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Towards Suitable Free-to-Play Games for Children

Master's thesis

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Abstract

Context: The Free-to-Play model has become popular in the gaming industry during the last decade. Games are offered for free, where additional content can be purchased. Different monetization features are used within Free-to-Play games to generate revenue. These features have been seen as problematic, especially when children are the players. A limited number of studies have highlighted the problem of these games, and little research has looked into the critical factors of Free-to-Play games and children.

Objective: The objective of this research is to identify the most critical factors towards creating suitable Free-to-Play games for children. The knowledge obtained from conducting a systematic literature review of Free-to-Play games and children led us to explore further how developers in the Free-to-Play-industry address children. In this study, we aim to answer the following research questions:

- **RQ1:** What is the reasoning behind the use of different monetization features in Free-to-Play games?

- **RQ2:** How are developers addressing children in Free-to-Play games?

- **RQ3:** What factors must be addressed to create suitable Free-to-Play games for children?

Method: We performed an exploratory study with 15 developers of Free-to-Play and children's games and three domain experts. Data was gathered using semi-structured interviews. A thematic analysis was undertaken to analyze the transcribed interviews and discover themes and patterns across our data set to answer the research questions adequately.

Results: The findings revealed six reasons developers had when choosing monetization features: 1) genre, 2) ethical perspective, 3) children, 4) purchase incentive, 5) player benefits, and 6) barriers. Developers addressed children to various extent, mainly through testing and through the use of guidelines. We identified five crucial factors to take into account when developing Free-to-Play games for children: 1) exploiting psychological behavior, 2) game design, 3) choosing features, 4) process, and 5) responsibility. The findings from the systematic literature review and the thematic analysis were used to propose a framework that practitioners can use to create suitable Free-to-Play games for children.

Conclusions and further work: The combination of Free-to-Play and children has several concerns, which we address by proposing a framework to be used by practitioners to develop more suitable Free-to-Play games for children. We hope this study will contribute to further research regarding Free-to-Play games for children's best interest.

KEYWORDS
Empirical Research, Free-to-Play, Freemium, Children, Systematic Literature Review, Thematic Analysis, Game Design, Game Development, Software Engineering.

Sammendrag

Kontekst: Free-to-Play modellen har blitt populær i spillindustrien de siste tiårene. Spillene er gratis, og ytterligere funksjonalitet kan kjøpes. Ulike inntjeningsmekanismer blir brukt for å generere inntekt. Disse mekanismene har blitt sett på som problematisk, spesielt når barn er spillerne. Et begrenset antall studier har fremhevet problematikken med slike spill, men det har vært lite forskning som har sett på kritiske faktorer knyttet til Free-to-Play og barn.

Formål: Formålet med dette forskningsprosjektet er å identifisere kritiske faktorer for å kunne lage Free-to-Play spill som er egnet for barn. Et systematisk litteratursøk på Free-to-Play og barn, ga oss kunnskap som motiverte oss til å forske mer på hvordan utviklere i Free-to-Play industrien adresserer barn. I dette prosjektet tar vi for oss følgende forskningsspørsmål:

- **RQ1:** Hva er resonnementet bak bruken av de ulike inntektsmekanismene i Free-to-Play spill?

- **RQ2:** Hvordan adresserer utviklere barn i Free-to-Play spill?

- **RQ3:** Hvilke faktorer må adresseres for å lage Free-to-Play spill som er egnet for barn?

Metode: Vi gjennomførte et utforskende studie med 15 utviklere av Free-to-Play- og barnespill, og tre domeneeksperter. Datainnsamling ble gjort gjennom semistrukturerte intervjuer. En tematisk analyse ble gjennomført på de transkriberte intervjuene for å hente ut temaer og finne mønster på tvers av datasettet, for å kunne gi helhetlige og gode svar på forskningsspørsmålene.

Resultater: Resultatene viser seks grunner for valg av inntjeningsmekanismer: 1) sjanger, 2) etisk perspektiv, 3) barn, 4) insentiver for kjøp, 5) fordeler for spiller, og 6) utfordringer. Utviklere adresser barn i varierende grad, hovedsakelig gjennom testing og bruk av retningslinjer. Vi identifiserte fem kritiske faktorer som burde bli tatt i betraktning knyttet til utvikling av Free-to-Play spill for barn: 1) utnytte psykologisk atferd, 2) spilldesign, 3) valg av inntjening- og sikkerhetsmekanismer, 4) prosess, og 5) ansvar. Funnene fra det systematiske litteratursøket og den tematiske analysen ble brukt til å foreslå et rammeverk som utviklere kan ta i bruk for å lage Free-to-Play spill som er egnet for barn.

Konklusjon: Det er flere bekymringer knyttet til kombinasjonen av Free-to-Play og barn som vi tar tak i ved å foreslå et rammeverk som kan brukes av utviklere til å lage egnede Free-to-Play spill for barn. Vi håper denne studien kan stimulere til videre forskning knyttet til temaet Free-to-Play og barn.

Preface

This thesis is submitted to the Norwegian University of Science and Technology (NTNU) as part of the course TDT4900 Computer Science, Master's thesis. The work has been performed at the Department of Computer Science, NTNU, Trondheim, under the supervision of Professor Letizia Jaccheri.

The Master's thesis builds on the systematic literature review from the course TDT4501 Computer Science, Specialization Project. A revised version of this literature review, *Understanding Free-to-Play Games For Children: A Systematic Literature Review*, has been submitted to the *Journal of Entertainment Computing (Elsevier)*, and can be found in Appendix B.1. This thesis will be submitted to the *Conference of Entertainment Computing (IFIP-ICEC 2021)*.

Acknowledgement

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Abbreviations

CEO: Chief Executive Officer
F2P: Free-to-Play
NSD: Norwegian Centre for Research Data
NTNU: Norwegian University of Science and Technology
SLR: Systematic Literature Review
P2W: Pay-to-Win

Chapter 1

Introduction

Free-to-Play (F2P) games are offered for free to the public, and developers get revenue from advertisements or additional content that the player can purchase (Harviainen et al., 2019). The paradigms of game development have changed drastically with the advent of F2P. The focus is shifting away from developing the best possible game to games that motivate the users to purchase virtual content as often as possible while increasing the user base (Flunger et al., 2017). Various strategies are thought to increase the player's commitment towards the game, increasing the risk of addiction, as well as overspending (Dreier et al., 2017). Features that resemble gambling have been widely used in F2P games and have received much attention over the years. With the advancement of technology, it easier for anyone to create games, and it is getting increasingly difficult to keep up with threats and vulnerabilities for all stakeholders, especially concerning children (Jaccheri and Morasca, 2021).

The objective of this thesis is *to understand better how suitable Free-to-Play is for children and what essential factors must be addressed to improve this relationship.* We present the findings from an exploratory study consisting of interviews with 15 developers and three domain experts. The main contribution is the Free-to-Play for Children framework.

This chapter proceeds as follows: Section 1.1 presents the motivation of the project. Further, Section 1.2 presents the research questions, followed by Section 1.3 that defines the research scope. Section 1.4 presents the chosen research methods and processes. Lastly, Section 1.5 presents the outline of the Master's thesis.

1.1 Motivation

It has never been easier to get access to games or apps for free. However, the revenue on in-app purchases on all apps was estimated to $4.6 billion in 2013 and $111 billion in 2020, a significant increase the last decade (Saleh, 2017; Chan, 2021). Virtual goods and other in-game content have become one of the most popular online consumptions in games

and a much-used revenue model for game publishers (Hamari et al., 2017a). The combination of children and F2P games could be ethically problematic, as the concept of money might not yet be clear to children (Alha et al., 2014). There have been observed several examples where children spend money in-game without their parents knowing. One example is when an eight-year-old spent £ 602 on Roblox's gaming platform without realizing they were spending real money (Tims, 2020). A survey among 3400 Norwegian children aged 9-18 revealed that 58 % of the children that play games had made in-game purchases (The Norwegian Media Authority, 2020a). Typically, F2P games include a variety of forms of advertisement and other mechanisms for monetization that consist of deceptive and exploitative elements (Fitton and Read, 2019). Additionally, some elements have a resemblance with gambling (Kristiansen and Severin, 2020). Features such as in-game advertisements and in-game purchases have been studied with adults. However, younger users have received little consideration despite their increased susceptibility to manipulation (Fitton and Read, 2019). Thus, there is a need for further research in this area.

Initially, as a part of the project thesis, an interview with a professor in game development, Alf Inge Wang, was conducted to get a broader understanding of F2P games. He provided several valuable insights and suggestions for companies that could contribute to further research. Moreover, the top 100 most popular games on App Store were scanned to collect relevant games. It was observed that most of them were marked with in-app purchases. Ten games in total were analyzed. The most used features in these games were advertisements (7/10). Additionally, the combination time restrictions and in-game currency were also used by several (3/10) and the concept of pay-to-win (3/10). Furthermore, the project thesis, *Free-to-Play Games For Children: A Systematic Literature Review* undertaken in the course TDT4501 - "Computer Science, Specialization Project" provides the foundation of the Master's thesis. This study has been submitted to the *Journal of Entertainment Computing (Elsevier)*. It can be found in Appendix B.1.

The objective of the systematic literature review was to research how children were addressed in F2P games and examine the common features used in such games. The findings did not answer what the most common features are but indicated that advertisement, lootboxes (e.g., mystery boxes), and in-game currency (e.g., the game's valuta) were widely used monetization features in F2P games in general. The discovery of the monetization features' characteristics motivated to examine developers' reasoning when choosing monetization features. Moreover, the systematic literature review identified that much of the research in this area is related to players' purchase motivations and revenue maximization. Few studies focused on the ethical aspects of children and F2P. Some studies highlighted the need for more restrictions, precise guidelines, and further research regarding the combination of F2P and children. This lack of research motivated us to investigate further how developers address children and what factors must be addressed to create suitable F2P games for children.

1.2   Research Questions

F2P developers need to design products to satisfy customer demands and attract more mobile device users to download and consume within the game (Chen and Lin, 2015). In many cases, this leads to over-aggressive monetization strategies and exploitive behavior (Fitton and Read, 2019). When creating games for children, they as a stakeholder should be included as much as possible in the development process (Jaccheri and Morasca, 2021). We aim at exploring how children are addressed in F2P games, how they should be addressed, and what factors are crucial for developing F2P games for them. These challenges have motivated the following research questions:

- **RQ1:** What is the reasoning behind the use of different monetization features in Free-to-Play games?

- **RQ2:** How are developers addressing children in Free-to-Play games?

- **RQ3:** What factors must be addressed to create suitable Free-to-Play games for children?

1.3   Research Scope

The investigation consists of semi-structured interviews with participants developing/have knowledge/experience concerning F2P games, games for children, or the relationship between F2P games and children. The primary focus was on participants that produce F2P games for children, mainly developers and game designers. However, as F2P for children is a small field, developers of regular F2P games were considered relevant to get better insight into F2P and the developers' design decisions. Three different domain experts were also included, as they were considered beneficial to answer RQ3. This resulted in the following criteria:

- The person had experience creating games for children.

- The person had experience creating F2P games.

- The person had the knowledge and experience about the relationship between games and children.

A candidate was considered eligible for an interview if they met at least one of the following criteria.

1.4   Research Process

To address the research questions, we chose to conduct a qualitative study. Interviews were the chosen data collection method, as it is considered an efficient method for answering research questions in explorative studies (Oates, 2005). The interviews were semi-structured as it gives the interviewee the possibility to express themselves more freely. The interview

questions were developed using the Goal Question Metric approach to ensure the research questions were answered (Caldiera and Rombach, 1994). All interviews were conducted digitally due to the ongoing COVID-19 pandemic.

All the interviews were recorded and transcribed. The transcribed interviews were then thematically analyzed based on Cruzes and Dybå (2011). NVivo was used to code the interviews. In total, there were 69 codes with 419 references. The generating of codes was conducted with a descriptive coding technique (Saldaña, 2021). The coding process was a mix of both inductive and deductive approaches, called an integrated approach. After the coding process, codes were categorized. From 16 themes, we ended up with three higher-order themes.

1.5   Outline of the Thesis

This Master thesis proceeds as follows; Chapter 2 presents the relevant background for understanding the context and the research questions. Next, Chapter 3 consists of the revised Systematic Literature Review, the method used, and a summary of the main findings. Chapter 4 presents the used research method for conducting interviews and thematic analysis, as well as ethical considerations when doing empirical research. The results of the thematic analysis are located in Chapter 5. Chapter 6 presents the proposed framework that is based on the thematic analysis, systematic literature review, and other relevant research. Furthermore, the research questions, limitations of the research, as well as implications of the framework are discussed in Chapter 7. Chapter 8 presents the conclusion and further work.

There are two appendices of this master. The consent form for participants of the interviews can be found in A.1. There are two different interview guides, one for experts (A.3) and one for developers (A.3). Further, A.4 contains the approval from NSD. Appendix B.1 contains the revised systematic literature review from the project thesis, *Understanding Free-to-Play Games For Children: A Systematic Literature Review* which has been submitted *Journal of Entertainment Computing (Elsevier)*.

Chapter 2

Background

In this chapter, necessary concepts for the objective, research questions, and context of the research are presented. Section 2.1 explains the Free-to-Play model and monetization features. Section 2.2 explains the important aspects related to children as a stakeholder and challenges concerning Free-to-Play and children. This chapter are a revised and updated version of the project thesis conducted prior to the Master's thesis. The following subsections are exceptions: Section 2.1.1, Section 2.1.2, Section 2.2.1, and lastly, Section 2.2.2.

2.1 Free-to-Play

Games that use freemium as a revenue model are usually denoted Free-to-Play (F2P). The freemium business model refers to a product or pricing structure where the core service is free. The revenue is generated through sales of additional products and premium services (Hamari et al., 2017b). The term comes from the combination of *"free"* and *"premium"*, due to the strategy providing a free version and having additional features that can be purchased (Gu et al., 2018). The freemium concept dates back to the 1980s when software firms such as Adobe started to publish software in *"light"* versions (Hamari et al., 2017b). These versions were free of charge but did not include all the functionality. A registration key could be purchased to gain access to all features. Over the past few years, freemium has gained popularity and seems to be the answer to earn money from content on the internet. Today, the freemium business is being used in various sectors such as music, social networks, data storage, virtual worlds, and most pertinently, the gaming industry (Hamari et al., 2017b).

