ETHICALITY OF MODERN SHOPPING APPLICATIONS: HOW GAMIFICATION IS USED TO MANIPULATE CUSTOMERS

Lappeenranta–Lahti University of Technology LUT

Bachelor’s Programme in Software Engineering, Bachelor's thesis

2024

Matias Tarvainen

Associate Professor Antti Knutas

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT School of Engineering Science

Software Engineering

Matias Tarvainen

Ethicality of modern shopping applications: How gamification is used to manipulate customers

Bachelor's thesis

2024

48 pages, 2 figures, 2 tables, 2 apppendixes

Examiner: Associate Professor Antti Knutas

Keywords: Gamification, goals and objectives, points and badges, feedback loops and iteration, intrinsic and extrinsic motivation

Gamification means deliberately making software, work environments or tasks into more game like. Gamification can be used for example boosting productivity and bringing interest into mundane and simple tasks. Gamification elements use extrinsic and intrinsic motivators to gain more use for the system. This brings up the worry of gamifications unethical implementations.

Why and how do modern software use gamification? How do gamification elements boost the appeal of the software? What is unethical gamification design and how do modern shopping applications use it to their advantage? This thesis aims to answer these questions by gathering data from Play-store applications with the help of predetermined taxonomy and using literary analysis to analyse found information.

This thesis' investigation into matters mentioned above found out that most of the applications were using gamification in order to boost their appeal with only one exception. Clear indications of unethical usage of these elements were also found to be present. These dark design patterns are used to manipulate users to buy more and could result in post-purchase regret and capital loss.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUTin insinööritieteiden tiedekunta

Tietotekniikka

Matias Tarvainen

Modernien ostos-sovellusten eettisyys: Kuinka pelillistämistä käytetään asiakkaiden manipuloimiseksi

Tietotekniikan kandidaatintyö

2024

48 sivua, 2 kuvaa, 2 taulukkoa ja 2 liitettä

Tarkastaja: Apulaisprofessori Antti Knutas

Avainsanat: Pelillistäminen, tavoitteet ja objektiivit, pisteet ja merkit, palautesilmukat ja iterointi, sisäinen ja ulkoinen motivaatio

Pelillistämisellä tarkoitetaan tarkoituksenmukaista ohjelmien, työympäristöjen tai tehtävien pelimäiseksi muuttamista. Pelillistämistä käytetään esimerkiksi lisäämään tuotteliaisuutta tai tuomaan mielenkiintoa yksinkertaisiin ja toistuviin tehtäviin. Pelillistäminen käyttää sisäistä, että ulkoista motivaatiota saadakseen lisää käyttöä sovellukselle.

Miksi ja miten nykyaikaiset ohjelmistot käyttävät pelillistämistä? Miten pelillistäminen lisää ohjelmistojen kiinnostavuutta? Mitä on pelillistämisen epäeettinen suunnittelu? Miten nykyaikaiset sovellukset käyttävät epäeettistä pelillistämistä hyödykseen? Tämä opinnäytetyö pyrkii vastaamaan näihin kysymyksiin keräämällä dataa Play-kaupasta sovellusten muodossa ja käyttäen kirjallista analyysiä perustelemaan näitä löytöjä. Pelillistettyjen elementtien keräämiseen käytetään ennaltamääritettyä taksonomiaa.

Tämän työn tutkimus kertoo, kuinka pelillistämistä käytetään sovellusten mielekkyyden lisäämiseksi. Selviä viittauksia pelillistämisen epäeettisestä suunnittelusta löytyi sovelluksista. Näitä niin sanottuja dark patterneja käytettiin ostajien manipuloimiseen. Tämä manipuloiminen voi johtaa ostopäätösten katumiseen ja rahallisiin tappioihin.

ACKNOWLEDGEMENTS

Thank you to Antti Knutas for the subject of this thesis and the great support and understanding of my situation. Thank you for all the great material and the help of guiding me on my work.

Thank you for my friends for proof reading and motivating me through this thesis.

Table of contents

Abstract

Acknowledgements

Contents

1 Introduction 7
2 Related Work 9
2.1 What is gamification? 9
2.2 Benefits of gamification 11
2.3 Unethical design of gamification 12
3 Research methods 16
3.1 Taxonomy design 16
3.2 Spreadsheet and rules 18
3.3 Method of picking applications 18
3.4 Limitations 19
4 Results 20
4.1 Clustering 23
5 Discussion 26
6 Conclusions 31
References 33
Appendixes 36

Tables

Table 1: Amount of gamification elements found in shopping applications

Table 2: Amount of gamification elements found in specific applications

Pictures

Picture 1: Number of gamification elements found in shopping applications

Picture 2: Number of gamification elements found in specific applications

Appendices

Appendix 1: Taxonomy of gamification elements

Appendix 2: Dataset and code (link)

1 Introduction

This thesis dives into the world of gamification with ethicality in mind. The term gamification, first born in the year 2002 (Marczewski, 2013), means the deliberate focus on making systems like applications, work environments and mundane tasks into more gamelike (Koivisto & Hamari, 2014). Gamification has been around for a very long time even before the year 2002 when it was first recognized as a term. Only after 2010 the term and the realization of its real-world possibilities took wind under its sails (Al-Msallam et al., 2023). With a new way of making workers more productive and keeping users interested in a product, it was a goal for many companies to adopt gamification into their workflow and systems. Gartner predicted in the year 2012 that 25% of companies will take advantage of gamification by 2015. However, trying to adapt to something as fast as possible might not be the best idea. Quick adaptation to a new tool without understanding it fully might have dire consequences.

The rapid growth of the gamification industry, projected to reach USD 37 billion by 2027, has led to widespread adoption. However, this swift embrace often neglects ethical considerations (Al-Msallam et al., 2023). Organizations, in their eagerness to gain a competitive edge, may inadvertently overlook potential downsides. Illusory results, such as superficial interactions and a false sense of achievement, can arise from hasty gamification implementations (El-khuffash, n.d.; Al-Msallam et al., 2023).

Al-Msallam, Xi, and Hamari's 2023 review on gamification highlights its negative effects, such as psychological impacts and irrational behaviours like overconsumption and addiction. Poor design choices in gamification, like unattainable goals or excessive competition, can harm well-being and social relationships. Additionally, it raises concerns about information risk, privacy, and manipulation of consumer behaviour. The study underscores the need to address ethical issues for the industry's long-term success.

While gamification has been rigorously studied during the last years, it has failed to identify the state of modern online shopping applications when considering the amount of gamification present in them. Some studies about the ethicality of online marketplace

applications with gamification have been made, but they fail to link specific gamification elements to these found unethical aspects.

This thesis uses a taxonomy to gather the gamification elements from the applications and marking down each element used by an application. After this an analysis of the data gathered will be made and the elements found will be linked to unethical design patters found in earlier studies.

The main research question, this thesis aims to answer is:

What gamification elements are modern shopping applications using unethically to sell more products?

Additional question that will be answered:

What kind of gamification are marketplace applications using and how much?

The next chapter will define previous studies going through what gamification is, why is it useful and what unethical implementations and bad side effects it may have. Third chapter will go through the methods of this research as well as consider the limitations that are in place. The fourth chapter explains the graphs and analyses them. The fifth chapter links the found gamification elements to their unethical implementations. The sixth and last chapter includes the conclusions from chapters four and five.

2 Related Work

"A well-designed game is a guided missile to the motivational heart of the human psyche."

Werbach & Hunter, 2012

Werbach and Hunter (2013) mention the two motivators for a user to keep using a system. The intrinsic and extrinsic motivation. Intrinsic motivation means the motivation coming from the user. A user voluntarily using a system, because they want to, not because they need to, is called intrinsic motivation. When the user returns to the system again and again, because they want to score a new high score, or they find the system interesting, and they achieve a feeling of accomplishment. That is when a system has accomplished motivating the user intrinsically.

Extrinsic motivation on the other hand means the external motivators that make a user return to use the system. It can mean a professor requiring a student to use a certain software like Word or Excel without the student really wanting to do so. This does not mean the fact that a student doesn't want to do the homework but rather that the student doesn't find the software intrinsically motivating and is forced to work with what has been given.

