behavior.

2.1.3. Summary

In conclusion, the definition of gamification can be understood as a way of applying play elements into services to enhance the users' experiences and values. Intending to fully recognize and understand the meaning of gamification, game elements are going to be discussed in the next section of this thesis.

2.2. Elements

To apply gamification, things that should be considered here are how to design a principle to help users engage more with the game world. This section has filtered the key points to concentrate on what could be the most critical aspects of designing a game system. Hunicke et al. [5] introduced the MDA framework which was related to the fundamental of gamification elements. The framework pointed out the three concepts: Mechanics, Dynamics, and Aesthetics. (see Figure 3)

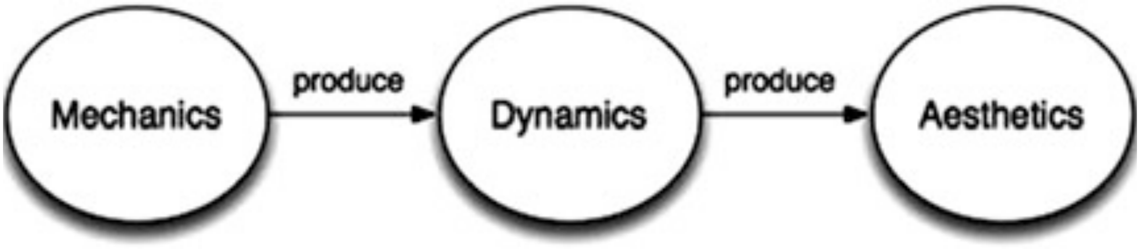


Figure 3: MDA framework by Hunicke et al (2004)

2.2.1. Mechanics

The first aspect, which appears in all game-like mechanics. is the point system. The point system definition can be understood as the money currency in the gamification world [5]. Points such as scores in a sports match, loyalty points achieved when buying clothes or points awarded in the video game, are part of the game mechanic system in gamification. The main purpose of pointing is to value, keep track of action the participants create and determine how the system interacts. Additionally, based on the feedback and results of the engagement, an adjustment will be considered.

There are many forms of rating based on point systems such as Cash score, Video game score or Social networking score [4, pp. 36-37]. The cash score is commonly referred to as the number that appeared in the bank account. Video game score, on the other hand, is noticeable from each video game and decides whether players win the game or not. Last but not least, social networking rating is another description of how many followers, shares, and likes users obtain in their profiles or posts. Consequently, the pointing system can be classified as these two types: Experience points and redeemable points. [4, pp. 38-39] On the one hand, experience points (XP) determines the time and effort users have spent in the system. This XP should never be decreased and cannot be redeemed within the program. On the other, the redeemable points (RP) can vary depends on usages. By using the system, users can receive the amount of RP they need to later exchange for provided items. This RP is so important that it could affect the whole game mechanic as it creates a virtual economy and drives users' behaviors [4, pp. 40-45].

Secondly, another aspect considered in-game mechanics is the levels and badges. Levels represent the improvement of users through progressing the game [6]. The difficulty transitions from one level the next is not only proved to be highly engaging but also helps users gain confidence and experience. In the real world, levels or badges can also be noticeable in credit cards as banks classify their users as Gold, Platinum or Black. In degree levels, universities contain many ranks based on the progress of studies like bachelor's degrees, master's degrees, and Ph.D. Besides, military and army service divide solders into different levels such as General, Private or Captain. Not only in games, but levels and badges have also been applied in many fields since a long time ago. This indicates how important this aspect is in the game mechanics.

Last but not least, leaderboards play an important role in designing game mechanics. A leaderboard's purpose is to add the competitive attribute by having a scoreboard that shows the list of people's ranks. In another definition, the leaderboard can be understood as a ranking system board. As users view their positions on the board, they can notice their ranks as well as friends or rivals. Therefore, they will recognize what they need to act to increase their ranks. This attribute increases the competitive elements and engages more and more people to participate. One of the most recognizable leaderboards is the Guinness world records. A straight leaderboard can be a strong motivating tool with genuinely competitive. But it can be both positive and negative for most explorers and socializers, as well as for other achievers. Understand the motives of the players and socialize the leaderboard: it's a win-win plan. [4, pp. 50-53]

2.2.2. Dynamics

Game dynamics characterize the mechanics' run-time actions acting on player inputs and the outputs of each other over time as Hunicke et al. [5] suggest. Therefore, dynamics form the explanation behind the game mechanics' motivational actions of the consumers. Game designers need to target and fulfill the specific desires of the various users. The game dynamics include rewards, achievements, and self-expression.

The main reason why games nowadays gain popularity is because of the rewards that the in-game system provides. When users interact or act within the game, points and rewards are given to the players. The reason behind these giving activities is to encourage users' behaviour and also help them create a habit of actions. The reward system can also fulfil users' altruism by having them the ability to give and receive gifts as rewards to each other.

Players must achieve an accomplishment to make the action possible to receive a bonus from the system. Users normally require ambitions, the need to achieve a mission, and a goal. Therefore, they tend to search for new opportunities to have a challenge and create their own goals to achieve. The system could include a reasonable achievement system and in some way provide enough status as well as recognition for the players. To gain the desired reputation and respect of other users, these latter need to participate in some activities based on the achievement requirement. This aspect is part of the human being desired needs.

Lastly, to help engage users to participate in gamified activities, the system needs to provide the possibility of self-express. Normally, people express themselves by wearing different clothes, choosing distinctive equipment or carrying a variety of items. The same behaviour also applies to design a gamification system. This includes the ability to customise their profiles, avatar or change the application theme colours. The self-express actions also increase the competition rate among the user's community due to the difference between each user and nobody wants to look like each other. As people line up and compete with others, they get inspired and satisfied.

In conclusion, Game Dynamics determines how the game and the players evolve, making the gamified experience fun and keeping the user involved for as long as possible. Game Dynamics adapt the game mechanics to meet the players' desired outcomes and unique motivations.[7, p. 10]

2.2.3. Aesthetics

According to Bohyun Kim [8, p. 18], sensation (game as sense-pleasure), imagination (game as make-believe), story (game as drama), challenge (game as obstacle course), friendship (game as social framework), exploration (game as unknown territory), speech (game as self-discovery), and surrender (game as pastime) are part of game aesthetics. Such aesthetics can be interpreted as the various goals and components of games [8, p. 18]. Additionally, Aesthetics define the emotional responses that are appropriate when the players interact with the gamified system. By recalling the emotion in people, gamification can enhance the motivation as well as increase the engagement from users.

Furthermore, to implement efficient learning gamification processes, it is necessary to understand the personality types of gamers that control the audience, to integrate mechanics and dynamics in the system layout applicable to the gamer types found. The gamer psychology Bartle test is a tool commonly used by video game designers to classify four Gamer personalities: Achievers, Explorers, Socialisers, and Killers. And through setting the player types on an axis, the chart introduces how players variety from acting to interacting, and from human beings to environments.[9, p. 36]

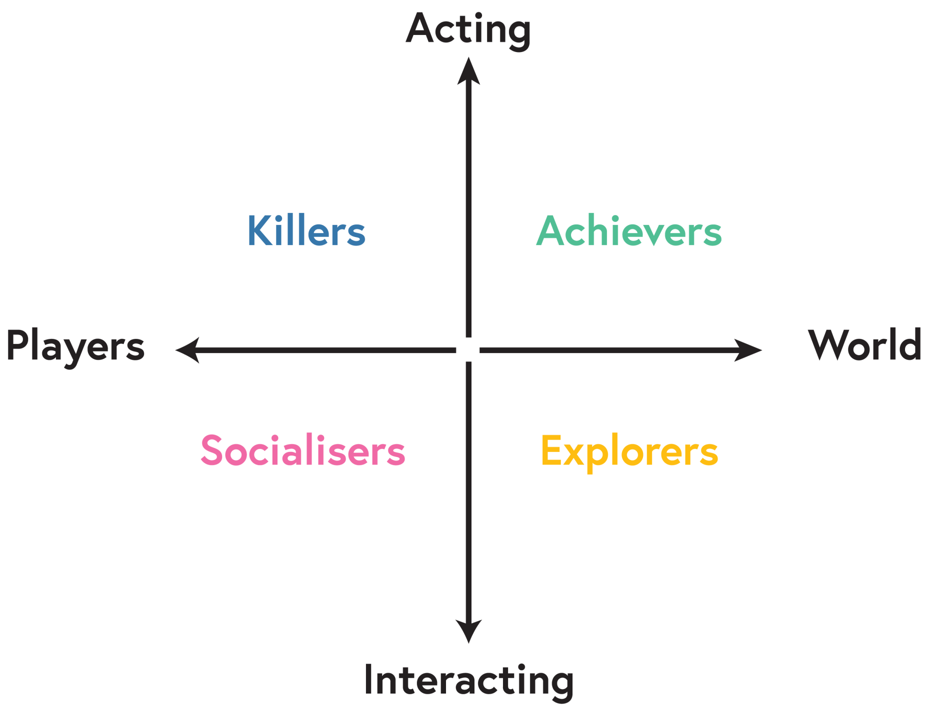


Figure 4: Bartle’s player-type model

2.3. Underlying Theories

The idea of gamification is not new, and in this way it depends on various ideas and speculations. Gamification can be firmly identified with social science as Stieglitz et al [6] suggest. Therefore, understanding the notable speculations from social science is central to building an effectively gamified framework.

2.3.1. Motivation Theory

As Nevid [10] explains, motivation is characterized as the cycle that starts, controls, and keeps up objective situated practices. It includes the natural, passionate, social, and psychological powers that enable the action of the subject. Besides, the physiological necessities are the main core of motivation theory. These necessities can be separated into two gatherings: homeostasis, which alludes to the body's programmed endeavors to keep up a consistent ordinary condition of the circulation system, as well as appetites, which alludes to giving our body what it needs [11, pp. 370-396]. The question here is what the physiological demands of gamification? Ryan and Deci [12, pp. 69-78] separate the types of motivation into two categories: intrinsic and extrinsic. Intrinsic motivations come from inside of each individual and encourage people to search out curiosity and difficulties, to broaden and practice one's abilities, to investigate, and to learn from outside. Additionally, gamified application is an easy tool to contribute these needs with its services such as providing tasks for users to complete, creating challenges, obstacles or setting up a life goal and milestone. According to Zichermann and Cunningham [3, pp. 21-23], there are four basic reasons to explain why individuals are motivated to play game: for dominance, to destress, to have a good time and to socialise. On the other hand, extrinsic motivations are external desires which frequently include rewards or goals. Zichermann and Cunningham [3, p. 27] also point out that, using extrinsic motivations should be put into consideration because of the expense in ownership and budget when giving rewards or cash as a part of encouraging individuals.

2.3.2. Flow Theory

According to Seligman and Csikszentmihalyi [13, pp. 5-14], Flow Theory (see Figure 5) is introduced as a state of focus and determination which can be attained when a mission is set to be accomplished. Csikszentmihalyi [13, pp. 5-14] indicates that there is a state of satisfaction between not getting bored and not feeling nervous. To be more specific, author perspectives flow as a state in which individuals are so occupied with an action that they may be careless in regards to their general surroundings area and potentially forget about time around. For example, when a musician is too focus on playing a piano, he tends to ignore what is happening with the surrounding area. His main target at that time was how to hit the correct notes of the music, how to keep the flow and tempo as well as perform personal expression. The state that this musician is having can be known as in the Flow Zone.