F2P has been discovered to be a promising revenue model to compete with classic models, such as one-time payment and subscription-based models that require a financial investment before the user could play the game (Luton, 2013; Flunger et al., 2017). F2P games are distributed and played free of charge. However, the games are typically restricted in some manner Alha et al. (2014). To bypass these restrictions, in-game purchases are re-

quired. One example is to restrict how long the player gets to play the game. Moreover, other ways to monetize are by offering in-game items that enhance the gaming experience or give advantages to the players; these are known as virtual goods. (Harviainen et al., 2019). Virtual goods have become the main monetization method in F2P games (Flunger et al., 2017).

F2P has found its way into various genres such as Massive Multiplayer Online games (MMOs), multiplayer shooter games, gambling-related games, and mobile casual games utilized on multiple platforms such as computers, consoles, and mobiles. Facebook games became very popular due to the social network integration and F2P revenue model, which provided a virtual distribution channel and easy access to social games. Such games take advantage of friendships in meaningful ways within the game. Examples of F2P games that became successful, gathering millions of players are: *Farmville*, *CityVille*, and *Candy Crush* (Alha et al., 2014). The reason why social games have gone viral is due to social interactions that enrich gameplay and contribute to game experience (e.g., competition, co-operation, etc.) (Davidovici-Nora, 2013).

Paavilainen et al. (2013) points out two significant advantages of the F2P model. Firstly, the game's virtual goods allow for flexible price points for customers with different willingness to pay for additional content. Each microtransaction is usually so small that they fall within the Pennies-a-day theory of mental accounting (Gourville, J.T., 1998). The Pennies-a-day theory is when a more considerable expense is converted into a series of smaller amounts, which leads the customer to view a series of small expenses as less painful than a substantial one-time payment.

Secondly, it allows for a more comprehensive segmentation of players as the entry is free, and the virtual goods can be tailored to different audiences (Paavilainen et al., 2013). In addition to these advantages, the F2P model makes it possible to create positive network effects with a large user base even if they do not contribute to in-game purchases. More users exchanging information and experiences will subsequently lead to increased visibility and attract more users. Consequently, the greater the user base means potentially more players converting to paying players, leading to increased revenue and profit (Flunger et al., 2017).

Premium. Premium is paying for additional features of a product to get the full version, which is an essential factor of the freemium model (Gu et al., 2018). One example is an advertisement in a product with free content, where the premium version will give the player a product free of all advertisements. The advertisement can be seen as an annoyance and encourage to buy premium. Another example is paying for special features such as items, maps, and extended options. Games can often have different restrictions, such as limited time and turns. The player can bypass these restrictions by purchasing coins or other virtual valuta to unlock these restrictions, which can also be seen as premium.

Pay-to-Win. A subset of F2P is Pay-to-Win (P2W). P2W is a billing system where paying in-game has an impact on the results of the player (Lee et al., 2019). In P2W, the user can pay for in-game content that makes the game easier to play, or achievements can be reached faster (Heimo et al., 2018). P2W has been criticized by many players be-

cause paying players are getting advantages over the non-paying players (Lee et al., 2019).

2.1.1 Monetization Features

As monetization is central for the F2P-model, we see a need to describe the different ways this is currently being used in these games. We define monetization features as the concepts and elements that companies use to monetize their users. Table 2.1 presents the different monetization features.

Monetization Features	Description
Advertisement	Advertisement that the player has to watch in-between levels in the game (Hamari et al., 2017a).
Battle-Pass	A pass giving the player additional content (e.g cosmetics, extra game levels). (Zendle et al., 2020)
Hooks & Boosters	Elements that give the player more tries or more time to complete a game level or objective (Hamari et al., 2017a).
In-Game Currency	The game's own valuta that is needed to do purchases in the game.
Loot-Box	Is a virtual element that can be redeemed by the player to receive a randomized selection of cosmetics or In-Game advantages (Kristiansen and Severin, 2020).
Paywall	Block the players from continuing to play without paying (Lin and Chakraborty, 2016).
Premium	A premium that can be purchased (e.g avoid advertisement, avoid restrictions) (Hamari et al., 2020).
Pop-Ups	Windows that pop-up while the player is playing (e.g to ask the player to purchase something). (Hamari et al., 2017a)
Skins/Cosmetics	Cosmetics that can be purchased (e.g upgrade looks of character, clothing) (Flunger et al., 2017).
Subscription	Player as access to the whole game, or extended features as long as they a pay a monthly amount.
Time-Restrictions	Restrict the player's progression in the game by using timers. (Flunger et al., 2017)

Table 2.1: Description of the different monetization features seen in F2P games.

2.1.2 Target groups in F2P

Generally, four groups of players can be identified based on their financial investment in F2P games. These consists of *Freeloaders* (Players that do not contribute financially in the game), *Minnows* (players that contribute with 1-5$/month), *Dolphins* (Players that contribute with 6-15$/month), and *Whales* (players that contribute with more than 16$/month) (Dreier et al., 2017). Typically, *Whales* represent approximately 15% of the total player base but generate more than half of the total revenue (Derevensky and Gainsbury, 2016). This is a pressing issue for many of the F2P companies that try to convert more players and may target the *Whales* even more (Shi et al., 2015). Dreier et al. (2017) identified significant associations for a large percentage of children and adults meeting criteria for internet gaming disorder (IGD) and were classified as *whales*. They call for more specific countermeasures guaranteeing youth protection and prevention of developing IGD.

2.1.3 Free-to-Play and Children

Over the years, there have been multiple news stories related to children doing accidental purchases with their parents credit cards (Kleinman, 2019; Norris, 2021). In 2013, the US Federal Trade Comission (FTC) filed a class-action lawsuit against Apple inc, due to allowing children to make in-app purchases without the parent's consent. This resulted in a settlement requiring Apple to refund $32.5 millions to the consumers that were affected (Nash et al., 2012). Since then, Apple has improved its security for in-app purchases, but we still hear about cases from time to time. In 2020 Apple was filed another lawsuit for having games that use gambling mechanisms to target children and addicted gamblers (Purcher, 2021). This resulted in Apple having to change their policy and force the game developers to disclose the odds of each item.

A study on how children make purchase decisions in a supermarket revealed that most children behaved without purpose when making decisions regarding purchasing (Mau et al., 2016). Most of the children were distracted by all the stimuli in the simulated supermarket. The study enlightens that before the twentieth century, children were not seen as purchasers. The study state that in 2012, German children aged 6 to 13 years, pocket money's annual income added up to 1.85 billion euros. Further, their buying power was estimated at 6 billion euros, which has led to children being more targeted by marketing.

The Norwegian Media Authority has conducted several research studies to examine the media habits of Norwegian children; all of the studies have sections concerning children and gaming habits. One of the studies is a survey where 3400 children age 9-18 years old participated (The Norwegian Media Authority, 2020a). The results show that 86 % of 9-18-year-olds play games, 58 % of them have bought in-game, either themselves or that the parents purchase for them. The amount that they purchase themselves increases with age. Among those that purchase themselves, 4/10 did not ask their parents before their last purchase. It is more common among boys to purchase in-game than girls. Further, 17% of the ones that play games think they spend much money on gaming.
A survey among parents with children aged 1-5 years old revealed that 48% of the chil-

dren have access to a tablet. Out of these, 72 % started using a tablet before age three (The Norwegian Media Authority, 2021). The most common for the youngest children is to play weekly (23 %), eight % of the children play daily. The amount of time spent playing increases with age in this age group as well.

The increasing use of media for children has led to increased exposure to advertisements (Mau et al., 2016). Ladeira et al. (2016) state that exposure to various advertisements and different game creators is seen as problematic for children. They suggest there should be developed public regulations and policies for designing advertisements for children. An experiment done with children proved that advertisement in-game affected them(Smith et al., 2020). The experiment consisted of having the children play a game for 4 minutes. During the gaming period, there an advertisement was shown. Afterwards, the children were asked to choose between several snacks, and the results showed that the children were more likely to choose a specific snack if they saw an advertisement for it. An important factor is the children's ability to understand the advertisement's persuasive intention (Mau et al., 2016). Moreover, Zagal et al. (2013) informs that if children are very engaged in a game, they are less critical, which can be problematic when children are exposed to, for example, advertisements in the game.

There is a growing amount of F2P games that are accessible for children today. Most F2P games are accessible to children on various platforms such as The Apple App Store and Google Play Store. Many games are explicitly developed for children, but the majority of them are not. With the advancement of technology, it easier for anyone to create games, and it is getting increasingly difficult to keep up with threats and vulnerabilities for all stakeholders, especially children (Jaccheri and Morasca, 2021). F2P games that try to publish their games on these platforms get controlled before they get published. Most inappropriate games are removed, but still, many games bypass the platform's quality checks.

2.2 Children as a Stakeholder

This research is a part of the ChildrenByDesign project led by Letizia Jaccheri. The project aims to develop software that adequately addresses children's rights and needs. Children-ByDesign focuses on two main challenges. Firstly, children's rights and needs are poorly understood by software-intensive organizations and software developers. Secondly, software engineering knowledge does not include theories nor tools to include children's rights and needs in the software development life cycle (Jaccheri and Morasca, 2021).

The study Jaccheri and Morasca (2021) suggests a Quality Model that has children's best interest in focus when creating software, shown in Figure 2.1. The Quality Model consists of four dimensions that are considered necessary when developing software for children. These four dimensions are security, well-being, creativity, and fun. Several of these aspects can be essential to address when creating F2P games for children.
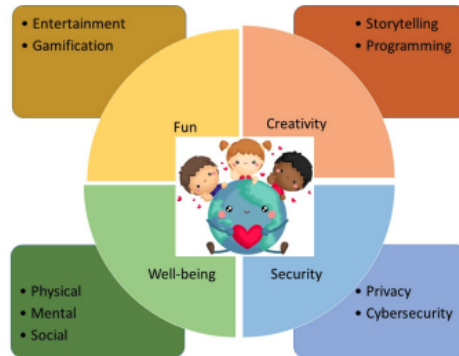
Figure 2.1: Quality model for software for children (Jaccheri and Morasca, 2021).

2.2.1 The role of parents

In a study conducted with 2000 parents with children aged 1-17 years old, the majority of the respondents think that parents and adults close to the children should have the main responsibility when it comes to protecting children and adolescents online (88%) (The Norwegian Media Authority, 2020b). Further, half of the parents state that they have all the information they need to guide their children about their online usage. Additionally, more than half state that neither themselves nor their children have bought something in-game (63%). However, the study The Norwegian Media Authority (2020a) reveals that a higher percentage of children bought in-game. Furthermore 28% of the children respondents stated bought something where the content was a surprise, while just 6 % of the parents state that the children had bought surprise related content (The Norwegian Media Authority, 2020b). One-third of the respondents agree that it is challenging to keep track of what their children do online. Near half of the parents do not use parental control (44%). Furthermore, 16 % states that they do not know how to use parental control. These studies indicate that parents struggle with keeping track of their children, and not everyone knows what to do. Even though most parents meant they were responsible, this indicates that it is not working in practice.

2.2.2 Regulations and children right's

Issues arise across many jurisdictions when evaluating consumer rights regarding in-game purchases, whether a virtual good should be considered equivalent to tangible real-world products (King et al., 2019). In the EU, consumers that buy online have the right to claim a refund, usually for 14 days (Hilgert, 2019). This is mandatory, except for digital content, where it can be contractually waived in advance in digital content contracts. Often it can be that the consumer consent that they renounce their withdrawal right when they start using the product. The purchase of virtual goods is one example of elements that qualifies as digital content. The authors Hilgert observed that the Apple App store has practices for requesting consent and inform of the loss of the withdrawal right.

Children's Online Privacy Protection Act (COPPA) regulates mobile apps, games, and websites regarding what personal information that is allowed to collect and process from children under the age of 13 (Reyes et al., 2018). COPPA disallows certain data collection practices, as well as requiring parental consent. Further, it prohibits having targeting advertisements (Vlajic et al., 2018). The study Reyes et al. (2018) revealed that the majority of the free children's apps potentially are violating COPPA. Mainly because of third-party Software Developments Kits. Furthermore, 19% collect identifiers or other personally identifiable information in children's apps.

The General Data Protection Regulation (GDPR) was established in EU and came into effect May 2018 (Jost and Lampert, 2020). GDPR aims to provide guidance in privacy and data protection and improve scientific integrity of human-related studies. GDPR has a broader focus than COPPA and is written to be a flexible legal framework that can be customized further by the countries in the EU (Vlajic et al., 2018). However, it is as strong as COPPA regarding the protection of children's privacy online. One of the articles in GDPR addresses the concept of 'minors' digital consent, with an age threshold of 16. Each EU member can set it to a lower age, but no lower than 13 years old. Below the given age, parental consent is required. GDPR has its own section related to kids, referred to as GDPR-K. One substantial difference between GDPR-K and COPPA, is that GDPR-K contains the provision *"right to reasure"*, also known as *"right to be forgotten"* (Vlajic et al., 2018). Moreover, Vlajic et al. (2018) reveals that kids and teens still are frequently tracked by third-party companies, despite existing laws that prohibit such practices. Children protected by the GDPR in the EU appear slightly better shielded from third-party tracking relative to the children protected by COPPA. However, it is still considered insufficient.

2.2.3 Ethics and dark design

It has been stated that developers have an ethical responsibility when creating software (Sommerville, 2016). Moreover, technical competence should not be used to behave dishonestly. Zagal et al. (2013) substantiates Sommerville (2016) and states that game designers typically are regarded as the player's advocates. However, the authors point out that the game creator does not necessarily have the same interest in the games as the players. Furthermore, it has been observed that not all developers may have the user's best interest in mind (Harviainen et al., 2019). Additionally, developers can have different perceptions of what they consider ethical game development. Features of games can be regarded as hindrances or psychological traps used to motivate them to spend money. A former CEO of the American game developer company Zynga has stated, *"I did every horrible thing in the book, just to get revenues right away"* (Harviainen et al., 2019). Ethical dilemmas may arise when people have different views of a situation or the way things are done. In today's gaming market, anyone can create a game and upload it to the App Store or Google Play Store independent of their background, leading to games that exploit the user, as the CEO from Zynga admitted.