2.1 What is gamification?

"The fundamental goal of gamification is to create systems that are more fun and more engaging by gamifying them. Because of this goal it is very important that using the system is ultimately fun and the player has a positive experience, otherwise it does not matter how well it should theoretically work."

Rajanen and Rajanen, 2017

Gamification in short uses the same motivators as games do to make systems more appealing and is trying to tackle the problem of lacking intrinsic motivation. Gamification as a term

was first coined in 2002 by Nick Pelling when producing a system for an ATM (Marczewski, 2013). This was not the first use of gamification, but rather the acknowledgement that it is a thing. Gamification has been around for a long time for example boy scout badges and school grading. While the term gamification was coined in 2002, it didn't experience widespread adoption until 2010. The use of gamification in 2010 was the incorporation of social/reward aspects of games into software (Wikipedia). As of the year 2010, gamification has gained wind as a term and a subject of study around the world. Marczewski (2013) thinks that this is because of a generation of people who grew around video games are entering the workforce.

The term gamification has been changing ever so slightly during the research of the subject. Deterding described the term in 2011 as the "use of game mechanics in non-gaming contexts". As the term was studied more the usefulness of the incorporation of gamification had become clearer. Marczewski (2013) for example wrote a book, Gamification: A simple introduction, where he introduced his thoughts on the matter and portrayed gamification as "making a task more interesting by adopting gaming mechanics". At its most simple form, it is getting a reward for doing a task. A reward like a trophy or just simply having fun while using the system. Hamari has been working with others on the description of the term gamification and making it more abstract. Hamari and Koivisto's description in 2014 for the term was "The phenomenon of creating gameful experiences". In 2017 Hamari redescribed the term with Huotari as a term that, "refers to a process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation". Even more abstraction to the term was added in 2019 by Hamari, when he described the term referring to, "technological, economic, cultural, and societal developments in which reality is becoming more gameful either by design or as an emergent transformation". As we can see from all of the above definitions a clear consensus is hard to come by. The terms meaning keeps on changing depending on the person and how much it is researched. However, according to a study by Seaborn and Fels in 2015 an emerging consensus on the definition of gamification is slowly gaining focus. The definition is rooted in psychological theories like self-determination and concepts of intrinsic and extrinsic motivation.

According to Werbach and Hunter (2012) gamification uses three intrinsic motivators to generate powerful results. Levels and points, choices and possibilities, and social interactions. Levels and points work as markers for competence and mastery. Choices and a

range of possibilities and experiences as a user progresses, feed the users desire for autonomy and agency. This allows the user to create their own story. Social interactions, like sharing things on Facebook or badges you can display on your page for your friends to see responds to the human need for relatedness.

2.2 Benefits of gamification

Important factor into gameful design is knowing your audience. Design of gamification should be user centred. Failure to identify, define, evaluate, and select the target behaviours may lead to designing a system that doesn't fit the requirements. (Rajanen & Rajanen, 2017.) If the design of a gamified system fits the requirements there are many benefits to having put the effort into gameful design. Caponetto et al (no date) say that gamification is used as a driver to promote fundamental things like learning, employee performance, customer engagement and satisfaction, and even crowdsourcing initiatives. Marczewski (2013) further promotes the idea of Caponetto; Application of gameful design into real life tasks influences the behaviour, improves motivation, and enhances engagement. Engagement is an important part of all systems and has business value in itself. Gallup's recent study about the state of the American workplace suggest that roughly 70% of American workers are not fully engaged in their jobs. This is undoubtedly going to affect their performance in addition to their happiness.

People usually know what they should be doing. Exercise more, eat healthier, go to the dentist, and so forth, "the hard part is being sufficiently motivated to do so". The incorporation of gamification into business practices increases participation into company surveys in addition to it motivating users to complete training, be it optional or mandatory. As the workers engagement is better in a training environment their learning also becomes easier. Many companies know that exercise has positive impact on the motivation of a worker, who must sit all day, a gameful approach to this problem has been implemented successfully in many companies increasing the performance of the company. Gamification also encourages positive adoption of change management projects. (Werbach & Hunter, 2013.)

Companies and businesses are not the only ones needing a boost in motivation. Education has also been gaining a lot from the use of gamification. Gamification has been in education even before the term was brought up. Points from exams, star stickers for good work and getting performance reviews in the form of diplomas and certifications. As of year 2010, gamification has been more deliberately studied and applied to education (Al-Msallam et al., 2023). The reason for this is because of a conviction that it supports and motivates students and thus lead to enhanced learning processes and outcomes (Kapp, 2012). The enhanced learning processes is only individual. Like mentioned before the implementation and design of a gameful system needs to match the requirements in order to work. Integration of gamification into online higher education courses has been noticed to expand motivation, but only for certain kind of students (Kaufmann, 2018). When done correctly the successful application of gamification elements and the delivery of information can transform a simple or mundane task into an addictive learning experience for the students. Gamification in education also minimizes negative emotions that students usually encounter in the more traditional form of education. It lets students approach knowledge and skills by failing, a so called learn-by-failure technique that is popular in games. This allows students to experience learning without the embarrassment factor that usually is a part of classroom education, like answering wrong when raising a hand. (Huang and Soman, 2013.)

2.3 Unethical design of gamification

The rapid rise in popularity of gamification has prompted companies and educational institutions to quickly embrace this trend. As projected by Digital Journal in 2023, the global gamification industry is expected to reach a market size of USD 37 billion by 2027. However, this rapid adoption often leads to a myopic focus on various aspects, diverting attention from the ethical considerations associated with gamification. In their eagerness to gain a competitive advantage in this rapidly expanding market, organizations may overlook the potential downsides. Successful gamification requires a thorough understanding of effective game design, and hasty implementations can inadvertently serve the interests of competitors. It has been observed that gamification can yield illusory results, creating a false sense of achievement. For example, awarding users points for brief comments on a social

media platform may result in superficial and unengaging interactions, such as mere greetings like 'HI' or 'Nice' (El-Khuffash, no date). While any increase in user engagement may seem beneficial for businesses, this approach could inadvertently encourage unethical system design. As the gamification market grows, it becomes increasingly important to address these ethical concerns to ensure the long-term success and integrity of the industry (Hyrynsalmi et al., 2018).

The danger in gamification is that it is easy to overlook it. While gamification has undoubtedly positive impact on systems, it is a design approach susceptible to affecting individual's psychological state and behaviour (Thibault & Hamari, 2021). Gamification can be incorporated into use for systems so fluidly that the users may not even notice that they have been lured and manipulated. This manipulation can manifest itself in the form of overconsumption, irrational decisions, post-purchase dissonance and addictive behaviours (Al-Msallam et al., 2023).

The elements used in gamification aren't inherently bad, but poor design choices can yield unforeseen and undesirable outcomes (Kim and Werbach, 2016). A literary review of unethical gamification conducted in 2023 by Al-Msallam, Xi and Hamari reviewed 25 papers. They found that gamification can be the cause of many negative experiences. Sixteen of these 25 papers documented experiences such as psychological distress, including stress, anxiety, frustration and helplessness. These experiences can be caused by for example the repeated inability of overcoming a challenge posed by the system. Challenges might bring points to a user and these points could be accumulated into a leaderboard, which was also found to be a possible cause of dissatisfaction in the form of constantly comparison of self to others. Leaderboards were also linked with loss of self-consciousness as the data is disclosed. The sixteen papers in addition to coming across these problems found out that gamified systems have an increased pressure on users to achieve more.

Five of these 25 papers found out that certain gamification elements have the possibility to increase and create addictive behaviour. These addictive behaviours included hyper using gamified systems to diminish boredom, continuously stimulating the mind. The addictive behaviour has been noticed to affect the adolescent the most according to psychological studies. One way gamification was noticed to create addictive behaviour was immersive design and game-based challenges. Addiction can be used for motivating harmful behaviours

like consumption of substances, sedentary lifestyles, or any behaviour in excess. Particularly one study found that from 102 applications, 44 were used to promote and sell alcohol and illicit substances. These applications included gamification to stimulate the users' motivation. Digital addiction has been noticed to have similar symptoms to alcohol withdrawal. These symptoms include mood modification, salience, tolerance, withdrawal, conflict and relapse (Jiang et al., 2015). When gamification is added to software, these symptoms might get even worse.