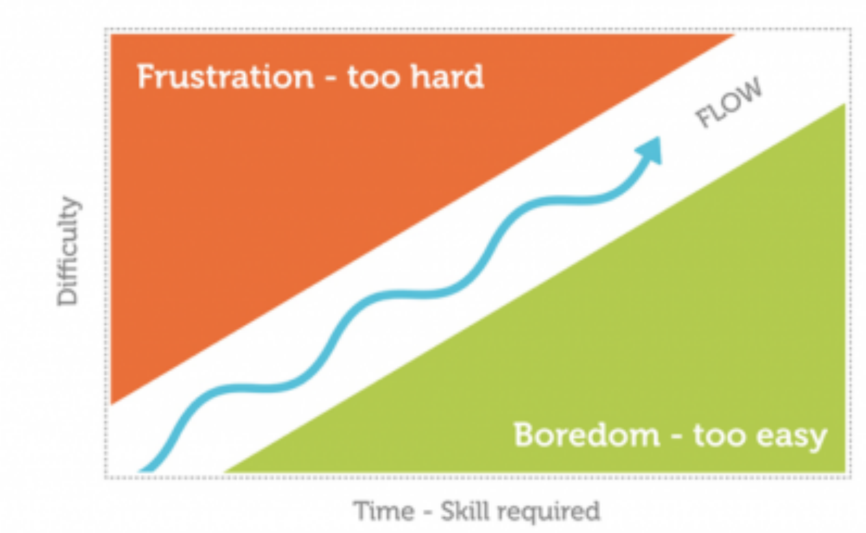


Figure 4: Csikszentmihalyi's Flow Theory

Therefore, gamification designer should always try to create this state (Flow Zone) among the users to keep them attracted to the system and guide them in the desired direction. It means that a gamified system needs to acquire a boundary in the middle of frustration and boredom. The ones that are legitimately identified with inspiration and commitment and ought to be thought about when planning gamification have been listed below [6, p. 15]:

- A challenge which test the required skills
- Combination of activity and mindfulness
- Individual's focus on a particular task
- Achievement goals and evaluation

2.3.3. Achievement Goal Theory

The question is what helps gamification in keeping users in the Flow Zone? Pioneered by Stieglitz et al [6, pp. 13-14], the achievement system is introduced as a popular method which many gamified applications recently apply. Apart from the key goal, this framework offers the objective group with additional targets which boost the commitments from users. Based on Galli and Fraternali [14, pp. 25-50], Stiegliz et al [6, pp. 13-14] also point out that achievements should be classified as different types with particular purposes:

- Instructors: aim to mentor users to finish basic and simple tasks, which are part of their learning process. This achievement has the advantage of inspiring users to familiarise the system flow as well as learn the essential knowledge.

- Quests: are presented to the users after they finish or complete the required condition. The main purpose of having quests is to encourage users to keep participating in the system

- Content Discoveries: help users experience what the application presents. When people acquire these achievements, it means that they have tried all the available features and modes provided by the system.

- Socialisers: are unlocked when users perform a social action inside the application. The social activities, for example, teaming up with people or having a conversation between individuals, help promote the user's corporation and practicability.

- Grinders: achievements that can be repeatable. Users will receive these achievements after repeating an action several times. The main idea of these goals is to educate users to become proficient in a specific task.

- Herculean Tasks: prove that users have good experiences or skills in some crucial actions.

- Trophies: handed only to the winners within the community and they bring the competitive attribute to the system.

- Loyalties: granted to clients who prove their dedication to the system. They indicate that the system really appreciates users' commitment.

3. Case study

3.1. Duolingo

Learning a new language leads to requiring many efforts and resources. Additionally, one of the biggest challenges is how to keep students' motivation and engagement throughout the lesson. Therefore, Duolingo comes as a fine solution to deal with this problem. This application is one of the most popular language-learning apps that appeared in the market which uses gamification as a main method of education. Inside Duolingo, languages have been split into bite-sized skills that are suitable for acquiring on any occasion. The application appears like a game, in which you will lose a life (heart) when you fail to answer a question as well as collect points after completing a lesson. Duolingo has a great achievement system and a leader board that produces motivation and competitiveness among users, giving it one of the best practices for applying gamification into solving a real-life problem.

3.1.1. Visual and Social

To catch the attention of learners, an application demands to have a catchy user interface and Duolingo has produced this quite well. This application is using animated images which makes the application resemble more like a game, rather than a traditional language learning program. It also splits parts into different categories and challenges which makes it easier for users to start learning a new language. This grants users a clear road map of what they are going to study and users will unlock new fields when they finish previous levels (see Figure 5). Additionally, Duolingo adds multiple animations to make the application lively and interesting, for instance, a moving icon when loading or rotating images. Not only can users explore new fields of the language but also relearn what they have studied during a new level. Besides, the repeatable attribute is essential in learning a new language. Each user will have enough life, which indicates how several times a participant can answer wrong. This will keep the users concentrating and motivating when they start learning a new field since he/she cannot continue studying when life reaches zero. To gain lives, the user has to spend points (in the app, it is called "lingots") to buy chances to continue the journey. Another great feature from Duolingo is that it integrates the social actions inside the application, which selves can comment on and have a discussion in certain lessons or tasks (see Figure 6). There is additionally a forum platform that shares the ideas plus opinions between language learners and this application has already been building a considerably large community.

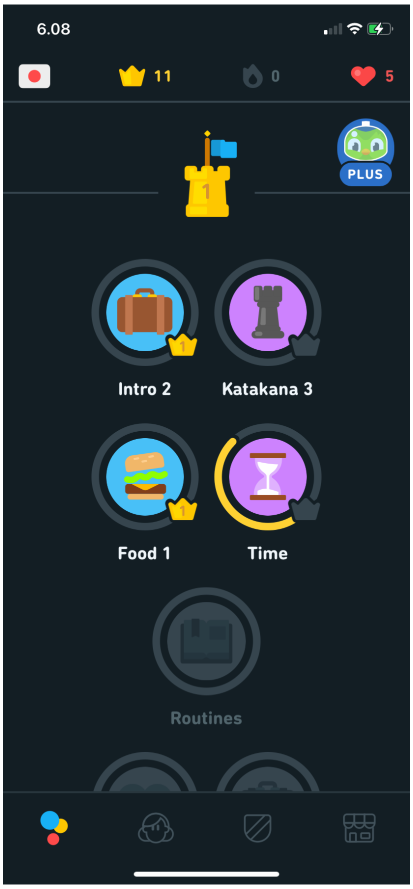
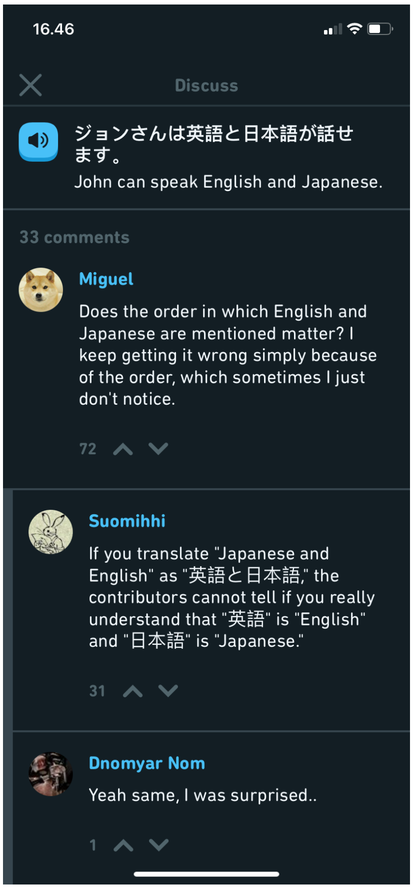


Figure 5: Duolingo language path



ジョンさんは英語と日本語が話せます。
John can speak English and Japanese.

33 comments

Miguel
Does the order in which English and Japanese are mentioned matter? I keep getting it wrong simply because of the order, which sometimes I just don't notice.

72

Suomihhi
If you translate "Japanese and English" as "英語と日本語," the contributors cannot tell if you really understand that "英語" is "English" and "日本語" is "Japanese."

31

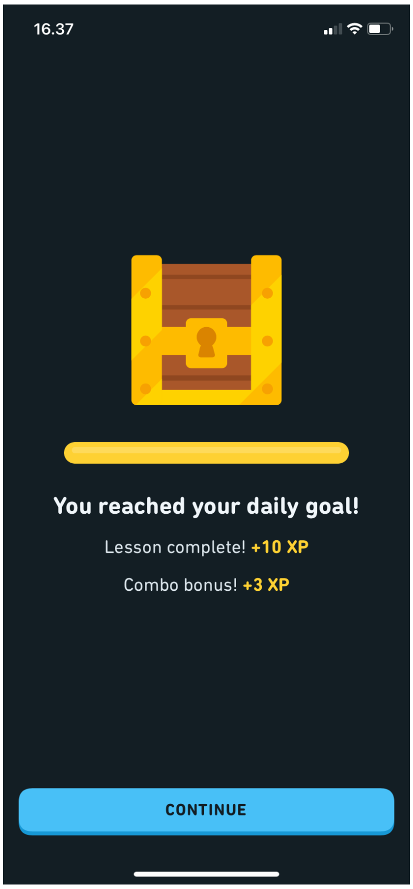
Dnomyar Nom
Yeah same, I was surprised..

1

Figure 6: Question discussion

3.1.2. Experience and League

As users continue to learn a new language throughout sessions provided by the application, they will gain XP (experience points). Also, based on the number of XPs an individual has, Duolingo will award you with different levels, known as “Crowns”. Each time you earn a new crown, the system will provide an quantity of “lingots” which you can spend to buy new lives, items to boost XP or outfits which can customise your profile based on personal preference (see Figure 7). Whenever users complete a session, the system also indicates that they have a learning streak. This daily streak means that users can view their progression of your training in this language as well as feel motivated to retain the daily streak longer. The application will boost your “lingots” established from the length of the current streak and will notify you daily to keep track. The longer the streak is, the more “lingots” people will receive. Furthermore, Duolingo introduces the League system where participants can compete with each other with their XPs and the leaderboard will use your current experience points to determine which rank users will be (see Figure 8). The rank of the league will also appear in the user’s profile and can be observed by other people. These elements are excellent examples of motivations that can retain users getting back to study.

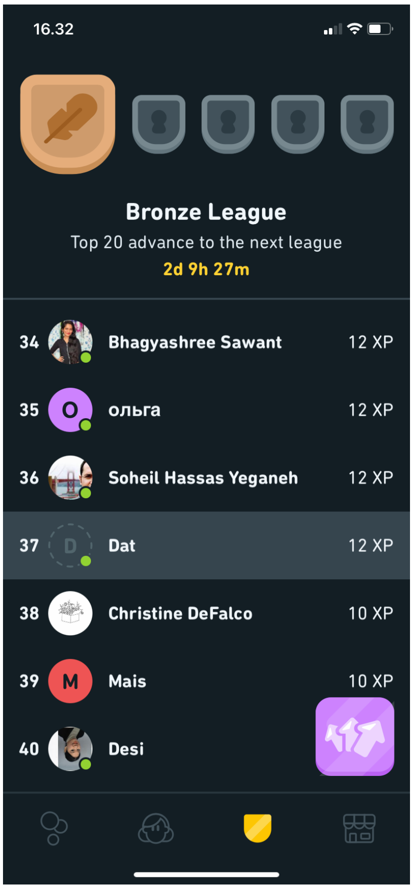


You reached your daily goal!