Another ethical aspect that has been observed is dark game design patterns. A dark game design pattern is defined as a pattern intentionally designed by a game creator to cause

negative experiences for players, which are against the player's best interest and likely to happen without the player's consent (Zagal et al., 2013). Additionally, the paper states that if the player is aware of the design pattern's effect and can give their consent, the pattern is no longer dark. Zagal et al. (2013) does not address dark patterns targeted at children in particular.

Chapter 3

Systematic Literature Review

In advance of the Master's thesis, undertaken in the specialization project, a systematic literature review was conducted to get insight in the area of Free-to-Play and children. Guidelines from by Kitchenham and Charters (2007) were followed in every step of the process to address the research objective and the research questions. This chapter presents the systematic literature review and its findings. Initially, the study provided 16 papers. Small adjustments to the search were made at the beginning of the Master's thesis to address the research questions better (Section 1.2). This resulted in a total of 19 papers. A table of all the papers can be found in Appendix B.1. As mentioned in Section 1.1, this chapter is a more concise version of our paper *Understanding Free-to-Play Games For Children: A Systematic Literature Review* submitted to the *Journal of Entertainment Computing (Elsevier)*. The chapter proceeds as follows: Section 3.1 presents and explains the research process. Section 3.2 presents the main findings and future work.

3.1 Research Method

This systematic literature review (SLR) follows guidelines by Kitchenham and Charters (2007). Moreover, an article written by Papavlasopoulou et al. (2017) on the maker movement was used as a template for conducting the SLR. The SLR covers 19 studies from 2015 to 2020. The main steps of the process are explained in these sections and include the research questions, data collection, inclusion/exclusion criteria, quality assessment, data analysis, and data synthesis.

3.1.1 Research Questions

The SLR aims to research how the freemium model, specifically how Free-to-Play games address children. With insufficient information from previous studies and their ability to understand how Free-to-Play games target children as their users, this study investigates two aspects. Firstly, the typical concepts and functionality used in Free-to-Play games that target children. Secondly, how children's rights and needs are addressed in the available

literature lead to the following research questions:

Research question 1 *What are the most common features used in Free-to-Play games for children?*

Research question 2 *To what extent are children addressed in Free-to-Play games?*

3.1.2   Data Collection

We searched the following international online bibliographic databases to collect high-quality data: association for Computing Machinery Digital Library (ACM), Science Direct, IEEE Xplore, and SpringerLink. In order to converge the search to find relevant studies for our research questions, a combination of keywords and their synonyms were used together with operators such as AND or OR, see Table 3.1. The exact search string was used for ACM, Science Direct, and SpringerLink, except for IEEE Xplore, where the search string was simplified to get more hits. This gave a total of 584 hits; see Table 3.2.

Online library	Search strings applied
ACM	(freemium OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)
Science Direct	(freemium OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)
IEEE Xplore	"in-app purchase" OR "in-game purchase"
SpringerLink	(freemium OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)

Table 3.1: Search strings applied in online bibliographic databases.

Online library	Number of hits
ACM	70
Science Direct	132
IEEE Xplore	7
SpringerLink	375

Table 3.2: The number of hits in each online library.

3.1.3   Inclusion/Exclusion Criteria

We defined filter criteria to retrieve the most relevant articles to the research questions. On-going studies, short papers, books, duplicates, and articles published before 2015 were excluded. This step decreased the number of papers in order to yield a manageable amount for detailed analysis. Papers with unrelated topics were excluded. Furthermore, studies that did not show empirical evidence were removed. Both qualitative and quantitative studies were included. We focused mainly on the title and abstract to decide whether a

paper was inside or outside the scope. The inclusion and exclusion criteria can be seen as three categories, as defined below:

1. The publish year of the article should be dated after 2015. Technology used before 2015 could potentially be outdated and were therefor left out.

2. Remove duplicates: Articles that appeared in the search for more than one online library.

3. The study's main concern is relevant to the research problem.
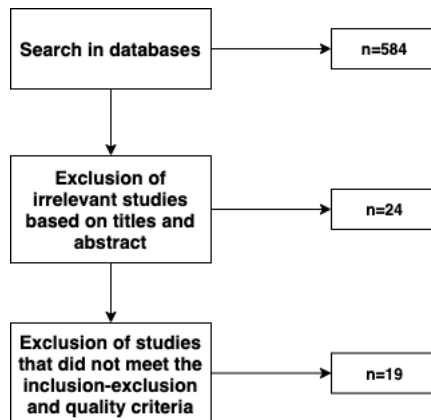
Figure 3.1: The study selection process, resulting in 19 papers.

This process decreased the number of articles in our data collection while increasing the relevance of the remaining articles. The distribution can be seen in table 3.3. Finally, we ended up with 19 studies, which can be seen in figure 3.1.

Online library	Number of hits
ACM	6
Science Direct	9
IEEE Xplore	3
SpringerLink	1

Table 3.3: Overview of the distribution of primary studies that met the inclusion and exclusion criterias.

3.1.4 Quality Assessment

According to Kitchenham and Charters (2007) there are three main criteria to perform empirical research in software engineering; (1) *rigorous*; (2) *credible*; and (3) *relevant*.

"rigorous" refers to the appropriate use of research method applied to the study, "credible" points to the presentation and validity of the findings, and "relevant" indicates whether the findings of each study points towards education science, as well as computer science education research communities. Three additional criteria were selected to assess the quality of the studies:

1. The study is a primary study presenting empirical results.

2. The study has a precise and well-described method.

3. There is a clear statement of the aim of the study.

In total, 19 studies met the inclusion, exclusion, and quality criteria. Concerning our critical examination of the papers, fields were defined to represent the content of each study (Appendix B.1). These fields are derived from considering different aspects of the type of Free-to-Play, methodology used, instruments, and findings. The categorization enabled us to document all the details needed from each literature review paper to address the research questions as explained in the next section.

3.1.5 Data Analysis

When going through the primary studies, the following was extracted in two tables; 1) Overview of Primary Studies: year of publication, author, title, the conference, method (qualitative, quantitative, mixed), instruments used (e.g., surveys, interviews, observations), sample size, duration, age of participants data analysis, see Table 3.4. 2) Main findings from Primary Studies: main findings, type of the Free-to-Play type, area of study (purchase motivation, company motivation, ethics, regulations), see Table 3.5. According to the coding scheme, all 19 studies were analyzed in detail, and data were extracted to answer the research questions better. Not every paper included all this information, and there were also various studies using adults and children. Studies with adults were also considered relevant since there were not that many studies that met the criteria. Further, an issue for adults is most likely an issue for children as well.

3.1.6 Threats to Validity

The original data collection resulted in 377 studies. However, applying inclusion/exclusion criteria and quality assessment resulted in 16 papers. There may be multiple reasons for the limited number of papers. Firstly, one possible reason is the lack of research concerning the topic. Secondly, the search strings used for data collection could have been too specific, which may have excluded relevant papers for the research project. The original search string included "well-being" and "security", as the original research question two was: *"How are children's well-being and security addressed in freemium games?"*. Furthermore, "security" and "well-being" were only relevant for the original research question 2. However, in the updated search, "security" and "well-being" were removed from the search string. The final result was 19 papers, just three more papers than the original result. Nevertheless, we observed that the updated data collection had a significant increase to 584 papers, but after inclusion/exclusion and quality assessment resulted in almost the same amount of papers. This indicates that this area of F2P and children is not that much researched.

Further, the expressions "freemium" and "F2P" were used interchangeably in the literature. It varied what the authors used to denote the games. However, F2P was not included in the search string, as the original research questions used freemium instead of F2P. This can have resulted in some papers being left out. However, of the papers retrieved, only one had F2P in the keywords without freemium as well. As Freemium is the collective term, it was considered to cover the field. However, the search string could potentially have limited the number of relevant papers.

On the other hand, the results showed an increase in relevant papers from 2015 to 2020, as more than half of the papers were from the last two years. This may indicate that the topic is becoming more researched and will probably increase over the years. The 19 papers show a broad aspect of different content, as shown in Figure 3.3. A variety of research perspectives can help get a general understanding of the research topic, but not a deep understanding. Furthermore, not every paper found in the SLR targets children in particular. They were considered relevant as many games today are not made directly for children but are available. Excluding studies that did not mention children or used children in the research would have limited the search too much.

3.2 Synthesized Results and discussion

In this section, a summary of the findings is presented. The results are divided into three parts: the general results, synthesized answers to the research questions (Section 3.1.1), and conclusion.

3.2.1 General results

The distribution of papers is from 2015 to 2020, see Figure 3.2. There is an apparent increase in the number of papers. More than half of the papers are from the period 2019-2020.
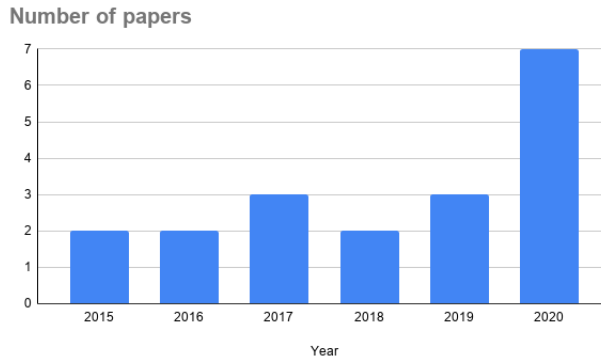
Figure 3.2: Numbers of papers in the literature review, published from 2015 to 2020.

All the studies focus on Free-to-Play. Most of the studies look into in-game purchases and different kinds of F2P features. Additionally, different papers have different perspectives. These are categorized into purchase motivation, company motivation, ethics, and regulations, shown in 3.5. The distribution of the different perspectives is presented in figure 3.3.
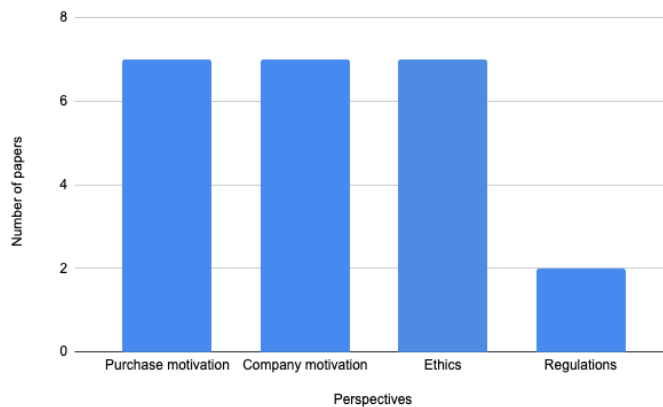
Figure 3.3: The different motivation areas discovered in the studies.

3.2.2 RQ1: What are the most common features used in Free-to-Play games for children?

Features include both specific functionalities and different design aspects and concepts concerning Free-to-Play. The majority of the papers do not discuss specific features but rather the concept of in-app purchase or Free-to-Play in general.

The study by Liu et al. (2016) revealed that among 67,778 apps targeting children, 22.5% of them offer in-app purchases, and 53% of them used targeted advertisements. The analyzed apps were free and mentioned to be a possible reason for the high percentage of advertisements. Another study done by Fitton and Read (2019) had similar results regarding advertisements. Moreover, the study Ekambaranathan et al. (2020) state that targeted advertisements is the most common way for generating revenue.

Several papers researched the loot-box concept, mostly because it is discussed to have a resemblance with gambling. Kristiansen and Severin (2020) had 1,137 participants aged 12-16 as a part of the research. The results showed that nearly half of the participants involved with gaming the last year had also engaged with loot-boxes. This F2P feature received much attention indicating that it is quite common to use in F2P games. Furthermore, in these studies, several of the features used relate to in-game currency, especially loot-boxes (Zendle et al., 2020). This indicates that in-game currency is an essential feature for F2P games.

The results of Fitton and Read (2019) show a classification of dark design aspects in F2P apps for children, shown in Figure 3.4. The different types, shown in the right column, are concepts or features typical to find in games for children. Features with pay-to-win mechanisms were discussed by Fitton and Read, as well as several researchers in the results.

Category	Types
1. Temporal	Grinding
	Play by Appointment
	Interstitial Non-app Content
2. Monetary	Pay for Permanent Enhancements
	Pay for Expendable Updates
	Pay to Skip/Progress
	Pay to Win
	Subscriptions
	Intermediate Currencies
3. Social	Impersonation/Friend Spam
	Prompts to Share/Review
	Social Pyramid Schemes
4. Disguised Ads	Advergames
	Characters Placement
5. Sneaky Ads	Difficult/Deceptive to Dismiss
	Camouflaged Game Items
	Notification-based Ads
6. Inappropriate	Unsuitable Adverts
	Encouraging Anti-Social Behavior
	Psychological Manipulation
	Persuasive Design
	Developmentally Insensitive

Figure 3.4: ADD framework adjusted for children (Fitton and Read, 2019).

3.2.3 RQ2: To what extent are children addressed in Free-to-Play games?

The systematic literature review revealed that children were addressed in different ways. One aspect concerns the role of parents when their children play games. Another focuses on how the developers and the companies that develop F2P games have the children's best interest in mind. Results also indicated that some games did not address children at all and that the focus is mainly on revenue maximization and designing games where the users want to buy in-game, as shown in Figure 3.3. However, several papers were critical to features and in-game purchase designs in children's games. Moreover, several papers expressed concerns about the ethical aspects and that regulations and game design guidelines were needed regarding children and F2P games.

The study by Ekambaranathan et al. (2020) examined the values and design practices of Android family app developers. The results revealed that the developers' tried to develop ethical apps for their users but were limited to do so due to biased guidelines and lack of monetization options. It is further stated that there is a need for actionable guidelines and important directions to support both end-users ' and developer's values. King et al. examines different design features and critically discusses them concerning behavioral economics, addiction, and the clinical conceptualization of gaming disorder (King et al., 2019). Through the framework, presented in Figure 3.4, Fitton and Read identifies problematic Dark Design aspects used in apps for adolescents.