Exploitation was also found to be present in systems with gamification. Thirteen studies of 25 had found exploitation in different forms. Some of the systems used the imbalance of mutual benefits between the provider and users to favour the providers. This kind of exploitation can be found especially in marketing and workplaces. In marketing exploitation can be in the form of virtual rewards like points and badges. These superficial prizes do not hold out in the real world, but make the users feel accomplished, while the companies gain value in the form of increased engagement. Badges could be used as an authority and should be designed to be consistent with what they are trying to achieve (Halavais, 2012). This leaves an opening for unethical design for badges and other ways of designing "big points" and achievements.

Increased engagement leads to increased market share, improved brand awareness and customer loyalty. Where companies are benefitting from gamification of the system, companies can also apply it inside the company in the same way. The employees can feel exploited to perform only productive behaviour, causing stress. Where gamification has been noticed to increase productivity, performance and satisfaction, it was noticed to be a hindrance or even counterproductive according to the studies. Constant monitoring of leaderboards and frantic fight to win might become distracting and make users perform their tasks in lower quality or disregard safety and guidelines. It has been noticed that that the rewards received through gamified work environment influence the workers motivation to participate in such endeavours. The rewards work as a carrot-and-stick approach from their managers and may work as an external regulation of the workers performance and could be seen as an unfair method to increase productivity with no real costs (Hammedi et al., 2020; Shahri et al., 2014).

While being a distraction for workers it can be used as a distraction to users and customers. In an attempt to accumulate points, trophies, or get discounts, the users may get their attention diverted from significant aspects of the product. This exploitation of human psychology changes the behaviours so that it serves the companies interests.

3 Research methods

This thesis uses mixed-methods approach for data collection and analysis, using both quantitative and qualitative research methods. The quantitative dimension involves data collection from free, top-ranking applications on the Play Store marketplace. This selection strategy ensures a focus on the more used applications, offering insights into dominant gamification elements. Mixed methods approach is a good way of gaining different perspectives, contextualizing measures, and building comprehensive understanding of the subject in question (Harvard Catalyst, 2023). As this thesis considers the ethical considerations attached to applications mixed methods give a more thorough understanding of what is being studied. This research' method will be based on convergent parallel method. This means that qualitative and quantitative data is processed at the same time and feeding each other. (Scribbr, 2023)

For the qualitative aspect, a well-established taxonomy is employed to identify and categorize the gamification elements within these applications. This methodological choice facilitates examination of the gamification strategies currently in use.

The compiled data is organized into an Excel spreadsheet, from where it is transformed into two graphical representations. This step uses the qualitative and quantitative methods, as it allows for the visualization of gamification trends across different applications.

This thesis then progresses to a qualitative analysis of the graphs. This stage is crucial, as it interprets the graphical data to provide a better understanding of the types of gamification elements found in the sampled applications.

3.1 Taxonomy design

The selected taxonomy, authored by Toda et al. (2019), has been chosen for its clear descriptions and comprehensive catalogue of gamification elements (appendix 1). The taxonomy provides a structured framework for systematically identifying and analysing gamification elements within applications. The taxonomy elements have added clarification

and more clear definitions in order to minimize biased opinion. The taxonomy follows a qualitative approach based on a study conducted in the year 2000 by Pope et al.. The study mentions taking fieldnotes. The notes will be taken into a Word file and used to make the data gathered via taxonomy more accurate. The Word file will also be used as a placeholder for noticed possible unethical aspects and later checked and used in the discussion section.

The study by Pope et al. notices the problem of qualitative data as it is time consuming and some refinement to the taxonomy will probably take place during the assessment of applications as some of the gamification elements may be present in many different forms and hard to notice. If a refinement is to take place a new visit to the applications needs to take place.

In the realm of gamified applications, a variety of elements are used to enhance user experience and engagement. Acknowledgement and reputation play a crucial role in recognizing users' achievements through visible rewards like badges, medals, and titles, fostering a sense of accomplishment. Chance and rarity introduce randomness and scarcity. These add luck-based outcomes and make users seek rare items, adding excitement and unpredictability. Competition and cooperation are social interaction elements, which make users collaborate or compete with each other. These elements are often intertwined with objectives and missions, which provide a user clear goals and challenges guiding player to a sense of direction and purpose.

The applications are further defined by levels and progression, offering a sense of advancement and achievement tracking the users' development through specific milestones. Economy introduces transactions, with which users can engage in market-like exchanges with in-application currencies, distinct from real-life economics. Imposed choice and narrative enrich the user experience by requiring the user to make decisions influencing the flow of the application or game. These often lead to user-influenced storylines or outcomes. Puzzles and time pressure add cognitive and temporal challenges, requiring strategy and quick decision-making.

Applications evolve through novelty and renovation, presenting new information or allowing users to redo actions, maintaining engagement and freshness. Sensation enhances the immersive experience by stimulating senses with impactful visuals and sounds. Lastly, social pressure and stats reflect the influence of community and visibly tracks users'

performance adding layers of social dynamics with the help of either collaboration, competition or messaging and personal achievement tracking. Each of these elements contribute to a rich, multifaceted user experience, catering to different motivations and preferences.

A more concise description of gamification elements can be found from appendix 2. It lists what each element is, what limitations they have and examples of usage.

3.2 Spreadsheet and rules

The data gathered will be placed in an Excell spreadsheet. The Excell spreadsheet has gamification elements on the x axis and the applications on the y axis. The rest of the spreadsheet can be used to check, whether the application has a specific gamification element or not.

0. The specific gamification element could not be found in the application.
1. The gamification element in question is found.

The spreadsheet will then be analysed with Python. Python was chosen for the ease of use and great libraries for building charts and reading data from files. Python could be considered slow for data analysis, but as the size of this research is not that big, so it doesn't need more optimized languages like C. Python library to read the Excel file is Pandas and the library in charge of making the graphs is Matplotlib.

3.3 Method of picking applications

Applications for this study will be selected based on various criteria. Specifically, the focus will be on applications available on the Play Store, excluding those exclusive to the Apple

Store. The selection process involves downloading online shopping applications from the Applications tab on the Play Store, with further refinement by choosing free applications. Additionally, applications will be chosen from the top charts, as these top-ranking applications have a more significant real-world impact.

It's worth noting that some applications labeled as "free" may require a subscription or purchases in order to have a comprehensive study about all of the gamification elements present. Furthermore, a key consideration in this study is that the Play Store's top charts are personalized based on the user's country of residence, with the top charts in this study reflecting Finland.

3.4 Limitations

As this thesis goes through ethical problems, it's important to acknowledge the potential for personal bias to influence interpretations. While a considerable amount of work will be put to minimize subjective influence, it's advised to approach the data with the influence of personal bias in mind and understand the inherent challenges in completely eliminating personal biases from such analyses.

Time is also a limitation as going through applications consumes a certain amount of time. The time taken depends on the complexity of the application in question. Recognizing this constraint this thesis will limit the number of applications chosen for inspection to 19. This ensures thorough enough evaluation of each application without stretching out the deadline.

As can be seen from previous studies in the chapter 2.3 the word “might” and “could” was used a lot. This means that the studies are getting results, but these results don’t apply to all users. All the applications cannot be designed for everyone, and it can make some applications seem more unethical than others based on current studies.

The study by Pope et al. mentions that the quality of the research depends on the skill, vision, and integrity of the researcher. This fact must be taken into consideration as the analysis is not done by a professional.