Lesson complete! +10 XP

Combo bonus! +3 XP

Figure 7: Finish a task



Bronze League

Top 20 advance to the next league

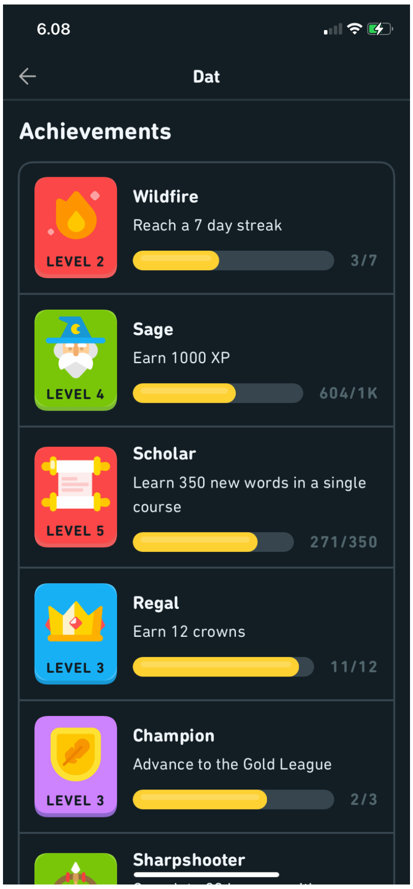
2d 9h 27m

34	Bhagyashree Sawant	12 XP
35	ольга	12 XP
36	Soheil Hassas Yeganeh	12 XP
37	Dat	12 XP
38	Christine DeFalco	10 XP
39	Mais	10 XP
40	Desi	

Figure 8: Duolingo league

3.1.3. Badges and Milestones

As mentioned above about how crucial achievements are in a gamified system, Duolingo builds an effective badges system as one of the main features that distinguish itself from other available e-learning applications. The list of badges provided from the system is enormous which varies from different fields and tasks. The badges are equipped with animated images as well as gamified names, similar to some role-playing computer games (see Figure 9). Moreover, each badge is set with specific missions to indicate the condition of unlocking it and a progress bar for users to keep track of their records. It helps create a user-friendly environment for new users, especially young people when they first interact with the application. By using the goal-setting tools, which level varies from casual to mastery, this application signifies a diversity of options for users to choose preferred methods comfortable for learning styles. The content of badges is also based on Achievement System Theory which brings more targets and goals to the end-users. Besides, people also notice that they desire to invest in collecting these achievements as part of their learning process and have a fancy for showing them in their profiles (see Figure 10).



6.08

Dat

Achievements

Wildfire
Reach a 7 day streak
LEVEL 2
3/7

Sage
Earn 1000 XP
LEVEL 4
604/1K

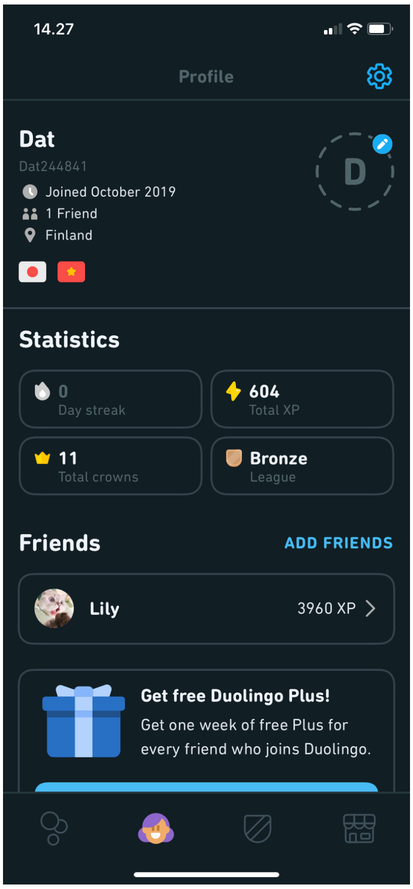
Scholar
Learn 350 new words in a single course
LEVEL 5
271/350

Regal
Earn 12 crowns
LEVEL 3
11/12

Champion
Advance to the Gold League
LEVEL 3
2/3

Sharpshooter

Figure 9: Achievements board



14.27

Profile

Dat
Dat244841
Joined October 2019
1 Friend
Finland

Statistics

0
Day streak

604
Total XP

11
Total crowns

Bronze
League

Friends
ADD FRIENDS

Lily
3960 XP

Get free Duolingo Plus!
Get one week of free Plus for every friend who joins Duolingo.

Figure 10: Profile customisation

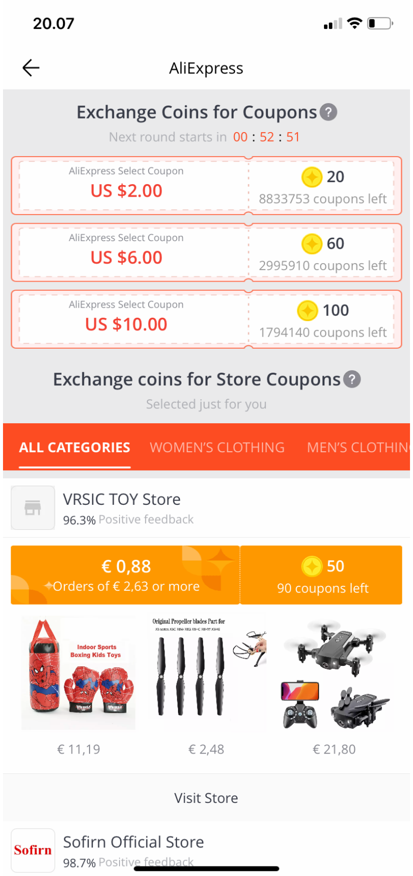
In summation, Duolingo proves that how gamification can affect learning a new language. This application promises to increase the awareness of users as well as boost the motivation from each individual by applying gamified elements efficiently and consistently. Subsequently, people recognise how enjoyable a gamified language learning application can be, especially for those who cannot find it effective to study a new language in a traditional way. Applications like these will drive a new way of engagement and open a new trend in teaching people new languages shortly.

3.2. Aliexpress

In recent years, shopping online or e-commerce, has become a new trend and revolutionised the retail world. It has developed to meet the changing needs of individuals, and reduce the difficulty of purchasing items online for the cutting edge customers. Aliexpress - a Chinese B2B e-commerce retailer, ranks up top tier in this field among other competitors. This platform provides many affordable products varied from different suppliers across the world, but mostly from its main land China. It works quite similarly to Amazon, and its products are diverse in many categories, from fashion, electronics to books, tools, etc. Aliexpress also provides many ways of delivery your goods to its destination with flexible prices and shipping plan, due to its huge logistics system. In recent times, to attract more end users to the platform, Aliexpress has applied some gamified elements which significantly makes impact on community engagement. This proves to be a good example of how gamification should be beneficial in e-commerce application.

3.2.1. Points system

Aliexpress introduces a game-based pointing systems, known as “coins”, which are the main currency in this application gamified field. As mention above in the Elements chapter, Duolingo points system is XP or exprience points that indicates the progress of users on the application. In contrast, Aliexpress’s coins are qualified as redeemable points (RP) which can vary depends on usages. These coins are expected to be used in exchange for items within the system. For Aliexpress, they define that coins should be used to exchange for shop vouchers, promotion coupons and sales on other available items (see Figure 11). As a result of aiming to control the inflation and deflation of virtual economy, this system restrict the amount of coupons that users can exchange. Aliexpress also display the exchange rate with the real money for individuals to check and compare with the actual value of products. The system provides only a limited number of coupons every hour which are available to achieved on a first come. Furthermore, business customers, for example stores and shops, can also set the amount of coins end users need to barter for vouchers used exclusively for items coming from the owners. Lastly, if users have enough coins in their pocket, they can buy an item with exactly value which are displayed in limited goods tab (see Figure 12). To conclude, Aliexpress has applied the pointing system in a particular way based on the method coming from MDA system introduced by Hunicke et al. [5]



20.07

AliExpress

Exchange Coins for Coupons ?

Next round starts in 00 : 52 : 51

AliExpress Select Coupon US $2.00 — 20, 8833753 coupons left

AliExpress Select Coupon US $6.00 — 60, 2995910 coupons left

AliExpress Select Coupon US $10.00 — 100, 1794140 coupons left

Exchange coins for Store Coupons ?

Selected just for you

ALL CATEGORIES WOMEN'S CLOTHING MEN'S CLOTHIN

VRSIC TOY Store

96.3% Positive feedback

€ 0,88 Orders of € 2,63 or more — 50, 90 coupons left

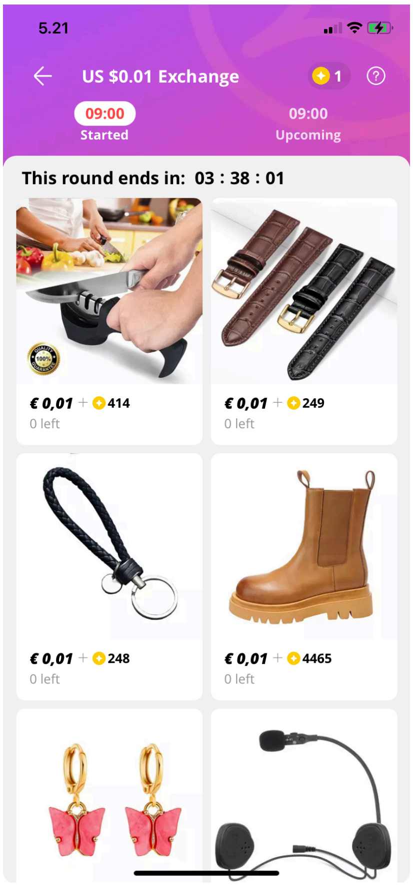
€ 11,19 € 2,48 € 21,80

Visit Store

Sofirn Official Store

98.7% Positive feedback

Figure 11. Exchange Coins



5.21

US $0.01 Exchange 1

09:00 Started

09:00 Upcoming

This round ends in: 03 : 38 : 01

€ 0,01 + 414, 0 left

€ 0,01 + 249, 0 left

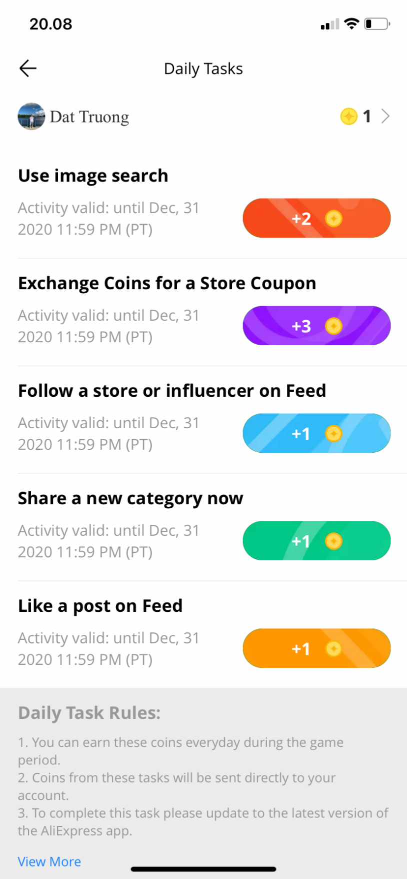
€ 0,01 + 248, 0 left

€ 0,01 + 4465, 0 left

Figure 12. Limited tab

3.2.2. Daily tasks

One of the main methods of getting these coins within the application is to complete the daily tasks which are listed. As can be seen in Figure 13, there is a total number of actions that can result in adding coins to the user's inventory. Each task is set with different awarded coins varied from 1 to 3 coins depending on the requirement. When the user taps on a task, the application will directly shift to a screen in which an individual can finalise the action. After successfully finish a task, Aliexpress automatically notifies you with an alert screen, and coins are sent directly to the user's pocket. Furthermore, users can only earn coins from tasks once a day and there will be a clock that specifies when will the next reward be available. The flow is simple enough and everything is automated which provides a smooth user experience within the application. The content of the actions is mostly related to the social task, such as "share a new category" or "like a post on Feed", which helps strengthen the community of the system, make users more active as well as boost the social engagement between end-users and business customers. In addition, AliExpress gets the chance to promote their new product categories. The direction of Aliexpress in near future can be predicted as an e-commerce social platform where users interact with each other plus spending money on online shopping. A straight example of this platform style is Facebook, which similarly has a market place for people to trade and exchange items. One more thing that can be noticed from the content of Aliexpress's daily tasks is that the “Exchange Coins for a Store Coupon” has the biggest value coin. This suggests that the system wants to direct users to communicate more frequently and they desire people to get the store coupon. When business customers acquire more users and successfully sell a product, Aliexpress will secure the money in between each transaction. This is the reason why the system pushes that action and sets the value highest among other actions. Additionally, another way to collect coins is from the Check-in section (see Figure 14). This application provides a generous reward for end users if they can check-in daily. The reward remains increasing as users keep the daily streak as long as possible. This is also similar compared to streak from Duolingo, which result in higher prize users will be awarded. The main purpose of this action is to keep users getting back to use the application and uplift the return-rate which is critical not only for data analyse but also for business investments. More users mean more money which is a win-win situation for both business customers as well as Aliexpress itself.