Overall the SLR indicates that there are several concerns regarding children in F2P games. Many developers have different perspectives than the children or their parents. Several features can be classified as dark design, indicating that children's best interest is not the focus.

3.3 Conclusion

The systematic literature review resulted in 19 primary studies in the scope of Free-to-Play games and children.

The results of the systematic literature review did not reveal a straightforward answer to the RQ1. However, the results indicated that typical features are advertisements, loot boxes, and in-game currency. Especially, targeted advertisements were highlighted and stated as the most common by (Liu et al., 2016). Further, several dark design aspects in apps for children were discussed. Pay-to-Win was researched and stated as a problematic concept. Several papers discussed the loot box feature due to its similarity with gambling. Furthermore, many papers discussed in-game purchases in general, and several mentioned different features and concepts. However, most of these discussions were more about the different features and their functionality. The literature review revealed that several features could negatively impact or trick the player into buying.

In light of RQ2, the findings revealed that children in F2P games are addressed in different ways. However, many of the primary studies relate to revenue maximization and influential factors to make in-game purchases. Several of the studies expressed concern regarding how games target children. Further, there were revealed several dark design aspects. Some of the features were discussed to have resemblances with gambling, which indicate a negative impact. Furthermore, features were linked to addiction psychology and gaming disorders. The parent's role concerning children's rights was discussed in some of the papers. However, no one concluded that it was their responsibility. One researcher examined the values of developers and revealed that they want to develop for the children's best interest but have to compromise due to revenue. Several researchers concluded a need for restrictions, more precise guidelines, and further research in the area.

The primary papers devoted no attention to the development process and how this could be improved to better address children's rights and needs. Several researchers agree that further research and guidelines are needed and that children are especially vulnerable. Overall, none of the results reveals solutions to creating Free-to-Play games targeted at children. Hence, based on the literature review, we conclude that there is a need for further research.

No.	Year	Authors	Title	Conference/Journal	Method	Sample Size	Participant type
1	2016	Chen et al.	A Decision Tree Based Method for Extracting Important Elements of In-Applications Purchase	2016 Third International Conference on Computing Measurement Control and Sensor Network	Mixed (Pre-test questionnaire)	217	<18 (3%) 18-30 (48%) 31-40 (14%) >40(35%)
2	2015	Chen and Lin	Purchase Prediction in Free Online Games via Survival Analysis & Key Factors of In-App Purchase for Game Applications	7th International Conference on Emerging Trends in Engineering & Technology	Mixed	205	<18 (0%) 18-30 (95%) 31-40 (4%) >40 (1%)
3	2019	Yang et al.	Purchase Prediction in Free Online Games via Survival Analysis	2019 IEEE International Conference on Big Data (Big Data)	Quantitative	-	-
4	2016	Liu et al.	Identifying and analyzing the privacy of apps for kids	Proceedings of the 17th International Workshop on Mobile Computing Systems and Applications	Quantitative	-	-
5	2019	Fitton and Read	Creating a Framework to Support the Critical Consideration of Dark Design Aspects in Free-to-Play Apps	18th ACM International Conference on Interaction Design and Children	Qualitative	39	12-13 years
6	2020	Lelonek-Kuleta et al.	Pay for play–Behavioural patterns of pay-to-win gaming	Computers in Human Behavior	Quantitative	2000	15-94 years
7	2018	Alha et al.	Free-to-Play Games: Paying Players' Perspective	22nd International Academic Mindtrek Conference	Qualitative	11	24-44 years
8	2020	Ekambaranathan et al.	Understanding Value and Design Choices Made by Android Family App Developers	CHI 2020 Late-Breaking Work	Qualitative (Interviews)	20	
9	2020	Wijanarko and Dewanto Hadisumarto	Online Video Games as Distribution Channel for Retail Brand Voucher	ICEEG 2020	Qualitative	523	
10	2020	Kristiansen and Severin	Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey	Journal: Addictive Behaviors	Quantitative	1137	12-16 years

No.	Year	Authors	Title	Conference/Journal	Method	Sample Size	Participant type
11	2018	Nouwen and Zaman	Redefining the role of parents in young children's online interactions. A value-sensitive design case study	International Journal of Child-Computer Interaction	Qualitative (Workshop)	Not specified	Parents
12	2017	Thaichon	Consumer socialization process: The role of age in children's online shopping behavior	Journal of Retailing and Consumer Services	Qualitative	63	8-15 years
13	2020	von Meduna et al.	Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey	Technology in Society	Quantitative	6000	All ages, mostly adults
14	2019	King et al.	Unfair play? Video games as exploitative monetized services: An examination of game patents from a consumer protection perspective	Journal of Computers in Human Behavior	Qualitative	13 patents	-
15	2017	Hamari et al.	Why do players buy in-game content? An empirical study on concrete purchase motivations	Journal of Computers in Human Behavior	Mixed	519	19-49 years
16	2015	Georgieva et al.	Transposing freemium business model from casual games to serious games	Journal of Entertainment Computing	Mixed	240	18-34 years
17	2020	Zendle et al.	Paying for loot boxes is linked to problem gambling, regardless of specific features like cash-out and pay-to-win	Journal of Computers in Human Behavior	Quantitative	1200	18-40 years
18	2020	Hamari et al.	"Why pay premium in freemium services?" A study on perceived value, continued use and purchase intentions in free-to-play games	International Journal of Information Management	Quantitative	869	<40 years
19	2017	Lin and Chakraborty	A Study of Crucial Factors for In-App Purchase of Game Software	JSAI International Symposium on Artificial Intelligence	Qualitative	361	-

Table 3.4: Classification Schema of the discovered studies from 2015-2020.

No.	Main Findings	Free-to-Play Type	Area
1	7 crucial factors for influencing in-App purchase; social value, satisfaction, compatibility, perceived enjoyment, animation, scenario, character, and innovativeness. The first three factors belong to the whole game App, and the last four factors related to game design.	In-App Purchase	Company motivation
2	9 important factors for predicting purchase behavior; perceived ease of use, compatibility, result demonstrability, trial, mass media, interpersonal channels, perceived enjoyment, cognitive concentration, and perceived risk. The discovered results can provide game App developers to design products in the future.	In-App Purchase Premium Advertising	Company motivation
3	Payers' in-game progress is the most important variable related to player purchase decisions in the gameplay experience.	In-App Purchase	Company motivation
4	A classifier was designed and evaluated to predict whether an app is designed primarily for kids. Several features from the detail page of app were extracted and evaluated the classifier on a set of 1700 labels, achieving 95%. Moreover the classifier were used on a large set of apps to generate a list of apps for children.	In-App Purchase Advertising	Regulation
5	The qualitative study supports the ADD framework considering Dark Design Aspects in Free-to-Play apps. Analysis of the data collected from the participants showed a range of emerging themes both supporting and utilizing the initial framework, and identification of a new category within the framework.	In-App Purchase Premium Advertising P2W In-Game Currency Time restrictions	Ethics
6	Five patterns of user involvement in the game was identified among players in P2W games: regular very involved/high payments, regular involved/low payments, occasional moderately involved, regular uninvolved, occasional uninvolved. Moreover, P2W gamers that paid to increase their chances of winning on average played several times a week, bought additional options on average once a month with average gaming session on 30-60 min.	In-App purchase Premium P2W Virtual Goods	Purchase motivation
7	Faster advancement in a game is worth the money. The participants saw their use of money generally in a positive light. Participants that had used several hundreds of euros, did not feel that it was problematic, considering how much time they had spent in the game. The F2P players experienced the F2P model as positive and ethical, but it included characteristic problems: paywalls, Pay-to-Win mechanics, content gained only through paying, aggressive monetization, and making exploitation easier.	In-App Purchase Premium P2W Paywall	Ethics

No.	Main Findings	Free-to-Play Type	Area
8	In general the developers values have the best interest of users in mind, they often have to compromise because of market pressure, lack of monetization options and the use of biased design guidelines. The paper propose a need for guidelines and important directions for HCI research to support end-users' and developers values.	In-App Purchase Advertising Game Promotions	Ethics
9	The results indicated that reasons for purchasing consisted of 6 dimensions: Ostentaious, Addiction, Generosity, Eagerness, Personal value, Indulgence. Further these factors in light of Behavioral Aspects and Intention to use cashback digital voucher was investigated - and revealed that the dimensions of Generosity and Personal Value could have an impact.	In-Game Purchase Cashback Virtual Goods Vouchers In-Game Currency	Ethics
10	56.1% were engaged in loot boxes at some level. 93% of males had earned, bought or sold items, 15% of the females reported engagement with loot boxes. New patterns between loot box engagement and and problems with gambling. 42.5% reported experience with obtaining a loot box, 19.8% indicated experience with purchasing a loot box, 10.6% reported experience with selling virtual goods from a loot box - requires greater engagement. The latter had the highest risk of gambling problems.	Loot Boxes	Ethics
11	Design guidelines based on the study: 1. Platforms for young children should provide concrete clues to parents about how the platform´s mechanisms define the child´s possibilities to play and communicate. 2. New functionalitites should enable parents to engage online with their young children in concrete, well-defined activities.	In-App Purchase	Ethics
12	Children aged 8-11 and 12-15 were different in their behavior and perceptions of online shopping. The results of the interviews suggest that the level of children´s online shopping varies and is influenced by many factors such as age, parental guidance, social networks, and peer influence.	-	Purchase motivation
13	Typical loot boxes are young, employed, have a low level of education but an average household income. They gamble with both real and play money are likely to be problem gamblers/gamers. Loot box users are an average age of 36.7 years	Loot Boxes P2W	Ethics
14	Many of the 13 patents used advanced data analysis tools to make the players do more purchases in-game. Appropriate policy and consumer protection measures, psychologically informed interventions, and ethical game design guidelines are needed in order to protect the interest and well-being of consumers, particularly adolescents who tend to be most avid players but may also be the most vulnerable and least well-informed consumer group.	In-Game Purchase	Regulation Company Motivation Purchase Motivation

No.	Main Findings	Free-to-Play Type	Area
15	Purchasing reasons converged into six dimensions: Unobstructed play, Social interaction, Competition, Economical rationale, Indulging the children, Unlocking content. The relationship between these factors and how much players spend showed that the purchase motivations of unobstructed play, social interaction, and economical rationale were positively associated with how much money players spend money on in-game content. The design affects how much players spend.	In-Game Purchase Virtual Goods	Purchase motivation
16	An effective model for analysing the players and their preferences tend to be the Free-to-Play model used as basis in particularly within the social gaming domain. The model can be very attractive; needs several iterations before starting to pay off in terms of revenue streams.	In-Game Purchase Virtual Goods	Company motivation
17	Correlation analysis showed that the greater the level of an individual's spending on loot boxes, the more severe their problem gambling. Cash out, near-misses, and using in-game currency strengthened links between problem gambling and loot box spending.	Loot Boxes P2W In-Game Currency	Ethics
18	The more enjoyable the players perceive the service to be, the more they are willing to use it, however, the less they are willing to purchase premium content. As expected, social value was found to be positively associated with purchasing game content. The quality of Free-to-Play service interestingly does not seem to be associated with the intention to continue using the Free-to-Play service. The economical value of the Free-to-Play service had an in-direct association with purchases through the increased willingness to continue using the Free-to-Play service.	In-Game Purchase	Purchase motivation
19	The results revealed 6 cruical factors for In-Game Purchase; social value (SV), perceived enjoyment (PE), affective involvement (AI), animation (GA), scenario (GSC) and innovativeness (GI)	In-App Purchase Advertising Paywalls In-Game Currency Virtual Goods	Ethics

Table 3.5: Contextual Descriptions of the discovered studies from 2015-2020.

Chapter 4

Research Method

This study aims to understand how suitable Free-to-Play (F2P) is for children and what essential factors must be addressed to improve this relationship. In particular, we will investigate how F2P developers address children, the reasoning behind the use of monetization features, and capture the important factors needed to develop suitable F2P games. We propose a framework that visualizes the critical factors regarding F2P and children, serving as a guideline for developers and a foundation for researchers to explore further.

This study is of exploratory nature as we seek to create knowledge by investigating the events and actions of those who experience them (Oates, 2005). Several data generation methods were evaluated to answer the research questions. We decided to use qualitative methods. More specifically, semi-structured interviews let us focus on the pre-defined questions to answer the research questions and let the participants express themselves more freely and allow for follow-up questions. 83 participants were contacted, which resulted in 18 interviews. Other data generation methods such as observations were considered, but the time constraint of this study made observations an unattainable option. Surveys were also considered. However, the immense number of participants required for such a method made this option unattainable. The overview of the research process is shown in Figure 4.1.

The chapter proceeds as follow: Section 4.1 presents and justifies the research questions in this empirical research. Section 4.2 presents the use of GQM-approach to create interview questions. Section 4.3 presents the subject selection. Section 4.4 presents how the interview were undertaken. Section 4.5 presents the qualitative data analysis process, consisting of how and why the thematic analysis was used. Section 4.7 explain how we manage the ethical considerations.
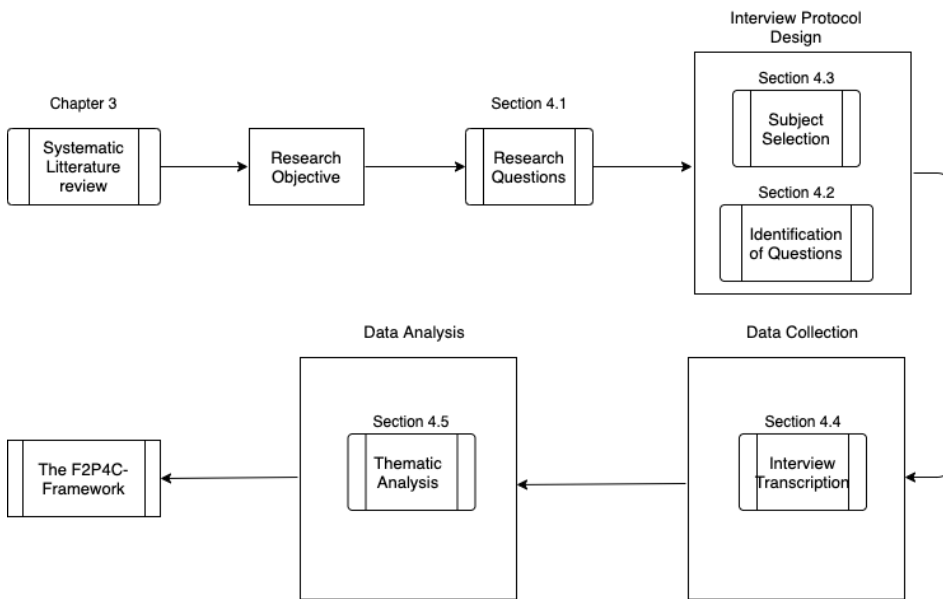
Figure 4.1: Overview of the research process.