4 Results

Figure 1: Number of gamification elements found in shopping applications

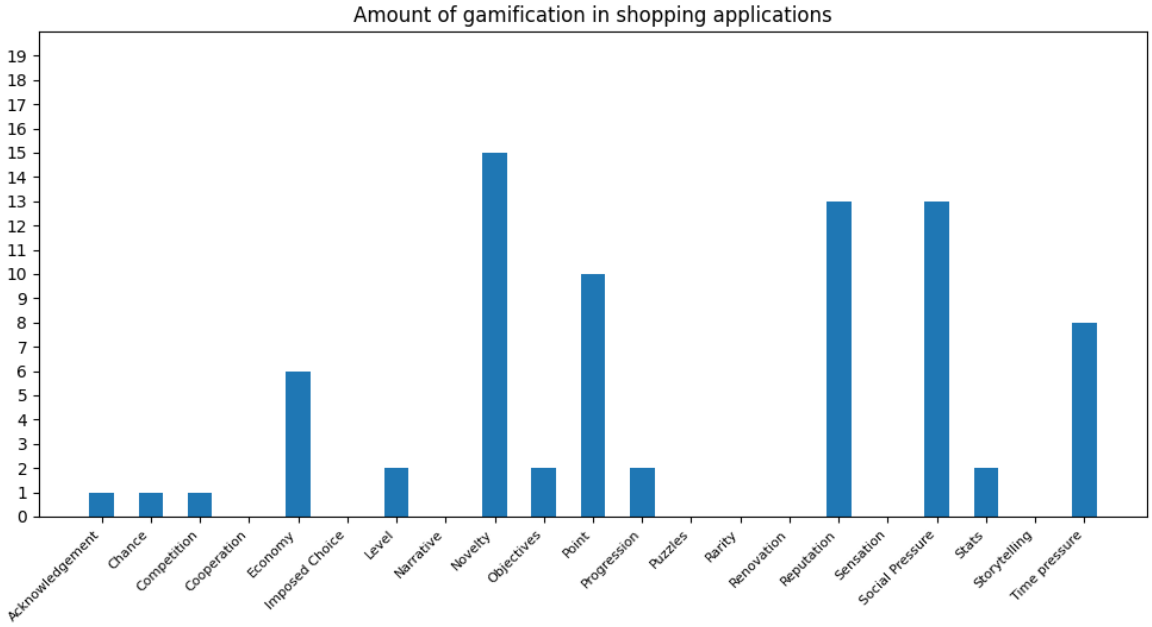


Figure 1 tells us how much of each gamification elements were used in the applications. As we can see from the image, novelty was the highest-ranking element with 15 applications out of 19 having this element. This element was found in the form of the applications presenting new information to users continuously. This meant that you could scroll indefinitely or for a very long time before the application stopped showing new content. This was to be expected from shopping applications, as shopping applications want to make as many sales as possible and presenting the user with as many options as possible is profitable to them.

Social pressure was the second most noticed element throughout the applications. Social pressure in applications is primarily identified through features like comments, likes and reviews. These elements combine to create a sense of community engagement and peer influence. A couple of applications were seen using a different approach to adding social pressure. One application showed the users the last time someone else had viewed a product and another application showed the user who was getting shop specific currencies through tasks. Additionally, a notable aspect of social pressure was also seen in the use of applications: a short video system also known as reels or shorts. This system was popularized

by the platform Vine and now predominantly used by TikTok, Instagram, Facebook, and YouTube. Now it has made its way into shopping applications. It serves multiple purposes in these applications like addiction as the endless stream of content can be addictive and keeping users engaged with the app. The short videos are also a good way of showcasing new products to the users. The short video format adds to the novelty by providing an unlimited supply of content. It also enhances social pressure, as users either engage by posting their own videos and receiving feedback (likes and comments) or by viewing and being influenced by videos showcasing products in a favourable light.

Reputation elements in applications are linked to features like user reviews and "verified badges." These aspects play a crucial role in building trust, getting user feedback and having a rank that is shown in how many stars a user has. With verified badges, the sellers can help establish credibility for users within the app. Reviews allow users to share their experiences, which can significantly impact the perceived quality and reliability of products or services offered through the app and giving a rank to sellers.

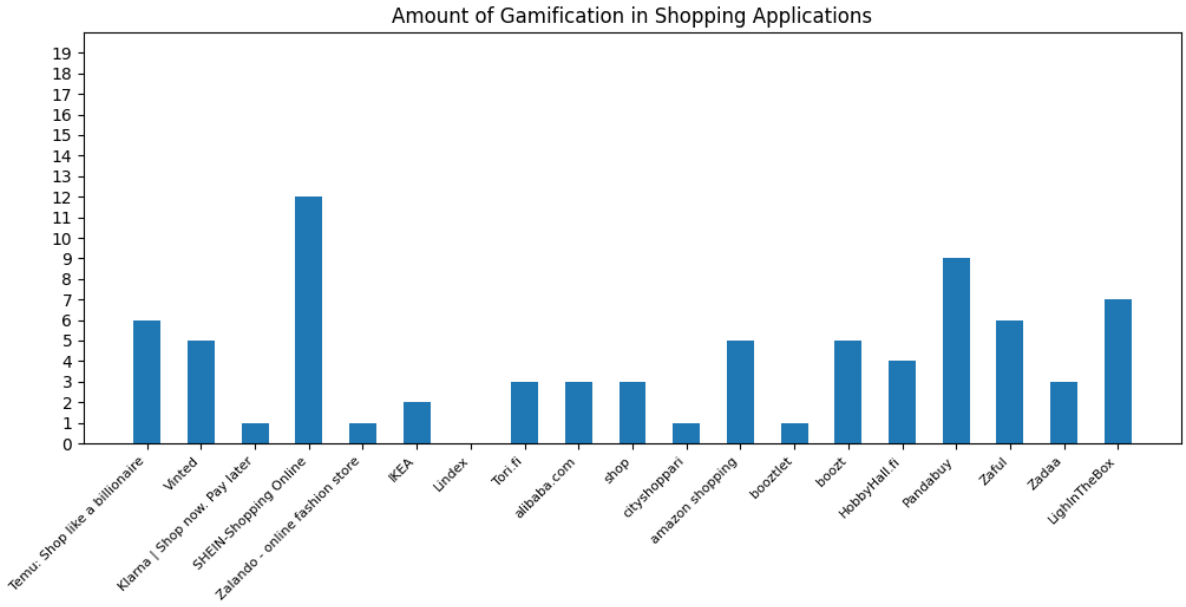
Both social pressure and reputation play a crucial role in shaping user experience and engagement within various applications, especially in the context of shopping.

Third most noticed element was points, which was presented as the amount of comments, likes, shares, scores, and shop specific points that could be used as currency in the application. 10 applications were using a certain type of point system. Half of them could be seen using the economy element, which meant the possibility of using the points as currency.

Time pressure was the fourth most used gamification element with 8 applications out of 19 that were using it. There were different ways of this showing up on the applications. Flash sales or lightning deals were the most notable ones, as there was a clear timer on the screen, which notified the user how much time was left on a discount. Another way of having time pressure, which was a little more hidden was for example, Christmas sales and discount coupon expiration dates. Some of the applications which had economy also had an expiration date on the points the user had gathered and a streak system for points. The streak system gained the user more points depending on how many days in a row the user had logged in and gathered the points. The streak would end if the user didn't log in for one day. This

makes the users want to log in and gather the points for the day making the user susceptible to new purchases as opening the app opens the shops main page with multiple items.

Figure 2: Number of gamification elements found in specific applications



From image 2 we can see which applications were using the most gamification with Shein being the clear number one in this regard. It was the only application which featured acknowledgements and competitions. Other rare gamification elements it had were levels, objectives, progression and stats. Other applications that used stats were Klarna, which had the amount of money a user had spent in the application. Objectives were also used by LightInTheBox and Pandabuy, which were tasks that would earn the user points to use as currency in the application. Tasks were simple, like browsing a shop page for a certain amount of time or inviting friends to use the application. PandaBuy was the second application to use a level system. It had the customer level, which was determined by growth value which was never explained anywhere but assumable sending and receiving packages will gather these points.