20.08

Daily Tasks

Dat Truong 1

Use image search

Activity valid: until Dec, 31 2020 11:59 PM (PT) +2

Exchange Coins for a Store Coupon

Activity valid: until Dec, 31 2020 11:59 PM (PT) +3

Follow a store or influencer on Feed

Activity valid: until Dec, 31 2020 11:59 PM (PT) +1

Share a new category now

Activity valid: until Dec, 31 2020 11:59 PM (PT) +1

Like a post on Feed

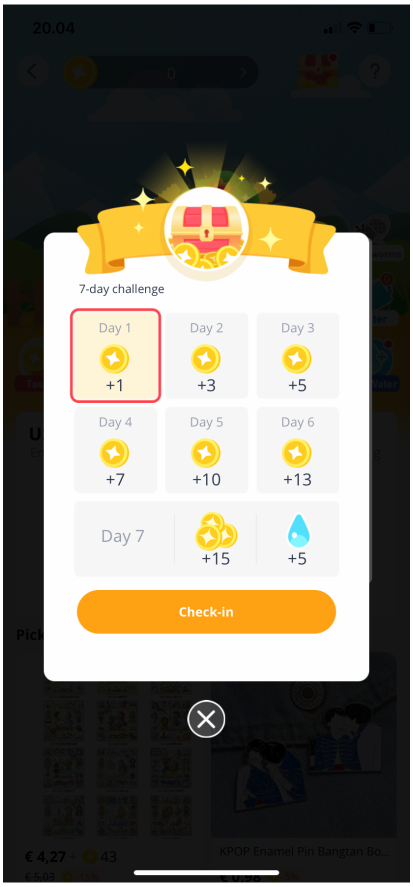
Activity valid: until Dec, 31 2020 11:59 PM (PT) +1

Daily Task Rules:

1. You can earn these coins everyday during the game period.
2. Coins from these tasks will be sent directly to your account.
3. To complete this task please update to the latest version of the AliExpress app.

View More

Figure 13. Daily tasks



20.04

7-day challenge

Day 1 +1	Day 2 +3	Day 3 +5
Day 4 +7	Day 5 +10	Day 6 +13
Day 7	+15	+5

Check-in

Figure 14. Daily check-in

3.2.3. Games

Aliexpress offers many different kinds of games built inside the application which reward people with coins as they participate. When end-users open the gamification task, the first game will be appeared in front of the screen (see figure 15). This game is known as raising a farm, which is popular among mobile game at the moment. Here users can raise different types of plants and later on these plants will produce crops, fruits which are harvested, and exchange into coins. Players will have many actions that help boost the development of plants such as watering or catching worms. Each action requires resources like water or the number of usage times, and to get these resources, end-users will follow divergent actions similarly to daily tasks. Plants will have time to rise until can harvest and players need to keep track of time. Another game that is newly introduced to the app is named “Coupon Pals” (see Figure 16). The game has a referral system in which users invite friends and earn better prizes together as your friends also win the game. These games are for people who enjoy consistency and long-term goals. It takes time to get the results, but the rewards are rather huge and worth This is a good way of motivating users by implementing a real game inside

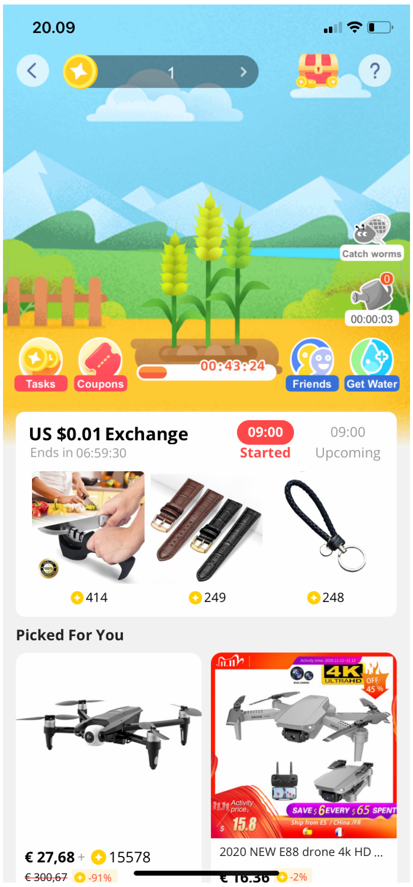
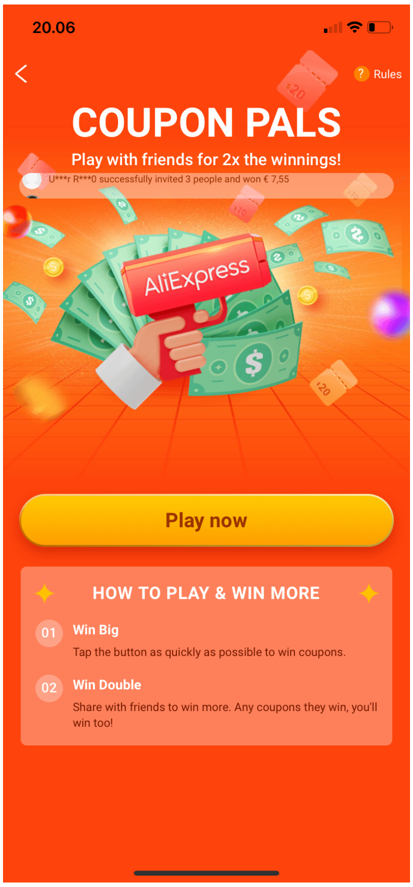


Figure 15. Farm game



Play with friends for 2x the winnings!

U***r R***0 successfully invited 3 people and won € 7,55

HOW TO PLAY & WIN MORE

01 Win Big

Tap the button as quickly as possible to win coupons.

02 Win Double

Share with friends to win more. Any coupons they win, you'll win too!

Figure 16. Coupon Pals

the application. Besides, to maintain a reasonable virtual economy, this system needs to provide many methods of controlling how currency goes out, like adding games as an example. And actions also should be meaningful, realistic, and trendy so that applications can not easily lose users.

In conclusion, using gamification proves significant changes in how users interact with e-commerce applications. It shows that in recent times, more and more big cooperation has put an eye on these gamified elements as a way of communicating, influencing, and engaging between enterprises and customers.

4. Gamification implementation

Snappmeal is a foodie application that establishes last-minute deals, promotes food events from the city, and introduces new dishes for users. The mission of Snappmeal is to create a fun and enjoyable environment when people eat out with the best deals they can find within the app. The way Snappmeal works is quite simple: users will browse the promotions around their positions, snap the deal, reserve for a table, or pick up and redeem them at the places. Additionally, for business customers, the application is created to help restaurants increase sales and spend less money on advertising costs. This system mainly aims for promotions and the digitalization of restaurants and cafes. Moreover, Snappmeal will push newly created deals and vouchers to all possible potential customers and food lovers around the area when restaurants have created the promotions they desire.

To improve the engagement of users to the application as well as increase the returning rate from older accounts, many methods have been put into consideration to face these challenges. After having a discussion and measurement, the team decided to use gamification due to its significant advantages and reasonable time to apply. Snappmeal application fulfills all the criteria required for a gamified application to work smoothly and efficiently. This application owns a user-friendly interface that puts the mascot as the main attraction to distinguish the application from other competitors. Also, Snappmeal has the potential to build a social community among users where gamification is essential to grow it bigger. Other actions inside the application like redeem, snap, or share a voucher can all work as game mechanic elements from the MDA model introduced by Hunicke et al. [5]. Virtual currency such as points or coins would be a tremendous way for keeping users interact with the application and they can use those to exchange for vouchers or deals. This would be essential for both end-users and business customers. Last but not least, the platform is capable of adding games into the application based on its way of working. In conclusion, by taking into consideration all the aspects above, Snappmeal is suitable for implementing gamification.

4.1. Planning

4.1.1. Challenges

As being discussed among the company, Snappmeal is facing many difficult challenges which are needed to be taken care of. Firstly, this application needs to find a way of increasing the number of people coming to use the platform. Because this is a start-up company, the data which shows the rate of users is quite important for raising money and attracting investors. Moreover, the application is yet in the early stage of development with many features are still under development. To attract users, the application should not only depend on the marketing side promotions and campaigns which usually take a lot of resources such as money and time. Snappmeal itself requires an enjoyable way of using and an attractive user interface. Here people should find it amused, fun as well as no difficulty while performing feature actions within the app. Hence, the platform is required to increase the number of snapping and redeeming promotions from individuals.

Secondly, Snappmeal discovers that the returning rate of people who have downloaded is significantly low. This means that the users only use the application in a short time and never come back. With the data gathered from the analytic team, one of the main reasons is that people find it boring after several tries. The user testing data also provides the same problems with Snappmeal at the moment. It poses a threat to the application as the number of users is decreasing days by days and could result in empty users without any specific solutions. No users mean there will be no cash running into the restaurants who are the application main customers.

Lastly, to create a community inside the application, Snappmeal needs to be innovative with social actions. Having a community is beneficial especially to adjust the direction of the system as well as understand the crow motivation. It can also be a great channel for marketing and promoting the company’s product through word of mouth. The development team should utilise the available resources which are app branding and trending social media channels. Influencers are also part of the elements which should be carefully considered.

4.1.2. Solutions

Since challenges have been discussed above, gamification would be suitable as a method to solve these problems (see Figure 17):

First of all, the application will implement a pointing system and create a virtual economy within the platform. This pointing system will use “points” as the main currency and should be followed by the MDA system which is introduced in the Element Chapter. The points currency will be clarified as RP or redeemable points and can be exchanged for vouchers, meals, event tickets, or turns. Users can acquire more points by doing certain actions. For example: redeem vouchers, snap vouchers, events, or share vouchers. These actions are called daily tasks which are available daily and reset every twenty-four hours. The benefit of having this system is to value participants’ actions and create motivation which helps restaurants acquire more customers. It also improves the using rate of users with application features resulting in a higher value. Another way of getting more points from the platform is that individuals will check-in every day to get a certain amount of rewards. These rewards will increase as users keep the streak for 7 days at its best. By adding the daily tasks, Snappmeal can have better-returning users for checking in every day. With enough points, users will be able to change them into real vouchers and promotions. That is the main motivation for users to achieve the points: to get some reward from completing some particular tasks. This creates a loop inside Snappmeal and keeps people come back and put effort into using the app functions.