4.1   Research Questions

Based on the Systematic Literature Review findings, there were observed several gaps regarding the perspective of children. Many of the studies focused on revenue-maximizing, either factors that incentives players to make in-game purchases or techniques companies could utilize to increase their revenue (e.g., data-driven development). In general, there was not that much research on creating F2P games for children. However, several studies claim F2P as problematic for children, more specifically regarding in-game purchases, gambling, and addiction.

Free-to-Play developers need to design products to satisfy customer demands and attract more mobile device users to download and consume within the game (Chen and Lin, 2015). In many cases, this leads to over-aggressive monetization strategies and exploitive behavior (Fitton and Read, 2019). When creating games for children, they as a stakeholder should be included as much as possible in the development process (Jaccheri and Morasca, 2021). We aim at exploring how children are addressed in Free-to-Play games, how they should be addressed, and what factors are crucial for developing F2P for them. These challenges have motivated the following research questions:

- **Research question 1:** *What is the reasoning behind the use of different monetization features in Free-to-Play games?*

- **Research question 2:** *How are developers addressing children in Free-to-Play games?*

- **Research question 3:** *What factors must be addressed to create suitable Free-to-Play games for children?*

4.2 Identification of Interview Questions

The identification and creation of the interview questions were made by using the Goal Question Metric (GQM) approach (Caldiera and Rombach, 1994). It was originally defined for evaluating defects for projects in the NASA Goddard Space Flight Center environment (Caldiera and Rombach, 1994). It has expanded over time from being used to define and evaluate goals for a particular project to a broader field of application. The results of the GQM approach is a measurement model that consists of three levels:

1. *Conceptual level (GOAL)*: Where a goal is defined for an object.

2. *Operational level (QUESTIONS)*: A set of questions used to characterize the achievement of a specific goal.

3. *Quantitative level (METRIC)*: A set of data associated with every question in order to answer it quantitatively.

This section covers these three elements of the GQM approach to map the research questions to the interview questions (Appendix A.2). This study aims to understand better how children are addressed in Free-to-Play games and identify crucial factors needed to create suitable Free-to-Play games for children. Three research questions were defined to address the objective, see Section 4.1. Moreover, the interview questions were used as metrics considering this empirical study uses semi-structured interviews.

Figure 4.2 illustrates the mapping between the research questions linked to the related interview questions. The relationship from research question to interview questions is represented as a one-to-many relationship, as many of the interview questions addressed multiple research questions.
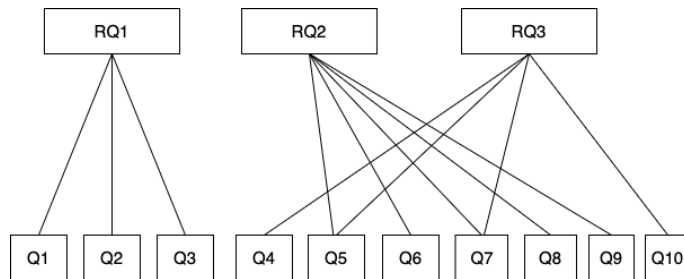
Figure 4.2: Mapping between the research questions and the metrics (interview questions).

4.3   Subject selection

For the interviews, guidelines produced by Runeson and Höst (2009) were used to define selection criteria for subject selection. We primarily focused on participants that produce Free-to-Play games for children, mainly developers and game designers. Participants with other roles was also considered relevant if they were included in the process of creating games. Free-to-Play games for children is a small field, and creators of Free-to-Play games for an older audience were also considered relevant to get more insight into the field of Free-to-Play. To better answer the research questions, participants who had insight or experience creating games for children were also considered relevant for this study. Additionally, domain experts on children and games were considered relevant. This resulted in the following criteria:

- The person had experience creating games for children.

- The person had experience creating F2P-games.

- The person had the knowledge and experience about the relationship between F2P games and children.

A person was considered a relevant interview candidate if they met at least one of the criteria. Participants that develop F2P games are denoted developer. Specialists or domain experts are denoted experts. The following distribution presents the expected contribution from each participant related to the research questions:

- **RQ1**: All developers

- **RQ2**: Developers of games for children (Accessible for children and targeted at children)

- **RQ3**: All participants (Developers and Experts)

The interview subjects were localized using several approaches. Four different channels were used to contact interview subjects: 1) LinkedIn 2) the professional network of our supervisor 3) Work-work 4) the professional network of the interview subjects. A description of the channels is shown in table 4.1.

The LinkedIn approach consisted of two ways. One was creating an informal post about the project to encourage people to participate or share the post. The post was shared by the supervisor and others in our network. The other way was reaching out directly to relevant candidates. The procedure for localizing people was as follows; a search through Apple's App Store was conducted by going through top children's games and top games. For the games that were free and labeled "in-app purchase", the company name was noted. Other well-known Free-to-Play companies were also added to the list. We searched on LinkedIn using the Recruiter-subscription to look up the companies we had noted. According to the specified criteria, people who had a suitable role and had an open profile so we could reach them on the LinkedIn in-mail function were contacted. Persons that had worked at the company earlier in their carrier were also contacted. If the search results revealed persons

Channel	Description	Link
LinkedIn	LinkedIn is a social network that focuses on professional networking and career development.	www.linkedin.com
Supervisors' professional network	Letizia Jaccheri Juan Carlos Torado: spanish company Alf Inge Wang: Norwegian companies and organization Betina Pedersen Bye: Norwegian companies	
Work-work	Co-working space and game community for networking, ICT business development and social interaction with flexible premises to promote game development and technology.	www.work-work.no/
Interview subject networks	Earlier colleagues and classmates	

Table 4.1: The different channels used for finding interview subjects.

who did not work at the company, their game company was examined and contacted if they met one of the criteria above. 65 persons were contacted through LinkedIn. Other approaches consisted of contacting persons through email. Everyone was asked if they knew anyone suitable we could interview. People that met the criteria were contacted. One interview subject was observed at a seminar about Free-to-Play and children for parents. Another interview subject was localized by a documentary about how technology affects children. In total, 83 persons were contacted.

4.4 Data Collection Procedure

The chosen data generation method was interviews, as it is an efficient method for answering research questions Oates (2005). The interviews were semi-structured since this is a flexible approach when the interview subjects have different backgrounds and roles in the game development of F2P games. By having semi-structured interviews, all the interviews revolved around the same themes, but it could be adjusted to fit each subject better through follow-up questions and prepared domain questions. In addition, it is easier for the interviewee to talk more freely.

Lethbridge et al. (2005) divides data collection techniques into three levels; first-degree, second-degree, and third-degree. The researchers were in direct contact with the subjects and can therefore be seen as a first-degree data collection technique. This technique can be difficult to undertake, but it allowed the interviewers to control all the data that was collected and to ensure that all the pre-defined research questions were answered adequately, and it allowed us to ask follow-up questions.

All interviews were conducted digitally on Zoom due to various reasons. Firstly, the on-going COVID-19 pandemic limited the option to conduct physical interviews with the interview subjects localized in the same city as the researchers. Secondly, the remaining subjects were located worldwide, which made digital interviews the most suitable. The interviews were either conducted in the subject's preferred language (English or Norwegian). All the interviews with Norwegian participants were undertaken in Norwegian as this allowed them to express themselves more freely, concisely and give more in-depth explanations. For the transcription phase, this resulted in having to translate the parts of the interview.

Two separate interview guides (Appendix A.2, A.3) were created to address the two main groups of subjects; the experts and the developers. Each of the guidelines followed the same structure, consisting of (1) advantages/disadvantages of F2P, (2) Monetization Features, (3) Factors, (4) Game Development Process, and (5) Improvements. These categories were directly related to the research questions, and questions had minor adjustments to enable both subject groups to answer the questions properly. The guidelines were used for all interviews. Initially, a consent form had to be signed by the participant before the interview was undertaken. All the interviews were conducted between February and May 2021.

A representation of the details of each interview can be seen in Table 4.2. Each interview was transcribed consecutively. Moreover, both authors reflected on and discussed essential topics that arose.

Subject	Role	Gender	Duration
Expert 1 (E1)	Advisor for games and apps	M	37 minutes
Expert 2 (E2)	Senior Legal Assistant	M	36 minutes
Expert 3 (E3)	Creative Director & Psychologist	M	43 minutes
Developer 1 (D1)	Game Designer	F	28 minutes
Developer 2 (D2)	Game Designer	M	27 minutes
Developer 3 (D3)	Game Designer	F	25 minutes
Developer 4 (D4)	Game Designer	M	34 minutes
Developer 5 (D5)	Game Developer	M	34 minutes
Developer 6 (D6)	Game Designer	M	40 minutes
Developer 7 (D7)	Game Artist / Art Director	F	22 minutes
Developer 8 (D8)	Game Designer	F	32 minutes
Developer 9 (D9)	Game Producer	M	22 minutes
Developer 10 (D10)	Game Designer	M	37 minutes
Developer 11 (D11)	Game Economy & Monetization Manager	F	38 minutes
Developer 12 (D12)	CEO	M	32 minutes
Developer 13 (D13)	CEO	M	34 minutes
Developer 14 (D14)	CEO	F	27 minutes
Developer 15 (D15)	Game Developer	F	28 minutes

Table 4.2: Overview containing information about the different interview subjects.

4.5   Analysis Procedure

Thematic analysis can be defined as "a method for identifying, analysing and reporting patterns (themes) within data" (Braun and Clarke, 2006). We applied a Thematic analysis based on "Recommended Steps for Thematic Synthesis in Software Engineering" proposed by (Cruzes and Dybå, 2011). Our thematic analysis aims to identify and understand the most critical factors needed to create F2P-games for children and answer our research questions. Figure 4.3 shows the main steps of the synthesis process from the initial reading to the higher-order themes.
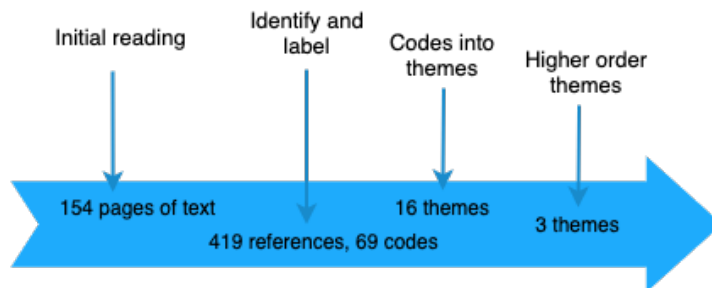
Figure 4.3: Overview of the thematic analysis process (Cruzes and Dybå, 2011).

Initial Reading. The initial step of the analysis process is to get familiar with the data set - to generate ideas and identify patterns. All the interviews were transcribed soon after the interviews were conducted. This made the transcription process uncomplicated, and it was also necessary to not alter the meaning of the respondent's answers. The GQM-method described in section (4.2) helped us ensure that we asked questions that would lead us to address the research questions accurately. Additionally, this was helpful in the analysis process to connect the respondents' answers directly to the research questions.

Coding Process. Saldaña (2021) define codifying as a way to arrange things in a systematic order, to make something a part of a system or classification, or to categorize. To generate codes, a descriptive coding technique (Saldaña, 2021) was used. The purpose of a descriptive coding technique is to summarize in a word or sentence's basic topic of a passage of qualitative data, to identify patterns, topics, and significant findings. According to Saldaña (2021), descriptive coding is very useful for inexperienced researchers.

The coding process was a mix of both inductive and deductive approaches, known as an integrated approach (Saldaña, 2021). In an inductive approach, the data is reviewed line by line, and a code is created when a concept appears. On the other hand, for a deductive method, a provisional list of codes is determined beforehand based on the study's conceptual framework, paradigm, or research goal. Our approach was more inductive than deductive as we did have some expectations of what to find from the data, but no predefined list of codes was used. The benefit of using such a mixed approach was preventing the creation of codes that exceed the context but not limiting the codes to the expected

results.

NVivo[1] is a qualitative data analysis program that we used for the coding process and to do the thematic analysis in an efficient and organized manner. NVio supports transcription of various files and has built-in visualization types such as frequency charts, word clouds, and comparison diagrams that help discover the meaning in the data. Coding with NVivo resulted in 201 codes with 419 references. After reviewing, merging, and deleting duplicated codes, we ended up with 168 codes.

Translate Codes into Themes. A theme can be seen as a way of grouping initial codes into a smaller number of sets, to create a meaningful whole of unstructured codes (Cruzes and Dybå, 2011). After the coding process, codes were categorized. The process reached its end when there no new themes emerged from the data, and that none of the themes were overlapping and that its sub-themes and codes were within the context of the theme. From initially 10 categories, we ended up with 4 higher-order themes.

4.6   Validity Procedure

When doing qualitative research, it is important to ensure the validity of the study - to what extent the results are true and not biased by the researcher's subjective perspective (Runeson and Höst, 2009; Cruzes and Dybå, 2011; Yin, 2008). We followed guidelines from Runeson and Höst (2009) to ensure the validity of the study.

Construct validity. This aspect reflects what extent the operational measures studied represent what the researchers have in mind and what is investigated according to the research questions (Runeson and Höst, 2009). Our interview questions A.2 were created using the GQM-approach to ensure that these questions answered the research questions. Before every interview, we gathered information about the subject or company to ensure that we had all the necessary information to avoid wrong interpretations.

External validity. This aspect is concerned with to what extent it is possible to generalize the findings and to what extent the findings are of interest to other people (Runeson and Höst, 2009). In this study, game development companies and domain experts in Europe and North America were interviewed. Each countries' legislation may differ and therefore this study might not apply for all Free-to-Play companies. Case descriptions, presented in Section 5.1 can be used by other researchers to transfer results to other studies.