4.1 Clustering

The data analysis was conducted using the K-modes clustering algorithm, implemented in Python within an Anaconda environment. The dataset, comprised of categorical variables, was ideally suited for the K-modes algorithm. K-modes is specialized for categorical data as it uses modes for cluster centroids. This algorithm forms clusters based on the most frequent categories within the data, providing us with archetypes. The execution of the program resulted in four different clusters. Initially, the decision to use four clusters was based on recognizable patterns or archetypes observed in the data prior to applying K-modes. To ensure the optimal number of clusters, various configurations were tested from 2 clusters to 8. Through this process, it became evident that dividing the data into four clusters yielded the most meaningful and coherent groupings. This approach aligned with the preliminary observations and also provided the most insightful and distinct categorization of the data, indicating that four is the ideal number of clusters for this analysis. These clusters are detailed below and reveal methods and tactics used by the developers of the applications.

The dataset, along with the source code used for this analysis, is provided in the appendix 2. The code is open-sourced and freely available for use under the MIT license.

The four clusters revealed for the applications:

Cluster 0 - Socially driven and reputation-centric engagement:

Description: This cluster stands out for its emphasis on social pressure and reputation. Points, novelty, and economy were also a part of this cluster, but not as prominent. The combination of these elements points to a gamification strategy that heavily relies on social dynamics and user reputation within the app ecosystem while also having economic incentives like discounts or loyalty points. These applications encourage user engagement through social and reputational dynamics in addition to having economy and points affect users' choices.

Implication: Applications within this cluster likely cater to an audience that likes a straightforward session, without any extra gamification features. This cluster however has added the reputation and social pressure into the mix. These are in the form of having

comments or messages, reviews, and ratings. These applications have them for the necessity of these elements as most of the applications are user to user like Zadaa, Tori.fi and alibaba.com. The necessity comes from the need for users to know whether to trust the seller or not and ratings is a great way to do that. Trust and reputation play a crucial role in social control in electronic marketplaces (Zhang and Cohen, 2008).

Cluster 1 - Dynamic and diverse gamification elements:

Description: Featuring a mix of novelty, points, reputation, social pressure, and time pressure, with additional elements like chance and economy, this cluster indicates a multifaceted gamification strategy. This suggests a dynamic user experience where surprise elements, rewards, and social aspects play significant roles. The presence of time pressure indicates flash sales and limited-time events.

Implication: Applications form this cluster forward have more in mind than just having justifiable elements like ratings and comments. This cluster has incorporated a diverse set of gamification elements into their use like points and economy playing a more crucial role than in the clusters that were mentioned before. The additions of time pressure and chance also indicate a more profound understanding of what kind of gamification works for online marketplaces. Time pressure for example has been noticed to influence the user to make more hasty decisions leading to worse outcomes for the customer, but faster purchases for the marketplace (Dhar and Nowlis, 1999). This suggests the clusters strategy already going forward in a more unethical direction.

Cluster 2 - All-encompassing, highly gamified experience:

Description: This cluster represents the most comprehensive use of gamification elements, with significant emphasis on economy, level, novelty, objectives, points, progression, reputation, social pressure, and time pressure. The inclusion of acknowledgements, competitions, and stats suggests even more rich and engaging user experience.

Implication: Applications in this group are likely aimed at users who are highly responsive to gamified environments, offering a complex and engaging experience that encourages continued use and deeper engagement through multiple layers of gamification.

Cluster 3 - Gamification with a focus on time pressure and novelty:

Description: Cluster 3 includes applications that use a very selective or even no gamification approach. The main features are novelty, stats, and time pressure. This suggests these apps focus on offering new products or features and time-limited deals to create urgency. They might also show users some basic statistics. Notably, some apps in this cluster might have very little to no gamification elements. These applications rely mainly on the freshness of content and urgency, rather than typical gaming features, to engage users.

Implication: This cluster is likely appealing to users who are attracted to new things and quick opportunities but prefer an easy-to-use app experience without complex gamification. Less gamified applications are more straightforward. This fosters a healthier environment for the users as they have a sense of control, rather than being led by the application to do what the application wants (not taking dark UX design into consideration). Applications falling into this cluster also probably know that the design of gamification is hard and bad gamification design will have undesired results. Thus, companies don't want to go tampering with an already working design. (Lee, 2017)

In conclusion each of these clusters define a different gamification strategy used by the applications. These strategies range from minimal gamification to wide array of gamified elements to enhance user engagement, social interaction and pressurized shopping experiences. Understanding these different types of clusters can help in identifying which gamification techniques are being used by different applications and how they might be impacting the users' behaviour and shopping experiences.

In addition to k-means clustering some other groupings were found by plainly looking at the data and grouping them based on their elements. What was noticed is that reputation and social pressure were always together. Where one was noticed the other one was also noticed. Also, time pressure, novelty and points made up one other grouping with only one exception in the applications. The last grouping noticed by plainly looking at the data was that objectives and economy was found to be together in each of the applications.

5 Discussion

On average the shopping applications had about 4 gamified elements. 77 gamification elements were found in total. From this we can see the popularity of using gamification elements has risen throughout the years. Gamification was most popular in low-cost online marketplaces clearly wanting to use the psychological advantages brought by gamification. Some of the gamification elements however were required for the applications to work. Reviews, messages, novelty, and some usage of the points system could be included in required elements in some of the applications but could be still misused. For example, having a short video platform on a shopping application includes the ability to message the users posting these videos which can be used for ill intended comments, and they also include novelty as unlimited video material could be viewed from there.

The analysis revealed varying gamification strategies across the reviewed applications, organized into four distinct clusters. Cluster 0, with seven applications, focuses on enhancing social interactions and building user reputation, employing gamification to foster community engagement. Cluster 1, comprising of four applications, adopts a diverse gamification approach, heavily leveraging novelty, time pressure, and points systems to engage users. Cluster 2, although including only two applications, stands out by intensifying gamification through acknowledgments, statistics, and competitions, representing the most gamified experience among the groups. Finally, Cluster 3, with six applications, showcases minimal to no gamification elements, emphasizing a straightforward user experience. With these archetypes in place, it is rather easy for someone without former background in any technical field to understand the purpose of gamification in different shopping applications.

From the data we can generalize that the amount of gamification correlates to low-cost online marketplaces. The highest amount of gamification was found from Temu, Vinted, Shein, Amazon shopping, Boozt, PandaBuy, Zaful, and LightInTheBox, where the lowest amount of gamification was 5 and from these applications only Vinted is not a low-cost online marketplace. One Low-cost online marketplace however was not included in the most gamified applications, and this was Alibaba.com. This information could be used for generalising the fact that low-cost online marketplaces want to sell as many products as possible and using gamification to help do so. However, the amount of data gathered must

be considered as it is only 19 applications and not all of them were low-cost online marketplaces. These most gamified applications fall into the cluster categories of 2 and 3.

The most common type of gamification noticed in the shopping applications was novelty, points, social pressure, and time pressure. Novelty was present in the form of having the possibility to scroll almost endlessly. The description of novelty is that the application presents something new to the user all the time and most of these applications made it possible. For an application that is trying to sell merchandise to users, this is a good way of trying to help the customer find exactly what they are looking for. However, some of the applications had shopping possibilities in every single tab. This is undoubtably a way of trying to make a user buy unnecessary items. For example, the application Temu had the possibility to buy items in the main tab, user tab, shopping cart and categories tab. This is also paired with many of the items having a "Almost sold out" or "Lightning deals. Ends in 04:10:13:45" making the user think there is a rush in buying the items. This is an example of time pressure, one of the most noticed gamification elements. A study by Young et al. in 2011 found out that the addition of time pressure into games clearly disrupted participants' observation behaviours. The amount of time spent thinking about decisions dropped. When time pressure is added to the applications, users can make more hasty decisions than what they would normally do.

If the constant bombardment of new items and the time pressure is not enough, the 4.5-star rating and tens of thousands of reviews will get the user thinking that the purchase is a good idea. Some of the items in Temu tell the amount that it has been bought, for example, "10pcs/Set Leaf & Faux Pearl Decor Stackable Knuckle Ring Chic Jewlery For Women Girls" has been bought 584 times but has almost 72 000 reviews. On closer inspection it can be noticed that it is the shops rating and not the items, but it is still marked on the item. None of the other applications had as devious ways of tricking the customer as Temu had, but time pressure was something that was present in many applications, and it was sometimes presented as clear pressure towards customers to buy products and make hasty decision.