To create a base community, gamification has some elements which Snappmeal can use. When the application introduces the daily tasks, there will be tasks related to social actions such as share vouchers or a blog post to receive points. With the motivation of getting more points, users will start to share these vouchers or blog posts on their social media channels. And Snappmeal will have the users marketing for the application by themselves without paying much effort. Furthermore, the system also provides quiz-type games that are available every week and months. The quiz game will have different themes but mostly related to food and drink fields. And users who take part in these games will be chosen as champions based on their quiz record. The leaderboard will be announced whenever the quiz time is the end and the winner will receive vouchers and promotions as a prize for participating. As discussed above, a leaderboard is an important attribute in creating competitiveness and users' engagements that boost the using rate from the application. Furthermore, by announcing the

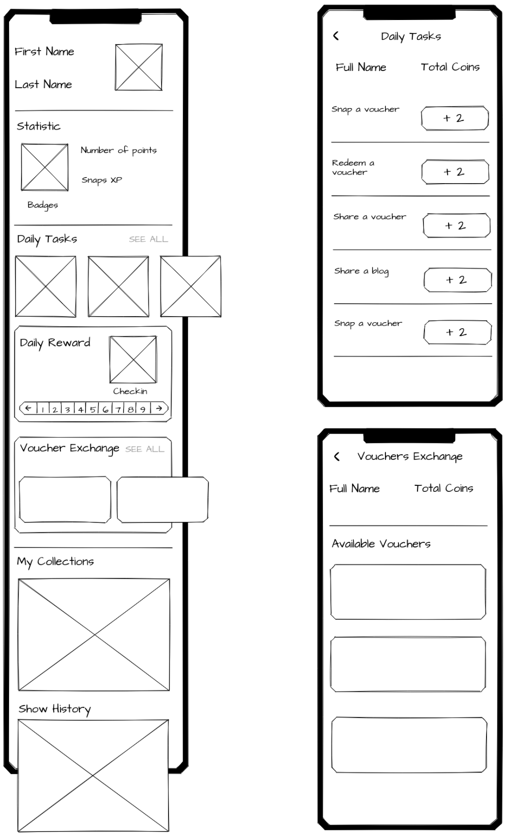


Figure 17. Mockup solution using gamification

winner, the system indirectly attracts non-users and self promotes to the one who has not used the app before. And people will come back to use the application weekly to participate in these limited quiz games.

4.2. Technical overview

4.2.1. Setup tools

React Native is a framework made by Facebook which is capable of writing cross-platform application for both iOS and Android. The framework is built based on React, a popular Javascript library used for creating a browser. Because it originates from React, the programming language used in React Native is JavaScript and will render to native code after compiling. The reason why the Snappmeal team chose this framework due to its cross-platform application development which is suitable for a start-up company that wants to push out products as soon as possible and can easily maintain two platforms at once. Another great benefit that comes from this framework is the large community of developers which contains useful libraries, a variety of third-party add-ons, and enthusiastic supports. Additionally, React Native is also backed up by Facebook and the framework is updated and developed daily.

Typescript, developed by Microsoft, is our main language over vanilla Javascript for this application. Normally, when developers use Javascript, they have to face many bugs, especially those related to ‘undefined’ errors which result in wasting time and efforts to fix. The reason which causes these problems is from the freedom of dynamic typing when they write a piece of code. Additionally, the system which uses Javascript tends to be complex and hard to scale once the system is getting bigger. Therefore, typescript comes as our team's first choice to apply to Snappmeal. There are many advantages which surpass original Javascript which can be listed like this:

- Type-check system which is useful to safely compile without facing unknown bugs

- It is an easy-to-learn language when you shift from Javascript

- Better performance compared to vanilla and works with nowadays IDEs

- Its scalability and refactor ways

Other third party library is also added to the application can be viewed below:

- ESLint: a tool implemented in text editors which analyses codes to quickly identify errors.

- Detox: an automatically end-to-end testing tools for mobile application

- Prettier: an code formatter that helps make code structure consistently and reduce the conflict between developers’ style of codes

- Jest: is a testing tool created for fast keeping track of objects by using snapshot methods.

4.2.2. System logics

Elika systems can be divided into two main parts: Business logic focus and Analytical tracking focus (see Figure 18). The application interface consists of three frontend clients and all of them are written using React/TypeScript. Additionally, all the business logic code, services as well as utilities are shared across frontend platform:

- The mobile application Elika App (Snappmeal) is written in React Native
- Widgets are written in React and are implemented by injecting javascript bundle to websites
- The dashboard are also written in React and is a single webpage application

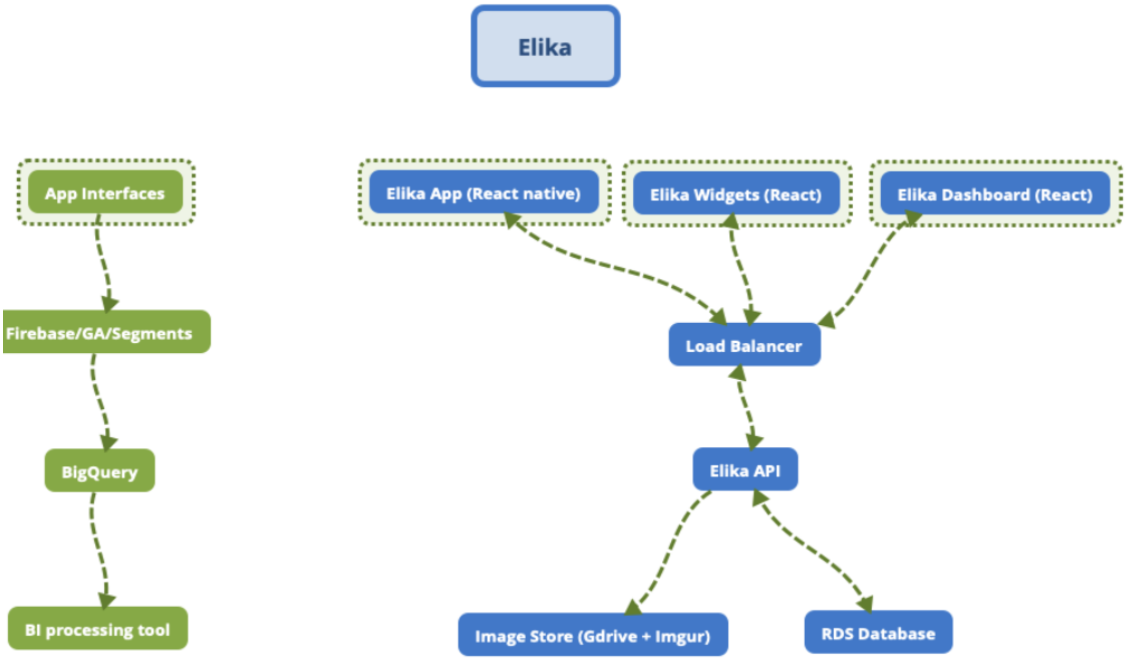


Figure 18. System overview

All three interfaces are actively sending data that aim to be tracked to Firebase, then, later on, being processed and forwarded to Google BigQuery for business insights. Those interfaces are interacting with Elika API via Load Balancer and using Rest API. Elika API is written in Django-rest-framework and API session is authenticated using Firebase SDK. About the backend, the following technical solutions are chosen:

- Rest API style

- Swagger docs endpoint

- Postgresql for database system

- Celery/redis for task queues and background jobs processing

- Google Drive for storing images

4.2.3. State management

As for how React Native works, the state is the core of the application which requires a proper management tool to handle. In this application, to manage state within classes, our team uses Mobx as a global state library. “Mobx treats application like a spreadsheet” [15] :

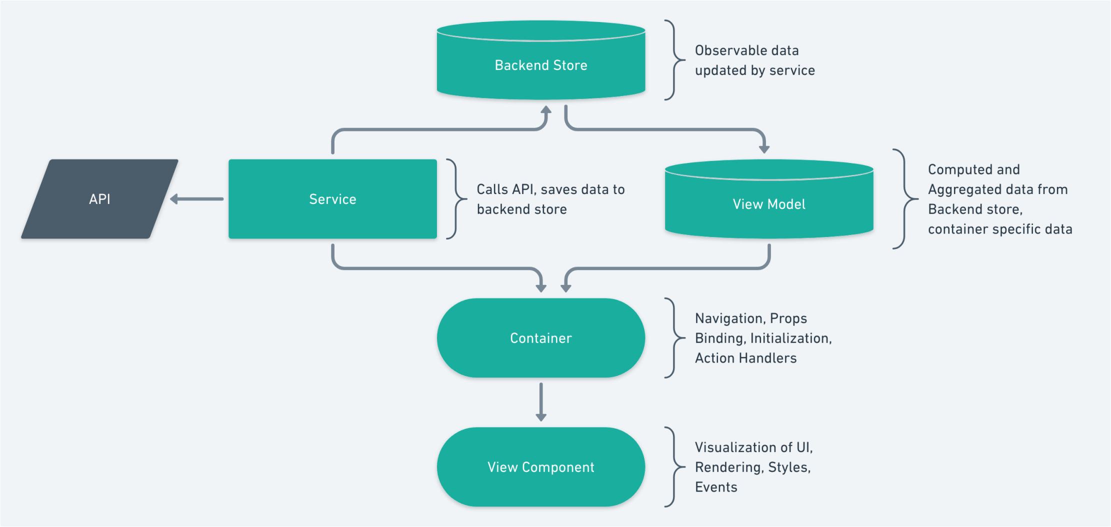

Backend Store
Observable data updated by service
API
Service
Calls API, saves data to backend store
View Model
Computed and Aggregated data from Backend store, container specific data
Container
Navigation, Props Binding, Initialization, Action Handlers
View Component
Visualization of UI, Rendering, Styles, Events

Figure 19. Mobx flow

In the first place, we have the application state, which are objects, arrays, and references. Those states define the view model of an application or we called data cells containing specific information. The view model also brings data from stores to the container. Additionally, services will call the API, then save data to store. After receiving information from services, the backend store will keep data. Here contains @observable variables, @action functions, and @computed properties which can be used for containers and view models. Furthermore, the container will call services and put data from the view model to the view component. The view component will use the input props and visualise as well as render for users to identify (see Figure 19). The implementation of Mobx into the application will be discussed in the key features chapter for further detail.

Mobx has some following advantages compared to other state management library:

- Store is not restricted, unlike Redux

- Observable will be used as default when apply

- Built based on Typescript and does not depend on React library

4.3. Key features

4.3.1. Pointing system

The very first solution which should implement inside Snappmeal is creating a pointing system. The concept is that every user will own an inventory that has points as their main currency. The most suitable screen which can demonstrate the display of the pointing system is the profile screen. Before adding gamification elements, the profile screen is a place to keep track of saved vouchers and function as a wallet for users to view what they have snapped. The design poses a boring environment and empty space makes it confused for end-users when they first came to the screen as can be seen from Figure 19. This profile screen also serves the wrong purpose which should be used for highlighting the personal side. The only function related to users is editing email and username. In contrast, when gamification kicks in, this profile view should be changed based on the requirements to view the user's progress through points and tasks. As can be seen from the application case studies, the profile screen plays an important role in defining how gamification can be viewed by people. This is also the place where users can customise their walls according to personal taste. Therefore, the development team comes up with this design following what a gamified profile should have (see Figure 20).