Reliability.   This aspect is concerned with to what extent the data and the analysis are dependent on the specific researchers (Runeson and Höst, 2009). Both authors attended all the interviews to decrease the risk of bias interpretations. Additionally, the interview questions were validated with our supervisor. Moreover, to ensure that we captured the participants' correct meaning, each interview was described shortly after being conducted to mitigate bias.

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[1]https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/about/nvivo

4.7   Intellectual Property Rights

Ethical issues are important to consider when planning and performing empirical research (Oates, 2005; Runeson and Höst, 2009). Every participant had to explicitly agree to participate through an informed consent before the interview was conducted, see Appendix A.1. This consent form states that participation in the study is voluntary and that withdrawal from the project can be made without further notice.

NTNU has appointed NSD[2] (Norwegian Centre for Research Data) as their data protection official. Every researcher and student at NTNU is obligated to notify NSD about their project if personal data are processed and used. This research project does not handle any personal information that can be traced back to an individual. However, NSD was notified about this project to ensure that our research is in line with Norwegian law (Appendix A.4).

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[2]https://www.nsd.no/

Chapter 5

Results

This chapter presents the findings from the exploratory study presented in the previous chapter to answer our research questions. Section 5.1 presents information about each of the 18 interview subjects (3 experts and 15 developers). Additionally, it presents the model based on the thematic analysis consisting of 3 higher-order themes. Section 5.2 seek to address the reasoning behind monetization features (RQ1), Section 5.3 seeks to address how developers address children in F2P games (RQ2), Section 5.4 addresses the crucial factors needed to create suitable F2P games for children (RQ3). Lastly, section 5.5 presents a summary of each research question's main findings, respectively.

5.1   Description of Subjects

In this section, we present the different subjects that were interviewed. Table 5.1 presents some essential information about the companies where the interview subjects currently are employed. Descriptions are made as accurately as possible without exposing the subjects or companies. Experts have notation "E", while developers have notation "D". Further, Table 5.2 shows what type of games the developers have been developing.

Company	Area	Location	# of employees
E1	F2P & Children	Norway	
E2	F2P & Children	Norway	140
E3	F2P	Norway	33
D1	F2P & Children	Spain	112
D2	F2P	Denmark	9
D3	F2P & Children	Germany	300
D4	F2P & Children	Sweden	
D5	F2P	Ireland	1,000+
D6	F2P	Canada	108
D7	Children	Denmark	-
D8	F2P	Japan	1,000+
D9	F2P	France	1,000+
D10	F2P	Serbia	42
D11	F2P	Romania	34
D12	F2P	Norway	18
D13	F2P & Children	Norway	8
D14	Children	Norway	10
D15	F2P & Children	US	1000+

Table 5.1: Information about the different subjects' companies.

5.1.1 Experts

Three experts with different domain knowledge related to F2P were interviewed. Expert 3 also qualifies as a developer since he has been developing F2P games earlier in his career and therefore meet the participant selection criteria (Section 4.3) for this study. However, due to his expertise in psychology, he is defined as an expert for this study.

E1 - Advisor for games and apps. E1 works in a Norwegian foundation that focuses on conveying facts and advice to parents about their children's use of technology. He has received many inquiries from parents who have children that have made many in-game purchases in F2P games without parents knowing. E1 represents a relevant perspective to this study due to their organization dealing with the consequences of how the system is today and can give insight into children and F2P games.

E2 - Senior Legal Assistant. E2 work at a Norwegian government agency and consumer protection organization that works to increase consumer influence and to contribute to consumer-friendly developments. He has a master's in law and works with consumer rights, which is relevant for Free-to-Play since a part of the problem is related to the differences in consumer rights of virtual goods and in-game purchases compared to making physical purchases. The motivation to bring him into the research was to understand bet-

ID	F2P	Children	F2P targeted at children	F2P accessible for children
E1				
E2				
E3	x	x		
D1			x	
D2	x	x	x	x
D3	x	x		x
D4	x		x	
D5	x			x
D6	x		x	x
D7	x	x		x
D8	x	x	x	
D9	x			
D10	x		x	x
D11	x			
D12	x			
D13	x		x	
D14		x		
D15	x			x

Table 5.2: Overview of what type of games the developers have been developing.

ter what rights consumers have regarding F2P, what obligations developers of F2P games have, and if F2P companies follow the laws. Moreover, domain knowledge on this topic could be used to examine if F2P games can be improved to maintain consumer rights, especially children.

E3 - Creative Director and Psychologist. E3 currently works as a Creative Director in a company that focuses on learning and training using gamification. Earlier in his career, he developed several F2P games, both as a consultant and in-house employee. He developed mostly F2P games that targeted players older than 13 years of age. He has developed a children's game, but this was not related to F2P. His educational background is in psychology with a specialization in the clinical treatment of adults. Throughout his career, he has worked a lot with children and game addiction. He was an optimal candidate for an interview, as he can contribute with domain knowledge regarding the psychological perspective of children playing F2P games.

5.1.2 Developers

This section presents the 15 developers that were interviewed.

D1 - Game Designer. D1 works as a game designer. She works with learning games for children between the age of 2-8 years old. They have become successful with more than 1

million users worldwide. The games they create are not typically considered F2P as they do not use typical F2P monetization features. However, they offer limited content for the players to interact with, and additional content can be purchased through a subscription. The trial version does not include any advertisements or other monetization features. The perspectives of D1 are helpful since they focus on the child's best interest.

D2 - Game Designer. D2 is currently working in a F2P company consisting of 9 employees that have created multiple successful F2P games that have been on the top 100 list on the Apple App Store. Moreover, the company does not focus on creating games targeted at children. However, D2 was localized on Apple App Store, as their game had an age limit of 9+. Other F2P games that the company had developed have an age limit of 4+. D2 has also been a part of creating games targeted at children for a client.

D3 - Game Designer. D3 works in a company that is a mobile-first game development company that creates F2P games and social games for mobile devices and social networks, such as Facebook. The company has several games with over a million daily users. The games on App Store have an age limit of 9+ and 4+. Despite the low age, most of their games are not targeted at children but aims to hit a broader audience. Currently, D3 is working mostly with a target audience of 35+. Earlier she has worked in another company that develops games for children.

D4 - Game Designer. D4 is a game designer that works specifically with the game experience in F2P. His company develops F2P games for children. The official target group is 6 to 11 years old, but children from 4 to 18 years of age and 18+ play the games. The company focuses on creating ethical games from the children's perspective. They also have their own monetization guidelines for internal use. D4 has worked as a F2P game designer his whole career, and he has been a designer for 10 years. Earlier in his career, he also worked on games targeting teenagers and adults.

D5 - Game Developer. D5 currently works in a worldwide F2P mobile game development company known for several award-winning titles that have been among the top 100 grossing games on the App Store and Google Play Store. According to D5, the main audience is middle-aged women, 35+. However, several of the games on the App Store has an age limit of 4+, which makes them accessible for children.

D6 - Game Designer. D6 works as a Lead Game Designer. The company D6 currently works at is a F2P company that creates games where the main age group is 20 to 34 and has games with an age limit of 4+ and another one of 12+. However, D6 was contacted because he earlier worked in a F2P company that has developed multiple games for children. He was localized through the search at App Store. His former company had more than 600 million kids using their apps, and they have also won awards for some of these games. Here he worked specifically with children's games; several of them were based on brand licenses. The main audience of these games was around 3-8 years old.

D7 - Game Artist & Art Director. D7 is currently working on a learning game for kids

age 8-13 years old. Earlier she worked in another company developing a children's game for PC; however, this was not F2P. Earlier in her career, she worked in a F2P company that focused on casual mobile games. The main audience for these games were women older than 40 years of age.

D8 - Game Designer. Currently, D8 works in a game development company that has created many famous titles in different genres. They have sold more than 5 billion games, both AAA games and F2P games. D8 has worked on a range of games from light massive multiplayer online (MMO) games for kids, Facebook games specifically targeting women, PC games for core players, mobile games for casual players and children, and console games. Several of the games she worked with were F2P. The children's games target children in the age group 4 to 7 years and 6+.

D9 - Producer. D9 works in a F2P company that has created more than 190 games. They have 1000+ employees based in studios all over the world. All the games he has been a part of were F2P. The main audience was 16+ and meant for adults. However, the company he works for creates F2P games for children, but he had not been a part of any of these games. He was considered relevant as he could give insight into the development processes. Additionally, he was helpful to answer the first research question regarding the reasoning behind the use of monetization features.

D10 - Game and Level Designer. D10 works as a game and level designer in a company that creates adventure games for smartphones. Here he develops a F2P game where the main audience is 16 to 30 years of age. Earlier, he worked in a game development company consisting of 1,000+ employees that have created many well-known titles on different platforms, including mobile. The company has several F2P for kids, with age limits of 4+, 9+, and 12+. D10 did not work specifically on children's games in this company, but as an experienced F2P developer, he was considered a relevant candidate.

D11 - Game Economy & Monetization Manager. D11 works at a F2P company with 16 employees that have created many popular shooter games. Earlier she worked at the same company as D9. She has worked on F2P games her whole career, and her job as monetization manager is a position that appeared due to the increased popularity of the Freemium model. D11 has never created games for children. However, her insight into the reasoning behind monetization features was considered useful for this study.

D12 - CEO and Game Director. D12 works in a start-up game development company that is currently creating a real-time strategy game that uses F2P monetization mechanisms. As a game director, D12 is included in game design. The game they create offers a free, limited version as a part of the onboarding. The user can then purchase the complete game. The company also tests out different F2P mechanics, which made him a relevant interview subject. The target group of the game is 20-45 years.

D13 - CEO. D13 works in a start-up game development company that is currently creating a F2P fast-paced online shooter. The game's target group is 10-35 years, and the company

has experienced through testing that especially the age group 10-18 years enjoy the game. As a CEO in a small start-up, D13 is included in most of the game development processes and decision-making. The game has not been released yet, but they plan to release it for free and to offer additional content, such as cosmetics that can be purchased.

D14 - CEO. D14 has been creating children's games for the last 20 years. As a CEO, she works with funding, recruiting and is involved in the design process. She works in a game development company consisting of 10 employees that have created games of some of the more famous Norwegian movies. Most of their games have an age limit of 4+. Their games are not F2P as they did a qualified assessment regarding F2P and did not consider it suitable for children.

D15 - Game Developer. D14 works as a freelancer and creates content full-time for one of the more successful F2P battle royal games. The game has an age limit of 12 years old but has proven to be popular among younger audiences. The game generates revenue through cosmetics, in-game currency, and battle pass. D14 does not directly create any monetization features, but her insight was valuable since she works with a market-leading game.

5.1.3   Interview Results and Findings

The goal of the thematic synthesis process (Chapter 4) was to identify themes and patterns to get a better understanding of the Free-to-Play model, how children are addressed and what factors are needed to create more suitable F2P games for children. Primarily, we have identified 16 themes. These themes are classified into three higher-order themes related to each of the three research questions. An overview of these themes, along with associated sub-themes and codes, is shown in Figure 5.1. Each theme is presented in the sections below.
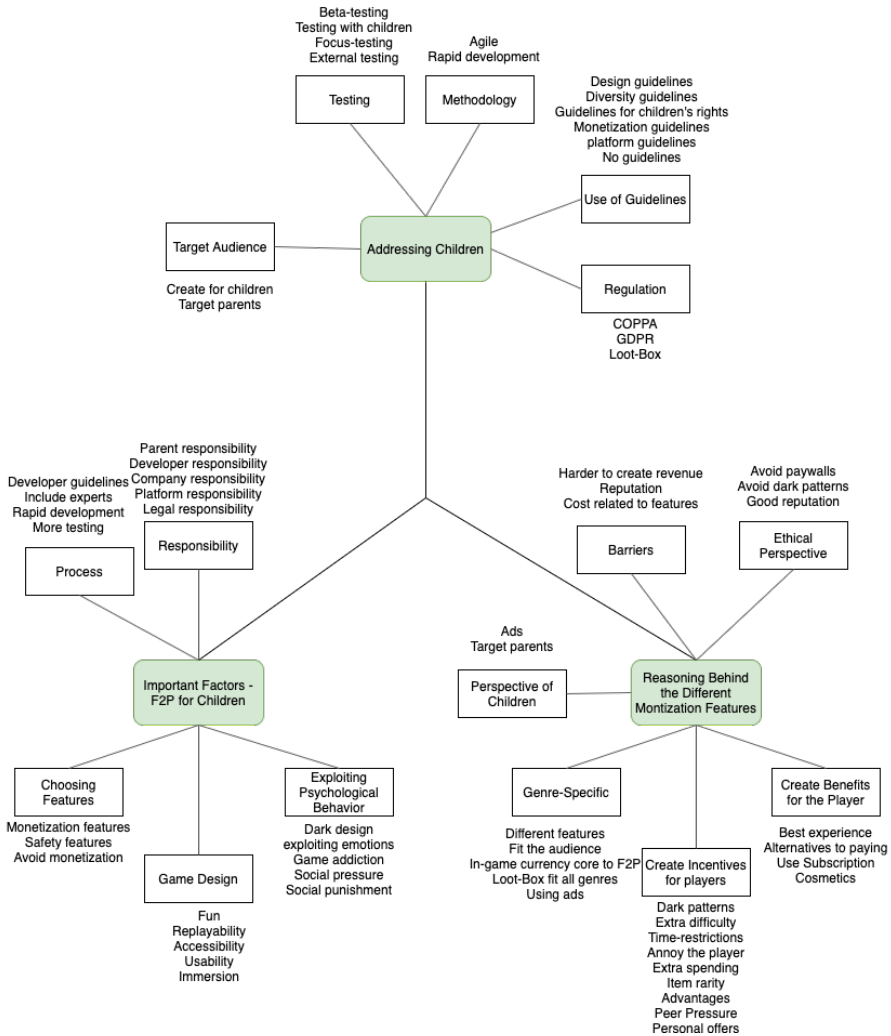
Figure 5.1: Model of higher order themes, and codes from the thematic analysis. The green squares represent the higher-order themes, the white squares represent sub-themes, and regular text represents the codes for each of the themes.