The ability to message other users in the marketplace is undoubtably a needed feature, as without this function buying items from other users would become hard and the customers would have to make their buying decisions based on the info in the item description. Ratings and reviews were also prone to show up in the applications. Especially if the application was

a marketplace, where anyone could sell items. Mostly it is a good thing in order for users to know which of the sellers are trustworthy. A study by Askalidis and Malthouse found out that there is strong evidence towards the fact that good reviews on a product make it more likely to be bought. This opens the possibility of using ratings for unethical purposes in case the reviews are bought or tampered with bots. Reviews thus can be used for falsely advertising the quality of products and services. For example, this research found a seller which had sold over 100 000 items and had 72 000 reviews. A seller that has around 70% of customers leaving a review where 81% of the reviews are 5 stars seems unlikely. This thesis is not going to take this into consideration as no proof of false reviews was found but is worth a mention for future studies as the review system can work as an authority and make users think that the items are good quality and extremely cheap. However, these two qualities often collide and are absent when other is present.

Levels, progression and economical points were quite rare in applications but were most common in low-cost marketplaces. Levels were mostly incorporated into loyalty and membership systems, where buying items would gain the users points towards next levels, which would give the user benefits like discounts, free shipping, points, and gift cards. Sometimes the memberships would have to be bought. Progression was shown with the level system, as the users could see how many points would be required in order to level up. Points could be gathered either by buying the membership or by logging in every day. The more consecutive days a user has logged in, the more points one would get. This so-called streak system is clearly put in place to get users logging in every day giving more exposure to the applications' products. Levels could be used to get users buy more items. In situations where a user is close to leveling up and stands to gain benefits on future purchases, they may be incentivized to buy additional items in order to obtain the rewards associated with reaching the next level. A study by Hsu et al. Conducted in 2009 found that in MMORPGs (Massive Multiplayer Online Roleplaying Games) the leveling up is found to be highly addictive and gives the users a sense of achievement. In games the leveling up requires a challenge of sorts and leveling up gives a reward. However, in the context of online shopping applications, the challenge of leveling up is using money and the reward is saving money on future purchases which leads to the question of should spending money be considered as a challenge?

As a new user to many of the applications a new arrival gift would appear on the screen. These gifts would be in the form of free shipping, discounts, coupons, more points from first

order. Temu for example had a wrapped gift on the screen, that could be opened by the user. The gift was always the same and would prompt the user to enter their information there to receive discounts to their email. This is a way of using the surprise element of opening a present but getting no real gift from it. The application is trying to get more information from the users. This brings up privacy issues.

Gifts and new arrival coupons seemed to have an expiration date on most of them. This makes the sense of hurry for the user. If a user then buys something from the store, the leveling up system comes into play for the next time they open the application or even during the first purchase. A user might either want to level up immediately or the next time they open up the application and notice that they could get discounts if they just bought a little more making the buying experience into a loop of trying to purchase items for as cheap as possible.

Short-form videos were present in a couple of the applications. These have been studied much since the rise of TikTok and researchers have found it to be highly addictive, especially in the adolescent and young people (Peng et al. 2022). It seems as if shopping applications are now also adopting this format. The reason behind this to sell more products in the application. The videos were sellers explaining or show casing their products. These videos were made to show the products in as good light as possible using either some sort of expert or a beauty image to advertise these items. How well the short-form videos are promoting products is still a question and would need more studies in order to find out about the impact. While the success of short videos has not been studied, the possibility of liking and commenting on these has been linked to “common neural currency”. This means that liking and commenting are shown to resemble a social reward system that could be interpreted as a form of currency. Likes have also been linked to a feel good response by the user. (Sherman et al., 2018) This undoubtably increases the usage of these short video systems and thus increasing the usage of the application.

In 2014 a study by Roberts et al. Found that almost 15% of males are compulsive buyers and 13% females are compulsive buyers. Now that gamification and ease of buying from anywhere in the world from your phone is added into the mix, one could imagine this number only going up. The only reason gamification is added to the applications, is to get buyers to buy more. This however is not mentioned in the applications and a central part of ethical

design of software is transparency and honesty (Marczewski, 2017). The design of ethical software should include the “golden rule of persuasion”. This means that “the designers of the software should not create programs that persuade to something they themselves wouldn’t like to be persuaded to do” (Nyström and Stibe, 2020).

This paper further expands the question of whether gamification should be regulated or not? “The current silence of marketeers possibly implies their acceptance of existing arrangements, i.e. general marketing codes, to oversee gamification’s practice.”. (Thorpe and Roper, 2019) This brings up the need for change in the regulation of gamification.

6 Conclusions

This thesis researched the gamification of modern online marketplace applications downloaded from the Play-store. With the help of a taxonomy and Python, the applications were put under inspection and analysed. Later the found gamification elements were linked to studies and explained, how ethical they were.

The need to research this subject was because the gamification and especially it's unethical implementations in online marketplace applications was lacking. An investigation to this matter is important, because users might not understand how they are being manipulated. Shedding light to this kind of manipulative design of applications is needed as in the future gamification might evolve more and keeping a careful watch to which way it is going is important.

Investigation to this matter found that gamification elements like time pressure, social pressure, novelty and reputation were used in many of the online marketplace applications. Most of the applications that were studied had some kind of gamification element either by design or by chance. Only one application was to not have any kind of gamification present.

Building on this thesis, similar findings have been observed in recent research. These studies highlight the ethical concerns and impacts of gamification in online shopping. Bayir and Akel in 2023 reviewed gamification in mobile shopping applications and found that these elements significantly affect consumer attitudes and behaviour, supporting the integration of the Technology Acceptance Model in their analysis. In a parallel study, Sheetal, Tyagi, and Singh in 2023 focused on the ethical perspective of gamification in online marketplaces. Their findings pointed out the potential for manipulative practices within gamified systems, emphasizing the necessity for ethical oversight. These studies reinforce the observations made in this thesis about the widespread use of gamification and its ethical implications, indicating a shared concern among researchers.

This thesis answers both of the research questions. From the 19 applications an average of 4 and a total of 75 gamification elements were found implying that the demand for gamification is unmistakably increasing. From these applications some of them could be linked with unethical usage of gamification. With the increase of applications with

gamification and the possibility of using it unethically, it could turn out that many more applications will follow suite unless something is done about the matter.

This thesis answers the question whether online marketplace applications are using gamification, how much of it there is and is it ethical. Future work needs to be done in order to clarify individual gamification elements' influence on users. Future work could also include the development of gamification and does the use of gamification keep rising. Further studies for regulation and laws on gamification and unethical design should be put in place.

References

Al-Msallam, S., Xi, N., Hamari, J., 2023. Unethical Gamification: A Literature Review.

Askalidis, G., Malthouse, E.C., 2016. The Value of Online Customer Reviews, in: Proceedings of the 10th ACM Conference on Recommender Systems. Presented at the RecSys '16: Tenth ACM Conference on Recommender Systems, ACM, Boston Massachusetts USA, pp. 155–158. https://doi.org/10.1145/2959100.2959181

Bayır, T., Akel, G., 2023. Gamification in mobile shopping applications: A review in terms of technology acceptance model. Multimed Tools Appl. https://doi.org/10.1007/s11042-023-16823-7

Caponetto, I., Earp, J., Ott, M., n.d. Gamification and Education: A Literature Review.

Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., Martínez-Herráiz, J.-J., 2013. Gamifying learning experiences: Practical implications and outcomes. Computers & Education 63, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020

Dhar, R., Nowlis, S.M., 1999. The Effect of Time Pressure on Consumer Choice Deferral. J CONSUM RES 25, 369–384. https://doi.org/10.1086/209545

Digital Journal. 2023. Gamification market size to hit USD 37 billion by 2027. Available at: [https://www.digitaljournal.com/pr/news/gamification-market-size-to-hit-usd-37-billion-by-2027]. Accessed: 23.12.2023.