In comparison between Figure 19 and Figure 20, there is a significant difference between the two designs. As can be seen, the new gamified profile screen is more attractive to users as well as it serves the right purpose of a profile screen should be. At the

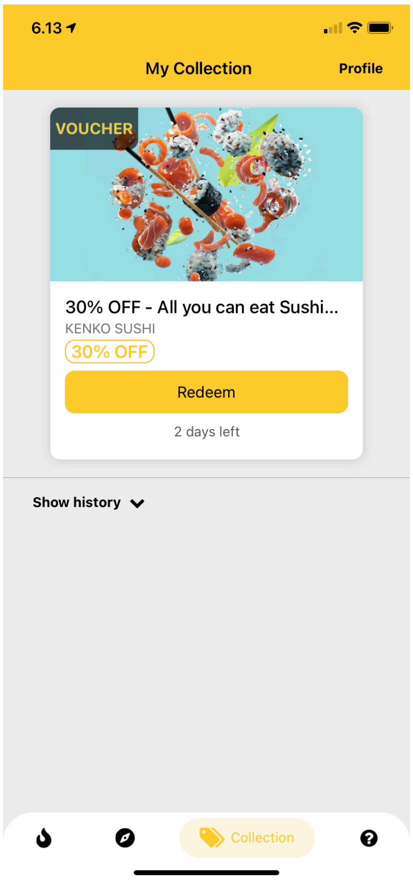


Figure 19. Old profile screen

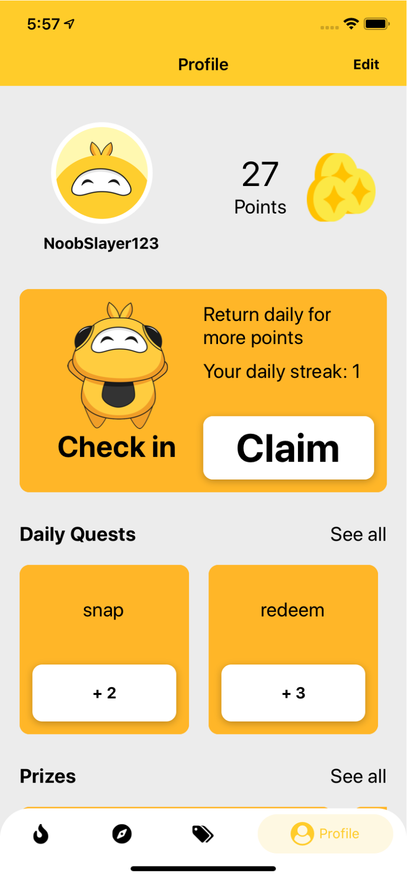


Figure 20. Gamified profile screen

header of the screen, there are two elements that come from the data back-end has sent. The API endpoint is used for getting user information is https://elika.reversely.fi/api/me.Inside the application structure, in order to get data, the client-side separates each function into services, stores, and model. Firstly, the developer needs to create a model that represents the response body and connects the database with the components.

```
export interface IMe {
  first_name: string;
  last_name: string;
  email: string;
  managing_vouchers: number;
  user_type: string;
  subscribed_topics: [Topic];
  points: string
}
```

Here we define which properties should be used based on JSON response. Thereafter, we create a base service class for setting up the header and response of an API call which uses endpoint.

```
protected async _requestAsync(
    url: string,
    requestType: string = 'GET',
    requestOptions: {
      params?: object;
      payload?: object;
    } = {}
  ) {
    const { params, payload } = requestOptions;
    const query = Utils.parseParams(params || {});

    const token = await AppStore.fetchToken();
    const pushToken = await AppStore.fetchPushToken();
 }
```

Firstly, in the base service class, we define an async function that has three params to fulfill an API call to the backend. Then we fetch token and push token for authentication as well as define request options and queries. After that, we start to create a header and response. Here the headers need to pass an authorisation token for API to work normally. We also set a response and return it to the JSON type. However, if the response is not ok, we will throw status text and log to handle the error.

```
const headers = new Headers(
      Object.assign(
        {},
        {
          'content-type': 'application/json',
        },
        token
          ? {
              Authorization: `JWT ${token} ${pushToken}`,
            }
          : {}
      )
    );

   const response = await fetch(`${url}?${query}`, {
      body: JSON.stringify(payload),
      credentials: 'same-origin',
      headers,
      method: requestType,
    });

    if (!response.ok) {
      const errorResponse = await response.json();
      const message: string = 'Request failed';
      if (errorResponse && errorResponse.error) {
        throw Error(errorResponse.error);
      } else {
        throw Error(message || response.statusText);
      }
    }
    return response.json();
```

Now we have finished creating our base services and this function can be reused for other classes from now on. As a result, the `_requestAsync()` function will be used as part of service to get user information from backend. Combining with the view model above, AppService can be formed like this:

```
export class AppService extends BaseService {
  public async getMeInfo(): Promise<IMe> {
    return this._requestAsync(`${this.endpoint}me/`, 'GET');
  }
}
```

After having a service with a call to API, the store should be used to keep the response data as property for later use. Inside `appStore.ts`, a new action will be added.

```
@action public async getUserInformation() {
    try {
      const me = await this.appService.getMeInfo();
      if (me) {
       return me;
      }
      return undefined;
    } catch (error) {
      return undefined;
    }
}
```

The profile class needs to @inject appStore and set itself as @observer. In addition to config Mobx, a variable named `me` should be also set as @observable in order to observe every time the property changes. When the screen first load, we call `appStore.getUserInformation()` to fetch the user data. By having this data, we can get the username and points information from the backend. To display it, the variables should be passed inside components.

```
<View style={styleSheet.headerStyle}>
     <Image
           style={styleSheet.defaultImage}
           source={require('../../../assets/mascot/avatar.jpeg')}
           resizeMode={"cover"}
     />
     <Text style={styleSheet.usernameText}>
           {this.me ? this.me.first_name : null}
     </Text>
</View>
<View style={styleSheet.contentView}>
     <View style={styleSheet.pointContentView}>
           <Text style={{fontSize: 35}}>
            {this.me ? this.me.points : null}
            </Text>
     <Text style={{fontSize: 20}}> Points </Text>
</View>
     <Image style={styleSheet.pointImage}
```

```
            source={require('../../../assets/gamification/game_-
point_extra_ic.png')}
            resizeMode={"cover"}
      />
</View>
```

Secondly, the check-in part has also been put into the new profile screen. When users tap the claim button, a new modal will pop up to indicate which days you have already checked in (see Figure 21). In order to implement a daily check-in feature, a new view model should be created as well as a service and store. Two models that are required for this feature are dailyStatus and game model. The dailyStatus model is mainly for getting streak_status and status of actions, while the game model is for config of actions available from gamification API. Additionally, new services need to be created:

```
export class GameService extends BaseService {
  public async fetchGameConfig(): Promise<IGame> {
    return this._requestAsync(`${this.endpoint}game/config/`, 'GET');
  }

  public async fetchGameDailyStatus(): Promise<IGame> {
    return this._requestAsync(`${this.endpoint}game/status/daily/`,
'GET');
  }
}
// add post action to appService.ts
public async checkIn(): Promise<any> {
    return this._requestAsync(
      `${this.endpoint}game/checkin/`,
      'POST',
    );
}
```

These two services will fetch game config and status from the backend with the purpose of tracking the daily streak of users. One post service should also be included to activate the check-in button. Moreover, the developer should also add a game store along with services. The store can be seen in figure 23 below. Having all the requirements for fetching daily check-in, it should be implemented inside the profile screen along with configuring the user interface for better results. There is a challenge in making this view based on the design. The first one is the grid display which day seven has a different design compared to the other day. Therefore, we need to have a condition that separate day and display different view. The data we receive from `gameConfig.checkin.points` is an array of [1, 4, 7, 9, 11, 13]. Following the array, we map each index into `(item, index)` and set the first condition: `index !== 6.` Here, if the index does not equal six, the box will have a different design. Then when it reaches index number six, the view will be set with a bigger style. Inside the style settings of these box components, a condition is also put in order for setting the faded style. This

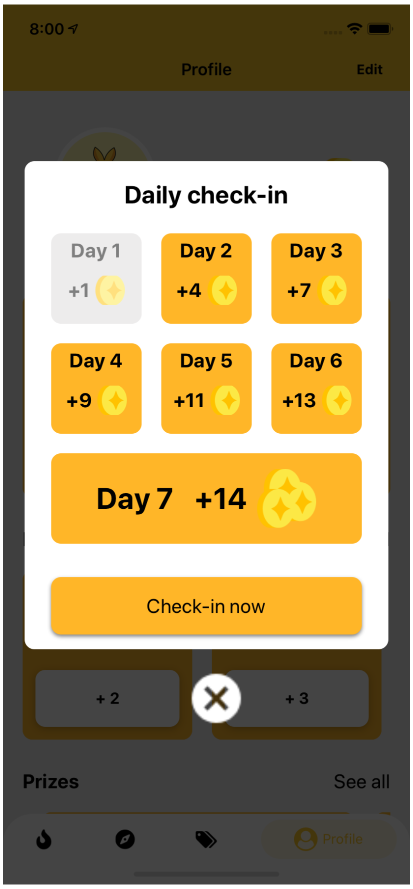


Figure 21. Daily Check-in 1

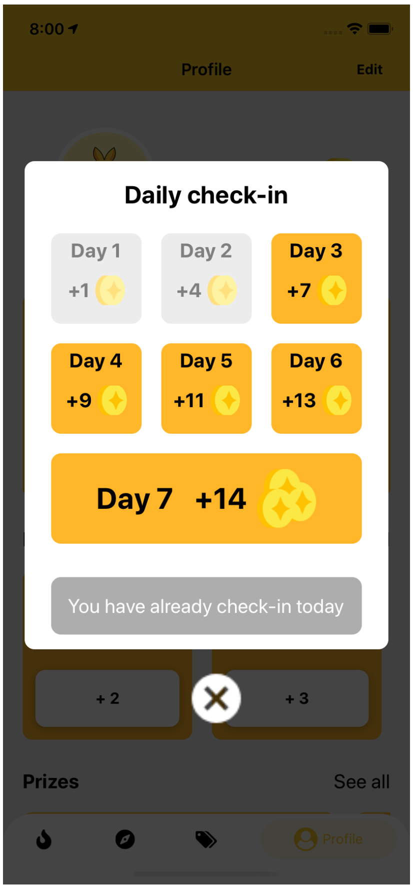
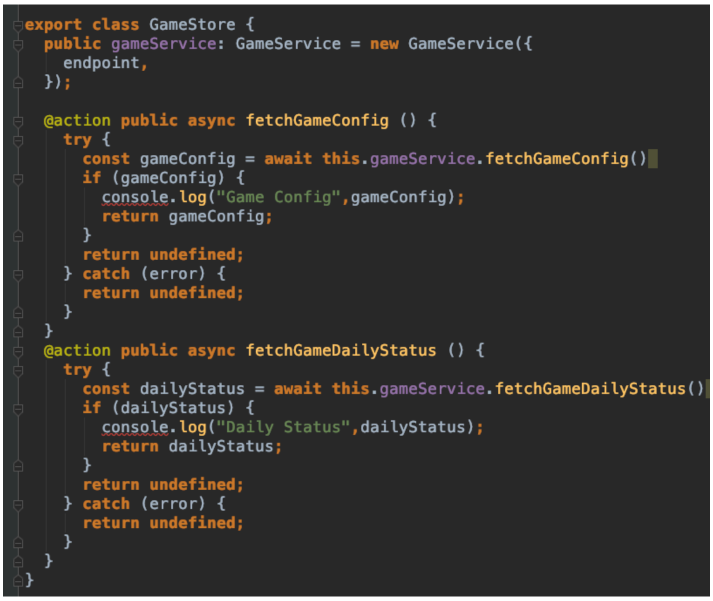


Figure 22. Daily Check-in 2



```
export class GameStore {
  public gameService: GameService = new GameService({
    endpoint,
  });

  @action public async fetchGameConfig () {
    try {
      const gameConfig = await this.gameService.fetchGameConfig()
      if (gameConfig) {
        console.log("Game Config",gameConfig);
        return gameConfig;
      }
      return undefined;
    } catch (error) {
      return undefined;
    }
  }
  @action public async fetchGameDailyStatus () {
    try {
      const dailyStatus = await this.gameService.fetchGameDailyStatus()
      if (dailyStatus) {
        console.log("Daily Status",dailyStatus);
        return dailyStatus;
      }
      return undefined;
    } catch (error) {
      return undefined;
    }
  }
}
```

Figure 23: GameStore

indicates which day users are on and they can keep track of their daily progress. The condition for this display is (index+1) <= dailyStatus.checkin.streak_status. Note that streak_status is a number type value that holds the number of days which the user has checked-in. The question is why we have to plus one for index? Since the array starts with zero indexes, we have to plus one to display the correct day which we want to display.