5.2 RQ1: What is the reasoning behind the use of different monetization features in Free-to-Play games?

This section presents the findings related to monetization features that are being used by the interviewees and the reasoning behind them, see Table 5.3. Section 5.2.1 presents how the game genre is a deciding factor for the reasoning of monetization features. Further, Section 5.2.2 is about using monetization features to create incentives for players to make in-game purchases. Section 5.2.3 is about choosing monetization features for the best player experience. Moreover, Section 5.2.4 presents reasoning related to the ethical perspective. Section 5.2.5 presents reasoning based on the child's best interest. Lastly, Section 5.2.6 presents challenges regarding the use of features.

The different monetization features used by each interviewee varied. See Table 5.3. The most used feature was in-game currency, while the second most popular was advertisement and loot-boxes. Some of the interviews had tested the majority of features and used a combination of them in the game, while others stuck with one or two main features.

Subject ID	Subscription	Ads	Paywall	Hooks	Pop-Ups	Time-Restrictions	In-Game Currency	Loot-Box	Battle-Pass	Skins	Premium
E1											
E2											
E3	x	x	x	x	x	x	x			x	x	x
D1	x										
D2	x	x	x								x
D3		x	x			x	x				
D4	x	x	x	x	x	x	x	x	x	x	x
D5				x	x	x	x				
D6		x				x	x	x			
D7				x	x	x	x	x			
D8			x				x	x			
D9						x		x	x		
D10		x				x	x	x			
D11		x					x	x	x	x	
D12									x	x	x
D13		x							x	x	x
D14											x
D15							x	x	x	x	

Table 5.3: Overview of the different monetization mechanics used by each interviewee.

5.2.1 Genre-specific

The rationale for using different features is connected to the game's genre and the platform where the game is published. One interviewee claimed the need to be more aggressive and proactive when creating mobile games instead of PC or console games.

D4 - *"Because different games, different genres, and different platforms require different features. In most of my career of being F2P-designer for mobile games, mobile F2P games are very different from PC or console F2P. As a result, we need to be more aggressive, and we need to be more proactive. So the reason is always dependent on platform and genre."*

Similarly, it was not seen as typical to use different monetization mechanics without a specific reason or connection to the game itself. According to one developer, the monetization strategy needs to intersect with the game-play to create an incentive for players to make

in-game purchases.

D8 - *"In general, the core game-play should intersect with the main monetization strategy to define the value of In-game purchases."*

Some games would use advertisement in the game, but it would typically only generate some percentages of the total revenue; the significant bulk is from in-game purchases. Some games use advertisement as their main monetization feature, but this was usually for games known as Hyper Casual Games. These games depend on getting viral with tons of players within a short period, such as the game *Flappybird*.

D6 - *"a lot of your typical F2P Games will not be getting the bulk of revenue from the adverts; most will come from In-app purchases. Games that make the most from adverts are the ones that are considered hyper-casual ones, such as FlappyBird."*

For other games based on the shooter genre, battle-passes were seen as the most popular monetization feature. It does not interrupt or change how the game is being played. It gives the user additional content to customize their in-game character. Additionally, it was seen as an industry-standard monetization feature for this genre.

D11 - *"In a shooter, the best monetizing feature is a Battle-Pass because the players are really into into that kind of content and they convert better with this mechanic"*

Generally, the most popular F2P-games set the industry standard regarding what features to include in the game. With all these games being accessible and available on different platforms, companies can easily see what features are popular among players and implement them in their games.

D11 - *" I'm assuming it is the industry standards nowadays. We take some chances with new stuff, but most of the content is something that's been vetted in the market. So the genre comes with a bunch of things that you can not drop, because otherwise you'd be making something else. Moreover, some features are inspired by successful games."*

However, D11 states that there is no obvious what features work in a game and that it is essential to test to see what works. Additionally, she points to loot-box as a feature that works with all genres. It was introduced as a gambling feature and became popular, both for the players and the developers, as it works well with the different genres. She had used loot-boxes in all the games she had developed.

D11 - *"Loot-boxes really work with the genres. Players really like the surprises like they like to open them, they like to collect the stuff inside. To the element of surprise, I guess that's drawing everyone towards them. So technically, they apply to pretty much any game."*

5.2.2 Purchase Incentives

One of the biggest reasons behind monetizing features is giving the players incentives to make in-game purchases. According to the developers, this is done in many different ways. One of the negative aspects of F2P is that the game is free, and to generate revenue, game companies need to create incentives for players to make purchases. According to one developer, this has led to many companies use dark patterns to exploit their users.

D4 - *"Of course, the side effect is that developers need to make money. To make money, you have to implement some monetization. Unfortunately, nowadays, a lot of free-to-play games are associated with dark patterns and dark monetary patterns where developers strive to trick into payment more often and create the unhealthy addiction in users to pay."*

Many F2P-games are level-based, where the initial level is easy to complete. As the player progression increases, levels get more challenging until it gets so hard that additional helpers such as booster or extra lives are needed to help the player complete the level.

D3 - *"I have been involved in, let's say, making games harder to win. So it's not something that can be seen directly. It just mean that players might want to spend more tries in a level until they win. So as to create an incentive for them to either buy power ups or helpers."*

Moreover, time restrictions are also used in addition to other features, such as the one mentioned above, to encourage players to purchase. Slowing down the game's pace to a level where it is too slow for the player can trigger an incentive to make in-game purchases.

D8 - *"Games are often designed to have choke points to make players spend money. Players do not get to play at their own pace. They have to accept the free experience pace or decide to pay."*

Slowing down the game's pace is also done in other ways by using a lot of advertisements that the player needs to watch. These advertisements are usually 10 seconds long and break the immersion for the player. In the long term, this will encourage the players to purchase to remove ads from the game.

D7 - *"And that's how you're going to get money out of them, they're going to get very annoyed with commercials."*

Another type of incentive is through in-game currency. These currencies are usually in fixed packets, where one pack of currency would, for example cost $10 USD and give the user 10,000 coins to use. There are no items that cost this exact amount, so the player would essentially end up with a digital wallet in the game. The digital wallet would make it easier for the player to make more purchases as the player already have money/coins in the game to spend.

D6 - *"I think on a business side it is easier for people once they have those currencies*

to make those purchases compared to spending real money multiple times within a play session."

Some of the interviewees also mention item rarity to make players spend money. Typically, loot-boxes will contain items that are rarer than others. These items could either be cosmetics or give the player advantages in the game.

D8 - *"The loot-box aspect is very appealing to players who want to draw a rare item. Item rarity makes players want to get lucky, which can lead to spending. These are especially useful in competitive games where getting lucky means having an advantage over other players."*

One common finding among the different F2P companies is that they make data-driven decisions in the game. They track data and use this data to do minor tweaks to the monetization features or game-play to increase revenue and improve the overall game experience. By tracking player behavior, F2P games can use this data to give special offers for a specific player and change the aggressiveness of the monetization features to incentives purchase (King et al., 2019).

D11 - *"It's like playing, buying, participating in events or interacting with features, we track it and we analyze it. It's really important for us to take data driven decisions".*

D4 - *"it's typical shop implementation and monetization, offering different offers to various players analyzing players behavior, and suggesting different offers that is based on their behavioral patterns"*

5.2.3   Benefit the Player

Many developers claimed that they chose monetization features to increase the game experience and that this was important. Some developers strived to create games that would benefit both the non-paying players and the paying players.

D6 - *"So we focus on developing the best possible experience for the free players, but then give the cherry on top to the premium players."*

Moreover, another developer used time-restricted loot-boxes at the core of the game. The players were given different alternatives to open it; they could wait until the timer run out, watch advertisements to reduce the timer amount, or pay to avoid the timer.

D10 - *"So basically everything goes through the boxes. So players have a couple of options. They can wait of course for the boxes to open on their own. They can pay with premium currency if they want or they can just reduce the time of the rate by watching ads. [..] And it's rewarding for the free to play players who don't really want to pay anything."*

Other children's game companies use subscription to give the best player experience without being bothered with advertisement or other monetization features.

D3 - *"we've gone over to a subscription model lately, where people can pay monthly to have the game without ads and some extra features. So that's like the next thing and then people can play for free with ads, and they can play all the content."*

5.2.4 Ethical Perspective

Many of the respondents highlighted the ethical perspective as necessary when choosing features. Our interview guide included a question regarding the balance between revenue-maximizing and the ethical perspective to examine what was prioritized. One of the developers mentioned how their focus had shifted from focusing primarily on revenue and not the ethical perspective to now having the ethical perspective impacting most of their decision-making.

D4 - *"I think when I started, we were not very nice to our users. And we even like, implemented a certain paywalls. Paywalls it's a way of blocking players progression unless we made an active purchase. Of course, this is as bad as it gets, so I will never do this again. The moment you introduce such mechanics, you can start exploiting unhealthy and dark sales by selling not enough coins or just enough coin. So this is not what we do anymore."*

Several developers informed that it was essential to be ethical because of their reputation with their community. One interviewee explained how some of the big gaming companies lost the majority of their user base when they introduced aggressive monetization mechanics in the game. He further stated that being ethical will be more profitable in the long run.

D13 - *"You want to maximize revenue, but I think it is a correlation between the ethical considerations and how the market perceives your company, and thus the willingness to purchase your product. So the ethical perspective is very important to us, to prevent our monetization from being perceived as unfair or unethical."*

How developers and companies addressed the ethical aspect varied, but one developer mentioned that most of the decisions were based on discussion. The developers' opinions were taken into account regarding the different monetization features and how ethical they are.

E3 - *"If employees is concerned about the ethical perspective, they talk together about how to design the feature to make it more ethical. Usually, there is often a discussion between those who want to make the world a better place and those who want to earn the most money."*

5.2.5 Perspective of Children

Children were also mentioned as a reason when choosing monetization features. Some had strong opinions about what features to include or avoid; several expressed concern about having F2P for children. Some meant there was no difference when creating games for children or adults. Additionally, several developers did not create games that target children. However, some of the reasons that were pointed out as to why they did not use certain features contradicted the reasoning from other developers. Some did not use ads because it would ruin the immersion, while others thought that ads were suitable.

D1 - *"we don't have any ads. We don't want kids to be interrupted or potentially click on them."*

Moreover, there were a lot of divided opinions about the loot-box as well. Some meant it resembled gambling and should be avoided, while other developers thought that loot-box was a great feature for children.

D7 - *"For the clash of clans like game, it was loot boxes, because that's, I guess, more game for kids. And they don't mind waiting for stuff, they'll go and do something else."*

The different interviewees had mixed opinions regarding who the actual target group is; children or the parents. As a result, different features are being used to address the fact that children cannot make in-game purchases themselves in many cases.

D5 - *" To address the problem of children asking for money, we use advertisements because it is more profitable.*

5.2.6 Barriers

The interviews revealed that some of the developers found some challenges with the F2P model. One developer mentions that the choice for features was not always based on what was considered the best or most suitable for their game due to tight budgets.

D2 - *"We don't have a marketing department or anything, so we can't really afford to spend a lot of money on making all these loot box mechanics and such, which is really thriving on the mobile market at the moment."*

Further, the same developer could tell that it is has become progressively harder to earn money now than earlier. Features that generated much revenue earlier are not doing it anymore, which has resulted in the need to use multiple features.

Similarly, another developer claimed that players now expect to have a free experience when playing games, forcing developers to use alternative ways to monetize, as mentioned above.

D2 - *"it's really hard to release games that are we have to pay up front or where you have to pay with money at all. So a lot of the players that we get reviews from expect to see some kind of model where you can, in the game, do some actions, watch an ad, or just wait a while or something to get the ability to move on."*

5.3 RQ2: How are developers addressing children in Free-to-Play games?

The thematic analysis revealed four main themes for how developers address children. These themes are presented in separate sections. Each section is divided into several sub-themes. Section 5.3.1 addresses the aspect of who should be targeted in children's games (parents or the children). Section 5.3.2 examines different findings related to the game development process of creating F2P games. Further, Section 5.3.3 presents the different types of guidelines developers use when developing games. Lastly, Section 5.3.4 presents how regulations affect the developers and the development of F2P games. How each developer and its company address children in F2P can be seen in Table 5.4.

Category	Addressing Children	Case
Target audience	Targeting parents	D4, D14, D7
Process	Agile methodology	D3, D4, D9, D11, D12 D14
Process	Testing on children	D1, D2, D4, D6, D7 D8, D12, D14
Process	Beta-testing	D2, D3, D5
Process	Focus-testing	D1, D3, D4, D8, D14 E3
Process	External testing-platform	D2, D6, D11
Process	External testing agency	D1, D11
Process	Inhouse-testing	D5, D4, D7, D12
Process	Using employee's children to test	D1, D6, D14
Process	The importance of testing on children	D1, D4, D6, D8
Process	Use feedback from customer support	D11
Guidelines	Design, platform	D1, D3, D4, D7
Regulation	Follows COPPA & GDPR	D1, D3, D4, D7

Table 5.4: An overview of how developers address children in F2P games.

5.3.1 Target audience

Designing for children was brought up as a challenge compared to designing for adults. Children have different mindsets, enjoying and experience games in different ways. It could be harder to get the mindset of a child, but it was something they tried to undertake.

D2 - *"I think in general, it can be a bit more challenging to design for children in the way that it's hard for you to put yourself in the mindset of a child compared to putting yourself in the mind mindset of somebody your own age."*

Targeting parents. The design of the game is dependent on the target group. One problem revealed when creating F2P games for children is that this group of players does not have their own credit cards, and developers need to find other ways to generate revenue - through the child's parents.

D4 - *"I think an important differentiation is who is the target audience because until a certain age, most developers for apps, they're not targeting children, they're targeting their parents, because parents have to make an active choice to download this app."*

To reach the parents, developers emphasized the importance of creating games that appeal to children and that this will lead to spending by the parents.

D7 - *"So basically, what we are trying to do is we get the kids to get the game downloaded. At some point, something will pop up and say like, you should subscribe to get that then hopefully it will go to their parents and that's how we deal with it."*

5.3.2 Process

Several aspects of the process were examined, and it revealed different ways that developers addressed children.

Working Agile. Agile was seen as the most used methodology among the companies, as this allowed for more flexibility in the development process and enabled the companies to have multiple test phases.