El-khuffash, A., no date. GAMIFICATION. https://www.el-khuffash.com/gamification/gamification_report.pdf

Halavais, A.M.C., 2012. A GENEALOGY OF BADGES: Inherited meaning and monstrous moral hybrids. Information, Communication & Society 15, 354–373. https://doi.org/10.1080/1369118X.2011.641992

Hammedi, W., Leclercq, T., Poncin, I., Alkire (Née Nasr), L., 2021. Uncovering the dark side of gamification at work: Impacts on engagement and well-being. Journal of Business Research 122, 256–269. https://doi.org/10.1016/j.jbusres.2020.08.032

Harvard Catalyst Community Engagement Program. No date. *Mixed Methods Research*. Available at: [https://catalyst.harvard.edu/wp-content/uploads/2021/09/HCAT_CEP_MixedMethodsResearch-Accessible.pdf] Accessed: 23.12.2023.

Hsu, S.H., Wen, M.-H., Wu, M.-C., 2009. Exploring user experiences as predictors of MMORPG addiction. Computers & Education 53, 990–999. https://doi.org/10.1016/j.compedu.2009.05.016

Huang, W.H.-Y., Soman, D., n.d. Gamification Of Education.

Huotari, K., Hamari, J., 2017. A definition for gamification: anchoring gamification in the service marketing literature. Electron Markets 27, 21–31. https://doi.org/10.1007/s12525-015-0212-z

Huotari, K., Hamari, J., 2012. Defining gamification: a service marketing perspective, in: Proceeding of the 16th International Academic MindTrek Conference. Presented at the AcademicMindTrek '12: International Conference on Media of the Future, ACM, Tampere Finland, pp. 17–22. https://doi.org/10.1145/2393132.2393137

Hyrynsalmi, S., Kimppa, K.K., Smed, J., 2018. Gamification Ethics, in: Lee, N. (Ed.), Encyclopedia of Computer Graphics and Games. Springer International Publishing, Cham, pp. 1–6. https://doi.org/10.1007/978-3-319-08234-9_138-1

Jiang, J., Phalp, K., Ali, R., n.d. Digital Addiction: Gamification for Precautionary and Recovery Requirements.
Kaufmann, D., 2018. REFLECTION: BENEFITS OF GAMIFICATION IN ONLINE HIGHER EDUCATION. JIR 7. https://doi.org/10.9743/JIR.2018.12
Kim, T.W., Werbach, K., 2016. More than just a game: ethical issues in gamification. Ethics Inf Technol 18, 157–173. https://doi.org/10.1007/s10676-016-9401-5
Knutas, A., Tylosky, N., & Hasan, T. (2022). Open research data and analysis - how to implement and publish in European project context. Advanced Visual Interfaces (AVI), Frascati, Italy. Zenodo. https://doi.org/10.5281/zenodo.7299954
Lee, S., 2017. Is it a good idea for app developers to use gamification for business apps? Glance. [online] 23 August. Available at: https://thisisglance.com/blog/is-it-a-good-idea-for-app-developers-to-use-gamification-for-business-apps [7.2.2024].
Marczewski, A., 2017. The ethics of gamification. XRDS 24, 56–59. https://doi.org/10.1145/3123756
Nyström, T., Stibe, A., 2020. When Persuasive Technology Gets Dark?, in: Themistocleous, M., Papadaki, M., Kamal, M.M. (Eds.), Information Systems, Lecture Notes in Business Information Processing. Springer International Publishing, Cham, pp. 331–345. https://doi.org/10.1007/978-3-030-63396-7_22
Peng, C., Lee, J.-Y., Liu, S., 2022. Psychological phenomenon analysis of short video users' anxiety, Addiction and Subjective well-being.
Pope, C., 2000. Qualitative research in health care: Analysing qualitative data. BMJ 320, 114–116. https://doi.org/10.1136/bmj.320.7227.114
Rajanen, M., Rajanen, D., 2017. Usability Benefits in Gamification.
Roberts, J.A., Manolis, C., Pullig, C., 2014. Contingent Self-Esteem, Self-Presentational Concerns, and Compulsive Buying. Psychology and Marketing 31, 147–160. https://doi.org/10.1002/mar.20683
Seaborn, K., Fels, D.I., 2015. Gamification in theory and action: A survey. International Journal of Human-Computer Studies 74, 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006
Shahri, A., Hosseini, M., Phalp, K., Taylor, J., Ali, R., 2014. Towards a Code of Ethics for Gamification at Enterprise, in: Frank, U., Loucopoulos, P., Pastor, Ó., Petrounias, I. (Eds.), The Practice of Enterprise Modeling, Lecture Notes in Business Information Processing. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 235–245. https://doi.org/10.1007/978-3-662-45501-2_17
Sheetal, Tyagi, R., Singh, G., 2023. Gamification and customer experience in online retail: a qualitative study focusing on ethical perspective. Asian J Bus Ethics 12, 49–69. https://doi.org/10.1007/s13520-022-00162-1
Sherman, L.E., Hernandez, L.M., Greenfield, P.M., Dapretto, M., 2018. What the brain 'Likes': neural correlates of providing feedback on social media. Social Cognitive and Affective Neuroscience 13, 699–707. https://doi.org/10.1093/scan/nsy051
Thibault, M., Hamari, J., 2021. Seven Points to Reappropriate Gamification, in: Spanellis, A., Harviainen, J.T. (Eds.), Transforming Society and Organizations through Gamification. Springer International Publishing, Cham, pp. 11–28. https://doi.org/10.1007/978-3-030-68207-1_2
Thorpe, A.S., Roper, S., 2019. The Ethics of Gamification in a Marketing Context. J Bus Ethics 155, 597–609. https://doi.org/10.1007/s10551-017-3501-y
Toda, A.M., Cristea, A.I., Oliveira, W., Klock, A.C., Palomino, P.T., Pimenta, M., Gasparini, I., Shi, L., Bittencourt, I., Isotani, S., 2019a. A Taxonomy of Game Elements for Gamification in Educational Contexts: Proposal and Evaluation, in:

2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT). Presented at the 2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT), IEEE, Maceió, Brazil, pp. 84–88. https://doi.org/10.1109/ICALT.2019.00028

Werbach, K., Hunter, D., 2012. For the win: How game thinking can revolutionize your business. [Audiobook]. Dixon, W. Audible

Warmelink, H., Koivisto, J., Mayer, I., Vesa, M., Hamari, J., 2020. Gamification of production and logistics operations: Status quo and future directions. Journal of Business Research 106, 331–340. https://doi.org/10.1016/j.jbusres.2018.09.011

Warmelink, H., Koivisto, J., Mayer, I., Vesa, M., Hamari, J., n.d. Gamification of the work floor: A literature review of gamifying production and logistics operations.

Young, M.E., Sutherland, S.C., Cole, J.J., 2011. Individual Differences in Causal Judgment under Time Pressure: Sex and Prior Video Game Experience as Predictors. International Journal of Comparative Psychology 24. https://doi.org/10.46867/IJCP.2011.24.01.04

Zhang, J., Cohen, R., 2008. Evaluating the trustworthiness of advice about seller agents in e-marketplaces: A personalized approach. Electronic Commerce Research and Applications 7, 330–340. https://doi.org/10.1016/j.elerap.2008.03.001

Appendixes

Appendix 1

Concept	Description	Affected Behaviour
Acknowledgement	All kind of feedback that praises the players' specific actions. Some examples and synonyms are badges, medals, trophies.	Engagement
Chance	Randomness and probability characteristics to increase or decrease the odds of certain actions or outcomes. Some examples and synonyms are randomness, luck, fortune.	Engagement
Competition	When two or more players compete against each other towards a common goal. Some examples and synonyms are Player vs Player, scoreboards, conflict.	Engagement Motivation
Cooperation	When two or more players collaborate to achieve a common goal. Some examples and synonyms are teamwork, co-op missions.	Motivation