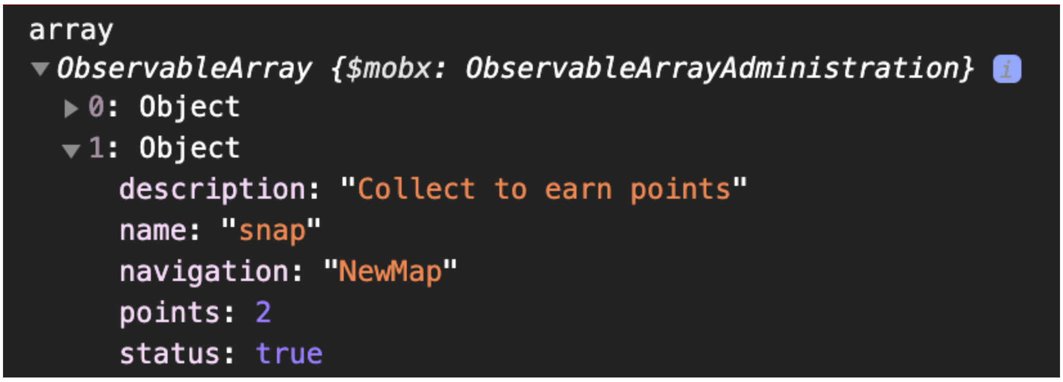
```
this.gameConfig?.checkin.points.map((item, index) => {
        return index !== 6
         ? <View style={[
            stylesGrid.box,
            index+1 <= this.dailyStatus?.checkin.streak_status
              ? stylesGrid.boxNotStreak
              : stylesGrid.boxStreak ]}>
            <Text style={stylesGrid.boxText}> Day {index + 1} </Text>
                 <View style={stylesGrid.boxContentView}>
                    <Text style={stylesGrid.boxText}> +{item} </Text>
                    <Image style={stlesGrid.image}
                           source={require(‘../../../assets/gamifca
tion/game_point_ic.png')}
                           resizeMode={"center"} />
                 </View>
           </View>
                    : ...
})
```

For the check-in button to work, we add a callback function to it with the action of this.props.appStore.checkIn(). A condition is also put into disabling the button when users have finished checking in and it is based on boolean dailyStatus.checkin.status (see Figure 22). When the status is true, the button will have a different design that indicates it is an active button. However, when users complete the actions, the status will be set to false and the button will be disabled until the next day which will be reset. Lastly, to open and close the check-in modal, a boolean state is toggled which triggered the condition visible of modal: <Modal visible={this.isCheckInButtonClick}>.

Next is the implementation of daily tasks below the check-in section. The daily quests session is displayed as a Flat-list array which maps each item with its own value. As part of demo, the array shows only two tasks redeem and snap. This array is a result of joining two objects into one key-value array. In componentDidMount(), we fetch three objects in total: me, gameConfig and DailyStatus. In order to receive an array of objects which has enough information to display to users, we use the map method like this function below:

```
public setUpGameObject = () => {
    this.tasks = Object.keys(this.gameConfig).map((k) => ({
      name: k,
      ...this.gameConfig[k],
      ...this.dailyStatus[k],
    }))
}
```

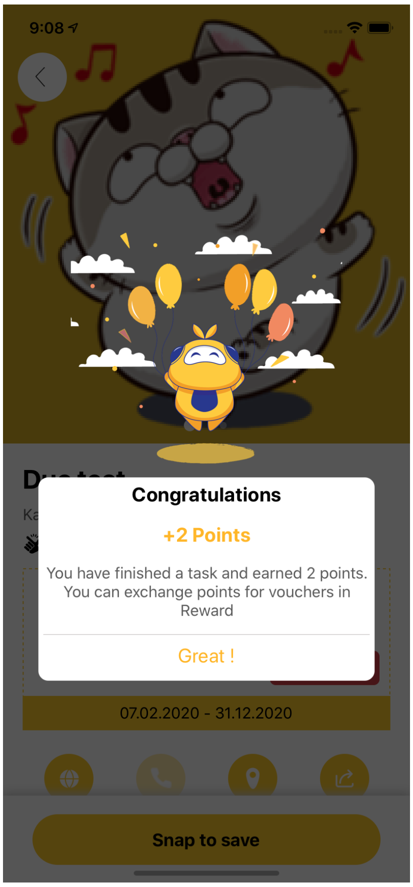
Here function uses the Object.keys which is mainly for returning an array of given object's property. Then we map the key into a new object. The result of this joining can be seen in figure 24.



```
array
▼ObservableArray {$mobx: ObservableArrayAdministration} i
  ▶0: Object
  ▼1: Object
     description: "Collect to earn points"
     name: "snap"
     navigation: "NewMap"
     points: 2
     status: true
```

Figure 24: Array of merged object

By having an array of need objects, Flatlist data should be passed from the newly made array. One thing that should be reminded is that the array needs to ignore the first index element because it is a check-in property and it does not belong to daily quests. Therefore, the passed array will have this form: `data={mergedArray.slice(1)}`. The slice function will remove the first index elements from the array. Moreover, when users tap on one of the daily tasks, the application will move users to the screen they need to complete the task. For example, the user taps on the redeem quest. After that, the screen will switch to map screen where many vouchers are displaying. Then the user will try to snap a voucher and the result is that system automatically detects the snap action and add points to the user's inventory. The system behind this is that when the user successfully calls snap API, in the backend, there will be a callback which plus the points property directly from the user's database. There will be an alert modal to show that users have earned points by doing the quest (see Figure 25). Moreover, that daily quest will be disabled in the Flatlist based on similar condi-



You have finished a task and earned 2 points. You can exchange points for vouchers in Reward

Figure 25. Finish a daily quest

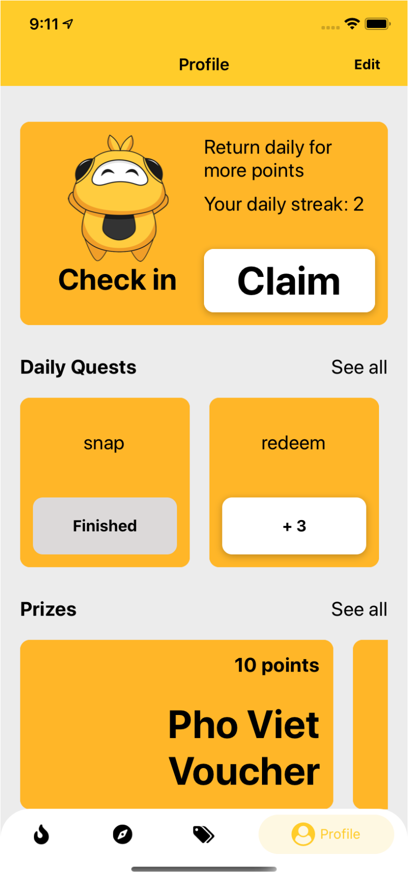
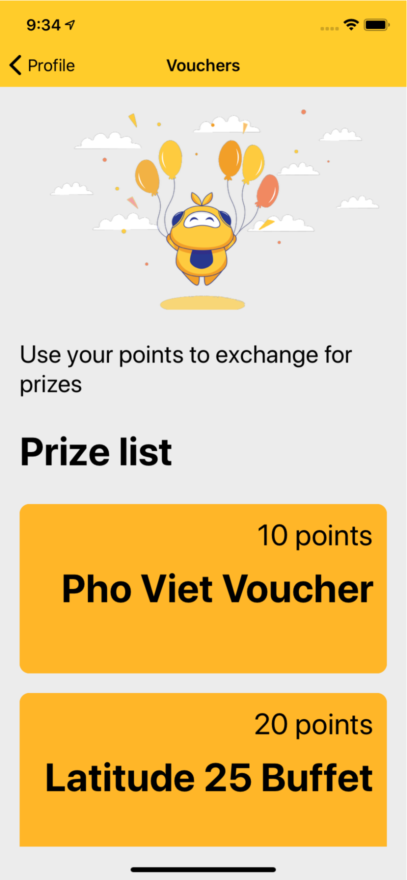


Figure 26. Quest completes

tions like the check-in button explained above (see Figure 26). The condition here is coming from boolean item.status. Last but not least, users can also view all the available quests by tapping on the “See all” button.

Finally, when users acquire enough points, they can move to the prizes session to exchange their currency with real vouchers. The voucher system has a similar way of implementing it into an application like the previous feature. It has also the `voucherService`, `voucherStore` and `voucherModel` which serve the communication between the client-side and back-end. The backend will return an array of vouchers and add a new property named `amount`. This means that the voucher is limited and users have to compete with each other to get it. When the number in `amount` property reaches 0, the voucher will disappear from the array list and users cannot interact with it anymore. The way to display an array of the voucher is the same as displaying a list of daily quests as well as the function of the “See all” button (see Figure 27). Besides, after tapping the desired voucher, the button will trigger an API call to the backend that checks the user profile whether they have enough points equal to the price point. If several points are enough for exchange, the backend will attach the voucher to the user's account and the participant can view the new voucher on the MyVoucher screen. If users do not have enough points to exchange, a popup will appear to inform about the failure in exchanging for prizes (see Figure 28).



9:34

Profile Vouchers

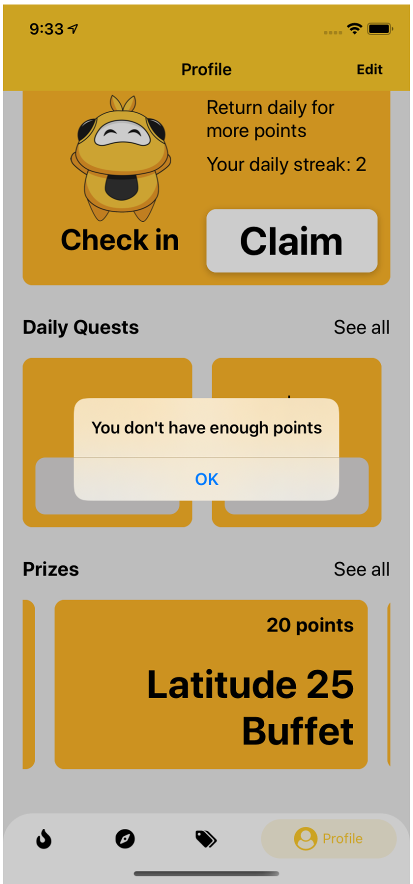
Use your points to exchange for prizes

Prize list

10 points
Pho Viet Voucher

20 points
Latitude 25 Buffet

Figure 27. Prize list



9:33

Profile Edit

Return daily for more points

Your daily streak: 2

Check in

Claim

Daily Quests See all

You don't have enough points

OK

Prizes See all

20 points
Latitude 25 Buffet

Profile

Figure 28. Fail to exchange voucher

To conclude this feature, by applying gamification in the profile screen, we have introduced a brand new user interface that is enjoyable to use and also more interactive with users. This new profile screen also serves a better reasonable purpose compared to the previous one that hardly keeps motivating users.