Economy	Transactions within the game, monetising game values and other elements. Some examples and synonyms are markets, transaction, exchange.	Engagement
Imposed Choice	Decisions that the player is obliged to make in order to advance the game. Some examples and synonyms are judgements, forced choices. (not to be confused with Narrative).	Engagement Motivation
Level	Hierarchical layers present in a game, which provide a gradual way for the player to obtain new advantages as they advance. Some examples and synonyms are character levels, skill level.	Engagement
Narrative	Order of events where they happen in a game. These are choices influenced by the players' actions. Some examples and synonyms are the strategies the player uses to go through a level (stealth or action), also the good or bad actions that influence the ending, karma system. (not to be confused with Imposed Choice).	Motivation
Novelty	New, updated information presented to the player continuously. Some examples and synonyms are changes, surprises, updates.	Engagement Motivation

Objectives	Guide the players' actions. Quantifiable or spatial, from short to long term. Some examples and synonyms are missions, quests, milestones.	Engagement Motivation
Point	Unit used to measure users' performance. Some examples and synonyms are scores, number of kills, experience points.	Engagement
Progression	This allows players to locate themselves (and their progress) within a game. Some examples and synonyms are progress bars, maps, steps.	Engagement
Puzzles	Challenges within the game that should make a player think. Some examples and synonyms are actual puzzles, cognitive tasks, mysteries.	Engagement
Rarity	Limited resources and collectables. Some examples and synonyms are limited items, rarity, collection.	Engagement
Renovation	When players are allowed to redo/restart an action. Some examples and synonyms are extra life, boosts, renewal.	Engagement
Reputation	Titles that the player accumulates within the game. Some examples and synonyms are titles, status, classification.	Engagement Motivation

Sensation	Use of players' senses to create new experiences. Some examples and synonyms are visual stimulation, sound stimulation.	Engagement
Social Pressure	Pressure through social interactions with another player(s) (playable and non-playable). Some examples and synonyms are peer pressure, guilds.	Engagement Motivation
Stats	Visible information used by the player, related to their outcomes within the game. Some examples and synonyms are results, health bar, magic bar, HUD, indicators, data from the game presented to the user.	Engagement
Storytelling	It is the way the story of the game is told (as a script). It is told within the game, through text, voice, or sensorial resources. Some examples and synonyms are stories told through animated scenes, audio queues or text queues during the game.	Engagement Motivation
Time Pressure	Pressure through time within the game. Some examples and synonyms are countdowns, clock, timer.	Engagement

Table 1. Taxonomy of gamification elements by Toda et al.

Acknowledgement:

Definition: Recognition of players' specific actions, limited to visible rewards like badges, medals, trophies and other rewards. Doesn't cover more subtle forms of recognition or points.

Examples: Badges, medals, trophies, rewards.

Synonyms: Acknowledgment, praise.

Chance:

Definition: Integration of randomness and probability characteristics. The likelihood of winning something or experiencing luck-based outcomes. It doesn't cover situations where uncertainty exists without the chance of winning. For example, activities like scrolling through a feed, where the next content is unknown, won't be considered as chance unless it's clearly linked to winning or luck.

Examples: Luck-based outcomes.

Synonyms: Fortune.

Competition:

Definition: Interaction involving two or more players striving towards a shared goal. Includes instances where competition doesn't strictly require multiple players and can be perceived as a single-player competition against system characters.

Examples: Player vs Player, scoreboards.

Synonyms: Conflict, rivalry.

Cooperation:

Definition: Collaboration among two or more players for a common objective. Instances where the application allows the creation of content or collaboration between users. Collaboration is not taking commenting into consideration.

Examples: Teamwork, cooperative missions.

Synonyms: Collaboration, teamwork.

Economy:

Definition: Transactions and monetization of system values. To validate the economy, the system needs to have an economy differentiated from the real-life economy. Applications with real money cannot be considered as having the economy element but rather need a different currency.

Examples: Markets, exchanges.

Synonyms: Transactions, monetization.

Imposed Choice:

Definition: Decisions players must make to progress, distinct from narrative choices. However, an application requiring a user to input an email, username, etc. is not counted as having imposed choice. For example, having to choose what kind of content a user wants to see in the application or choosing a right answer for a question.

Examples: Forced decisions, judgments.

Synonyms: Obligatory choices.

Level:

Definition: Hierarchical layers providing gradual user advancement. A goal or an objective that has either a name or a number that the user needs to achieve. Levels are progress in numbers or level names that a user has progressed to.

Examples: Character levels, skill levels.

Synonyms: Advancement levels.

Narrative:

Definition: Sequential order of events influenced by users' actions. User continuously making decisions that impact the flow of the application. So, narrative requires imposed choice to change the flow of the application.

Examples: user-influenced storylines, karma systems.

Synonyms: Story progression.

Novelty:

Definition: Continuous presentation of new and updated information. An application that has nearly unlimited amounts of content available for the user and continuously presents it to the user. For example, being able to scroll for a very long time before content ends.

Examples: Changes, surprises.

Synonyms: Updates, freshness.

Objectives:

Definition: Clear goals that guide the users' actions, ranging from short-term to long-term challenges. Having something a user can cross over after they've done it. It can also be a bigger level, challenge, or a goal that is presented in a way that the user should do it.

Examples: Missions, quests, milestones.

Synonyms: Challenges, tasks, goals.

Points:

Definition: Units used to measure users' performance and accomplishments in a game. Any kind of score counter present in the application, not including the amount of money or wallet size.

Examples: Scores, number of kills, experience points, likes.

Synonyms: Point, score.

Progression:

Definition: Mechanism allowing users to locate themselves and track their advancement. Presented as having levels and showing the progress towards these levels. Also considered as a user knowing how far away from an acknowledgement they are. For example, having 100 points towards the next level or being three purchases away from a reward.

Examples: Progress bars, maps, steps.

Synonyms: Advancement, development, journey.

Puzzles:

Definition: In-game hurdles designed to make users think and strategize.

Examples: Cognitive tasks, mysteries.

Synonyms: Obstacles.

Rarity:

Definition: Limited resources or collectibles within the game. How rare something is that a user has obtained. For example, a chance-based reward that is better than other rewards that were possible to get or a limited trophy.

Examples: Limited items, rarity, collection.

Synonyms: Unique, exclusive, limited resource.

Renovation:

Definition: The ability for users to redo or restart an action within the system. Limited to getting a wrong answer and having the ability to retry it. Also boosts, be it popularity or other types of boosts.

Examples: Extra life, boosts, renewal.

Synonyms: Restart, refresh, revive.

Reputation:

Definition: Titles or status that accumulate based on users' achievements within the game. A title can be earned or paid for. The title differentiates the user from others in some way like having golden borders around their avatar.

Examples: Titles, status, classification.

Synonyms: Prestige, rank, standing.

Sensation:

Definition: Utilizing users' senses to create immersive and novel experiences. The use of music, sounds, and visuals that stimulate the user. Stimulation must be more than what basic user experience requires, so a clicking sound, or fancy buttons are not enough.

Examples: Visual stimulation, sound stimulation.

Synonyms: Immersion, experience, perception.

Social Pressure:

Definition: Influence and expectations from users and systems own characters. The ability to comment or influence other users via the application. Competitions also considered as social pressure.

Examples: Peer influence, community expectations, guilds.

Synonyms: Peer pressure, community standards, social influence.

Stats:

Definition: Visible information of user statistics. Data about the users' actions, present and past.

Examples: Skill points, health bar, head-ups display, receipts, charts.

Synonyms: Statistics.

Storytelling:

Definition: A story. It is told through text, sound, voice, or sensorial resources. A clear story structure, use of animation, and/or sounds.

Examples: Animated scenes, sound and text queues.

Synonyms: Story.

Time Pressure:

Definition: Pressure that is present in the form of time limits or ticking clocks. Any kind of clock or set date to achieve something or losing something after a certain time has passed.

Examples: Clock, timer, limited offer.

Synonyms: Pressure, timer, clock, countdown.

Table 2: Further explanation of gamification elements

Appendix 2

https://github.com/Poppaluu/Gamification-data-and-analysis/tree/main

Link 1: Dataset and code