4.3.2. Quiz game

As one of the challenges is to build a community between users who participate in Snappmeal, the team has decided to add a quiz game inside the application. Based on the theory of motivation and apply the MDA system, the application set up two main actions that need to be created: intrinsic and extrinsic. For intrinsic, setting up a quiz game is a great way to challenge users when they try out the application. The quiz is also been sent through push notification to remind users to participate. Nevertheless, for extrinsic, the quiz set up a prize and reward for the winner of this contest. Therefore, the quiz game is probably reasonable to be developed as a gamification element. One tricky question is that where the quiz should be put in. After researching the data analysed and studying the user's flow, we have found out that two screens which have the highest attention among users are the map screen and discover screen. For the map screen, it is not right to have a quiz inside a map-based view. Therefore, we decided to put a quiz game on the discover screen. The quiz will be displayed alongside blog posts, a time-based deal, and promoted vouchers. One of the fastest ways to have a quiz game is to use a website question form. It is suitable because the person who in charge of this game can edit and post the quiz without having to touch into source code. To display the website question for, `Webview` is the most logical way to display a web-based type component.

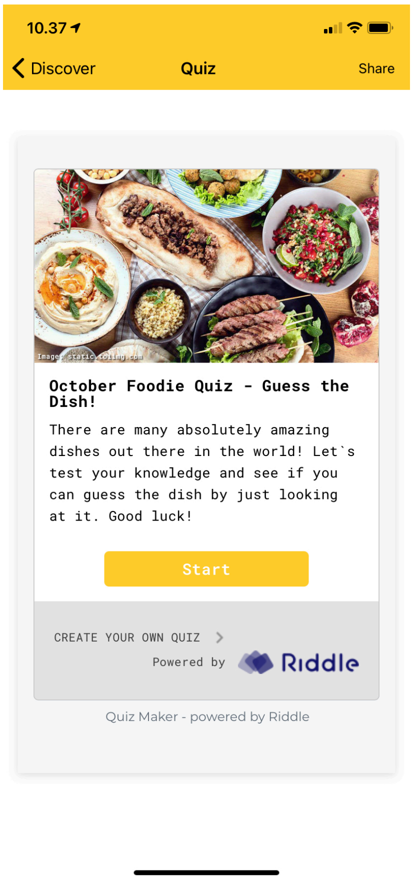
The flow of creating a quiz is quite simple. Firstly, the quiz maker will create a quiz on a website. Here we use Riddle as a tool to create a form of quiz. After finishing the questions, that person will share the Riddle link to the backend database. Then when there is an API call from the client-side, the backend will return that weblink in a string format. For more details, this code snippet below should describe in a more detail way:

```
// Fetch all the available campaign from database
campaignStore.fetchAll();

// Campaign view model for campaign type
           export enum CampaignType {
                      VoucherList = 'voucher_list',
                      Story = 'story',
                      WebLink = ‘weblink',}


// Map campaign type based on key
// If key is equal WebLink, when users tap, application will direct to
// Quiz screen based on screen property
switch (key) {
        case CampaignType.Story:
          screen = 'VoucherBlog';
          params = {
            campaignId: campaign.id,
          };
          break;
        case CampaignType.WebLink:
          screen = 'Quiz';
          params = {
            quizId: campaign.id,
          };
          break;
```

After moving to the quiz screen, the webview component will receive the props `campaign.description` from the campaign object and the source will be in the URI style (see Figure 29).

```
<WebView
            originWhitelist={['*']}
            ref={(r) => (this.webRef = r)}
            javaScriptEnabled={true}
            scalesPageToFit={true}
            domStorageEnabled={true}
            allowUniversalAccessFromFileURLs={true}
            source={{
              uri: campaign.description.match(/link:\ (.*)/)[1],
            }}
            allowsBackForwardNavigationGestures={true}
/>
```

One notice coming from the backend is that the property `campaign.description` is full of contents and webview needs to find the correct link among lines of words. In other words, we have to find the link starting with "/link". Therefore, we should add a `match` function before passing the `description` to URI and the first index elements will be the link we need for the quiz. The webview performance is suitable for rendering light websites such as form, quiz. After users have finished the quiz, they can add names to save the score at the end of the quiz and the system will record it as well as quickly list them to track. At the end of each quiz game, a leaderboard will be announced on the discover screen as an image and the staff will contact the winner based on the information provided from the quiz (see Figure 30). As mentioned above in the Mechanic chapter, the leaderboard will boost the competitive environment among participants. Moreover, the more valuable prize is, the more users will find it motivated and willing to take part in the events.



10.37

Discover | Quiz | Share

October Foodie Quiz - Guess the Dish!

There are many absolutely amazing dishes out there in the world! Let`s test your knowledge and see if you can guess the dish by just looking at it. Good luck!

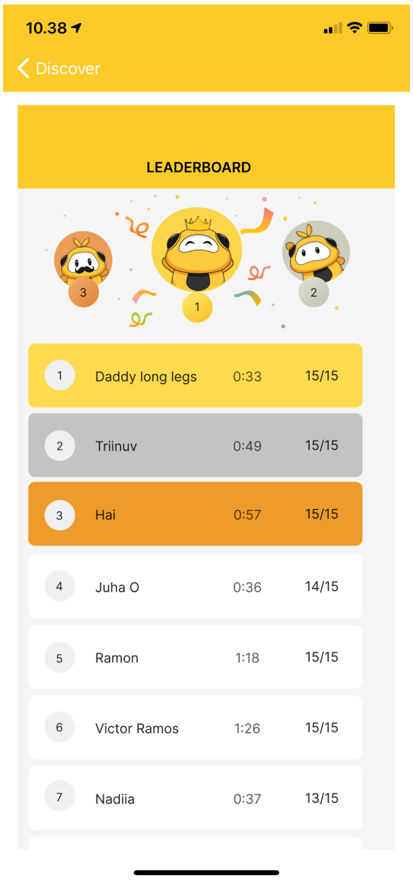
Start

CREATE YOUR OWN QUIZ >

Powered by Riddle

Quiz Maker - powered by Riddle

Figure 29. Quiz game



10.38

Discover

LEADERBOARD

1	Daddy long legs	0:33	15/15
2	Triinuv	0:49	15/15
3	Hai	0:57	15/15
4	Juha O	0:36	14/15
5	Ramon	1:18	15/15
6	Victor Ramos	1:26	15/15
7	Nadiia	0:37	13/15

Figure 30. Leaderboard

4.4. Future improvements

Following the theory listed above, there are still some missing gamified elements that could be implemented into Snappmeal. First of all, the system could utilise the Achievement Goal Theory as a way of keeping commitments from the users. In this case, there are many opportunities that this theory can fit in. For example, users will go through a road map that requires finishing some quests to achieve higher levels. After completing an achievement, participants will be rewarded with prize and badges which can be displayed on the profile. Moreover, restaurants can create their badges which are similar to membership cards (see Figure 31). This also opens a new sales point for Snappmeal as some badges are exclusive only from this application.

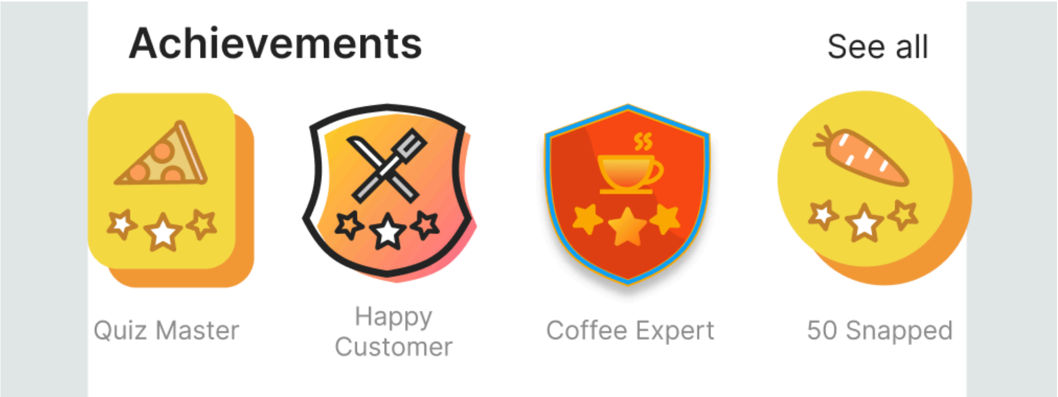


Figure 31. Achievement mockup

Another aspect that can be exploited is based on Dynamic elements from the MDA system. This aspect means that the application creates a chance for users to express themselves through customising their profiles. The actions they can perform should be:

- Changing avatar or profile image
- Ability to customise in displaying badges or achievements
- Using points from inventory to decorate profile
- Show tips, recommended vouchers or write a review

The main idea of this is to make a social media profile that users want to be proud of and willing to share with other users.

Lastly, Snappmeal can invest in developing more games for users to participate. Moreover, the referral system also needs to be included as it will make a huge impact on attracting new users to come.

4.5. Evaluation

The evaluation is based on the reviews from internal testing between team members of the company. There are two main goals for these two fields: B2C and B2B. The B2C goals are increasing user retention (more time spent on the app, and more time use per month) and making people refer others to install the application. In addition, for B2B, Snappmeal needs to increase customers and returning-rate. The user retention rate is data that gives a number to the percentage of users who still use an app a certain number of days after install. It is calculated by counting unique users that trigger at least one session in one day, then dividing this by total installs within a given cohort.

The framework our team has used for testing is Lean Prioritisation or the so-called Value-Effort framework. The framework divides the test into two parts: Importance and Difficulty. For the first part, we need to answer the question of how it is important. We evaluate based on value (potential revenue), benefit (to current customers and potential customers), and impact (on business goals and strategic goals). Then we move to “How difficult is it to build ?”. We assess the relative importance of the issues with four elements: Cost, effort, risk, and complexity. The team put the score from 1 to 10 (higher value to higher score) and also 1 to 10 (higher effort to lower score). After having a discussion and using the framework, the pointing system and quiz game are the highest score among other elements and have been chosen to put into practice.

Snappmeal has successfully implemented the gamified solutions to deal with the challenges the team provided. After internal testing, the team feels confident in what benefits gamification will bring to the application as well as the direction of development. The result of this project is a well-constructed virtual economy (pointing system) platform that solves many accumulated problems. The project also introduces a new user interface, the logic flows that help motivates users and increase the returning rate from old users. This proves that appropriately adding gamified elements, it can create a significant performance gain for application.

By contrast, there is still room for improvement that requires deeper research inside the fields. Besides, the application still needs to have a usability test to identify more problems and find a better solution to optimise it. Furthermore, the source code should also be taken into consideration for scalability, as the application is getting bigger in the future.

5. Conclusion

The main purpose of this thesis was to determine some of the major elements developers need to consider when applying gamification when developing mobile applications. In the first section, the author reviewed the literature sources as well as researches. Moreover, the study discussed the history and definition of gamification. The author likewise introduced the key elements to apply gamification to designing applications. As a consequence, based on the definition and history of use, the study suggests that gamification is necessary for developing an application.

The second part is about decomposing some applications that are popular for its gamified elements. The author lists the main features that signify the theory listed in the first chapter and points out the reasons behind the implementations.

In the third part, this thesis utilizes the gamified implementation as an example of applying the theory element into real-world application. The research is based on a food application named Snappmeal. After gathering test data and analyzing major factors in the study, the author suggests that applying gamification in developing a mobile application is reasonable. The outcomes of the test application are positive; applying gamification seems to result in increased engagement and interaction of users in the mobile application.

In conclusion, the future of gamification is bright and its applicability is no doubt essential for developing applications. Individuals and companies who recognize gamification and integrate it into their structures could hold a major advantage in the engagement battle

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