D4 - *"We are working agile, we more or less follow the classical game development process. As any game development, we start with ideation and proof of concept with prototype. We have pre-production stages, we have production, we have releases and life support."*

Testing. The majority of the subjects reported that they did testing in some way and that the feedback was important to improve the game. Various test methods were used to gather feedback. Testing as early as possible was important to see if the game was interesting and fun for children.

D1 - *"it is very important for us to test the game with kids as soon as possible. As soon as we have a playable game, we want to test right away to see if it is interesting, if kids get engaged with it, or if they get bored and want to play something else."*

Testing with children in the early stages of the game was observed to work well due to children being experienced players. Developers could test specific game elements in an unfinished game and still receive good feedback.

D14 - *"We run tests in different stages. What we have experienced is that kids is very used to play games and can understand the game even when it is not finished yet, in this way we can test if the game elements works and we can do that very early in the development process"*

Beta-testing was one of the most used tests among the companies. Participants would get access to a pre-release version of the game through a unique registration key. The players would then play the game and give feedback to the company. This testing method was an efficient way to test the game. Many of these companies had accumulated a large testing group over the years, allowing for quantitative and qualitative feedback to be collected.

D2 - *"With some of our older games, who also put out just a beta, where we've had maybe 500 people try out the game before launch. Getting more quantitative feedback instead of what fewer people's opinions were of the game."*

Developers also conducted focus testing with children in kindergartens and schools to get honest feedback on what works and not and if the game is perceived as fun.

D1 - *"We gave the game and to get to kindergartens to see how kids play with it and how they react to everything. And after we polish the game based on the feedback we got from the kids."*

Moreover, some developers had a network consisting of representative researchers from different countries that assist with conducting tests with children.

D5 - *"We have representative researcher in the USC, where we could test another group of users from another country."*

Websites such as Playtestcloud[1] allow for testing online. They have a large user base consisting of gamers in different age groups who can play the game, give feedback to the developers, and earn money. Playtesting enables the game developers to select player types and test types. This tool was used by several of the developers.

D11 - *"But we actually have a process in testing our games that called Playtesting. We use a platform for this, where we just select the type of players that we would like to have; like genre, age-group, and what we would like them to do. The player then plays for 20*

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[1]https://www.playtestcloud.com/

minutes, and they comment and film themselves, and we can see everything they touches in the game. So we get the really good input there."

Other companies used external agencies to do the testing for them. These are companies that are specialized in executing testing and can do it as the F2P companies demand.

D11 - *"Yes, we actually have an outsourced team for that, it's a big testing company. [..] We have to externalize QA and for customer support. We still have people on our team that are leading those departments, but most of the work is done by another company remotely."*

The ongoing COVID pandemic had affected many of the companies, especially regarding testing. With limiting options for testing, some of the companies used their employees' children to test the games.

D1 - *"Right now is a bit more difficult. Mostly people from the company who have kids, try the games and send us videos. That's the best we can do right now. We tried to go to kindergarten, but it is kind of dangerous."*

Moreover, one company could not afford to thoroughly test the game because of the cost related to testing. So most of the game-related decisions were based on experience.

D2 - *"It's usually one iteration, we can really afford to test it all the way through. So I think at the beginning, we relied a lot on our own gut feeling about the game: We would just try to make something we like as starting point and then give it out to the audience afterwards."*

Developers also highlighted the issue of prioritizing children and testing and that there is not always enough time to undertake as much testing as wanted.

D14 - *"We think that the earlier you could test with children the better. But as a company you have to run initial phase, you have to finance, secure the staff, and then the children should have an opinion. It is usually the children that do not get the biggest priorities, I must admit that."*

5.3.3 Guidelines

Design guidelines. When creating games for children, it can be beneficial to follow guidelines or rules in order to avoid common issues and challenges to create games that are suitable for children. To what extent developers followed guidelines varied. Some followed external guidelines, mostly created by the platforms (Apple App Store, Steam) to publish games. Others had developed internal guidelines that were mostly used to design different buttons, animations, and specific user-interaction flows in the game.

D1 - *"There is a lot of stuff, from the size of the buttons to how the character should be designed to express friendliness. Also, we try not to make very long games, because kids don't have very long attention spans."*

One of the companies focused on how diversity should be introduced in kids and digital media apps. They have their own research team consisting of professors and other experts that help them create guidelines and help with validating the games.

D4 - *" we have a diversity board, like a bigger an external group of people whom we trust. This is people from different countries and with different occupation, some are working in universities, some are working as a researcher, some are working with other apps for kids. They can have very strong opinions about how diversity should be introduced into in the apps for kids and digital media for kids. So we often verify our ideas with them, do changes if needed."*

This company also follows a lot of the guidelines from Designing for Children's rights[2], a non-commercial organization. The aim of these guidelines is to *"refine a new standard for both design and business to direct the development towards products and services that have ethics and children's best interests at their core."* The design guide is open for everyone and consists of 10 principles.

Internal Guidelines. Other companies had developed internal guidelines that deal with the monetization features, both the ethical perspective and their combination.

D4 - *"Just to give you an example, we have a no for loot-box based monetization. We have a no for randomization features for example, this we will never be implementing in our project."*

External Guidelines. All the companies followed external guidelines created by platforms, such as Apple App Store and Google Play Store, that need to be followed in order to publish the games.

D2 - *"Mostly, there are guidelines on the platform we release on for example, if it's an iOS game, you have to follow certain rules. And we've also released games on the Nintendo Switch with a more thorough kind of evaluation process before you can get your game listed on the platform."*

Several interviewees could tell that the platforms had declined their game because the content was not according to their guidelines.

Many developers did not follow guidelines and developed games based on their expertise and experience. It was seen as problematic to use guidelines because each game is different, and the guidelines would need to be adapted for each game.

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[2]https://childrensdesignguide.org/

D7 - *"Basically what we do is we just work out from our gut feeling."*

5.3.4   Regulation

Several regulations affect the gaming industry regarding what content to have in a game. Regulation through GDPR and COPPA has to be followed in order to publish a game. Such regulations have had an impact on the different companies and how they create games.

D4 - *"There are many guidelines just to be able to be a kids developer, like there is kids GDPR, there is COPPA compliance. So like we have to be following these formal rules to even be able to release something. So all our products are certified by this standard."*

One of the developers researched COPPA and experienced that COPPA requires a lot from the developers.

D9 - *"When I was working as a social designer, they asked me to research what COPPA requires, and it's a lot. Like, you really need to take care of how they communicate. Don't allow them to socialize. As you know, people can get toxic online. Don't allow them to monetize because you don't want them to be gambling. You want them to just play the code loop and be covered from everything else."*

5.4   RQ3: What factors must be addressed to create suitable Free-to-Play games for children?

Concerning factors that must be addressed to create suitable F2P games, the thematic analysis revealed five themes with corresponding sub-themes, see Figure 5.1. Section 5.4.1 examines the psychological aspects of F2P games and children. Section 5.4.2 presents the findings related to the design elements of a game. Section 5.4.3 examines what monetization features that are suitable for F2P games for children, both related to what to avoid and what to include. Further, Section 5.4.4 reveals factors related to the game development process. Furthermore, Section 5.4.5 looks into the perspectives of which stakeholder should be responsible for F2P and children, as well as who should address the problems.

5.4.1   Exploiting Psychological Behavior

Among the interviewees, exploiting psychological behavior was seen as an emerging factor that needs to be addressed. With games being free, companies are forced to generate revenue through in-game purchases. Purchase incentives are crucial for the game's survival, and exploiting players' psychological weaknesses is one way to create such incentives. Games typically use multiple monetization mechanics and game elements that can be used to trigger incentives for the players to purchase. Findings from the interviewees

reveal several of them.

Dark Design. Dark design, also known as design patterns to trick the users into paying or creating unhealthy addiction in users to pay, was highlighted as something that is currently being used in F2P games and should be avoided when designing games for children.

D4 - *"But we should avoid dark patterns. [..] avoiding things like scarcity of goods in the shop, interruptions in the game play with annoying offers, targeted offers, avoiding actually tracking behavior or performance. Because all these things, they're not healthy and they're actually exploiting psychological weakness of users."*

Exploiting Children Emotion. Similarly, A game, *Doctor Kids*[3], was used as an example by one of the experts to expose how the game exploited children's emotions. Each player had their own unique character, and the character would cry if the store was exited without making a purchase, see Figure 5.2. This feature is now removed but is a typical example of one way to exploit the users.

E2 - *"All marketing has an element of manipulation, because that's the point of marketing. Doctor Kids, where the character starts to cry if you did not purchase anything from the store is completely hair-raising."*

Figure 5.2: Screenshot of the game Doctor Kids exploiting children emotion by using characters that would cry if the game store was closed without making any purchases.

Game Addiction. The psychologist claimed that addiction related to F2P-games were some of the most usual cases. This is due to the low threshold to enter the game and how accessible it is, especially on mobile devices. Additionally, he expressed concerns regarding how easy it is to spend a lot of money on F2P games.

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[3]https://play.google.com/store/apps/details?id=com.bubadu.doctorkids&hl=no&gl=US

E3 - *"There is a low threshold to enter. It's easy to spend too much money on them if you become addicted, for example by buying lots and lots of jewels in Clash of Clans or other similar games where the player can get benefit."*

According to the psychologist, getting addicted is especially concerning when the player is a child. He states that research reveals that the chance of being addicted is higher at lower ages and decreases as you get older. Because we learn to regulate our emotions and behavior with age.

E3 - *"The younger the child is, the higher the chance of addiction.[...] Because life teaches you to regulate your emotions."*

Whales is a widely used expression related to F2P games and in the gambling industry. They are typically a tiny proportion of the user group but account for most of the income. The interviews show that the business model tends to rely on converting a small percentage of the user base to create income and cover the loss of the non-paying players.

D6 - *"I guess is the business model tends to rely on a very small percentage of players, since most players would not be paying. So you really need to convert a small number of them. And then for that small percentage of players, the developers are hopeful that they will spend a lot of money to pay for the large percentage of people that are basically playing for free."*

This was seen as problematic since more aggressive monetization strategies are used to convert this small group of players. This can be problematic due to no limitation regarding how much money one can spend in the game, leading to overspending.

D2 - *"The way that some mobile games try to cater to the the whales, the players that are really willing to pay a lot of money. And I mean, looking at what content they offer, it just seems like they're they're feeding off some people's addiction of that game, right."*

Social Pressure. Social pressure is mentioned by several respondents as a challenge with F2P for children. Social pressure in the context of F2P and gaming, in general, can occur in many different ways. As E1 informs, children get more involved and immersed in games than adults. This is because their friends are usually playing the same game and spend much time playing. He states that social pressure occurs, both in what games to play and to spend in-game. The use of cosmetics is mentioned to create social pressure in the same way as clothing pressure in real life. It is optional in the game to purchase such cosmetics, but many players want to create a unique character that looks cool and follows the friend group's trends.

E1 - *"In addition, there is a kind of brand pressure in games. If everyone else has cool skins in Fortnite and you only have the standard skins there will be social pressure to spend money."*

Moreover, item rarity and scarcity are usually associated with games that have cosmetics. Some Cosmetic items are only produced in a limited amount, while other items are not. This affects the prices of each of these items where some are worth more than $100 USD and others are worth $0.1 USD. This can lead to social differences between the children and create more social pressure.

D12- *"Big differences between the children, those who have parents who can afford to spend a lot of money on skin packs and those who do not."*

One of the developers supports their stand and states the importance of not creating such mechanisms for children.

D2 - *I think it is more about not making mechanics that will get the children hooked on something that they will have to pay for, for example, with skins and that kind of thing, which is very much like a scheme to get kids to hype each other about.*

Social punishment. Many F2P games use features such as Battle-Pass and add-ons that can be purchased to have more levels or maps to play. Social punishment involves punishing the player for not making in-game purchases by limiting the player's social interaction with others. E3 presents several aspects of F2P games that are not good practices. Many of them revolve around the social punishments players experience when not paying.

E3 - *"And then there are elements that cause you to sort people, for example if you do not pay - you do not get to meet your friends, and that you are not good enough to play with those that have paid. There is a sorting society inside, based on how much money you spend, and it is very destructive. This is something we see many game companies do."*

Additionally, many team-based games are based around matches or rounds that last a specific amount of time. A player who leaves the game prematurely will be punished by waiting a particular time before they can play again. For a children's game, this is seen as something that should not be used - there should not be any negative consequences for a child that stops playing the game.

E3 - *"No, I think that if you make F2P games for children you should make it easy for children to put the game away. This means: no social punishment for being a child."*

Moreover, E3 states that this is also problematic since social interaction is an important feature to make a game fun for its player. Not punishing the players for breaking the rules in the game would ultimately destroy the game's social element.

E3 - *"It becomes difficult and challenging for game designers to make F2P games for kids because they use all these social elements and all these things are there for it to appeal to the kids, that it should be fun. If a child should easily be able to put away the game, it will be challenging for the designers."*

To address this, E3 further states that the best option for social interaction in the game
is through the use of non-concurrency - where social interaction between players is not
happening simultaneously but over a more extended period.

E3 - *"As soon as you can help people further and do social things, it becomes more ap-
pealing. In games that have achieved non-concurrency players can be social, but do not
have to play at the same time, and this is more suitable for children."*

5.4.2 Game Design

Several factors were seen as necessary regarding the design of the game. When creating
games for children, more areas need to be addressed compared to regular Free-to-Play
games. Many developers have already spent much time figuring out good design elements
for children, such as button size, use of text, sound, etc.

Fun. To create a successful game, fun was seen as an important aspect and the underlying
foundation for the creation of a game. This was the main focus of several developers.

D1 - *"Since I'm working as a designer, all we think about is the kids having fun. So we
take that on account in every single decision we make."*

Some of the interviewees had created F2P games for children that were primarily based on
subscription. Since parents are paying for their child in most cases, it was essential to give
the child space to enjoy and have fun with the game before any monetization mechanics
started appearing.

D8 - *"When making games for younger children, it is important to give the child space
to play and have fun. The game has to prove it is fun before the parent is asked to spend
anything more on it."*

Moreover, it was important for one of the companies to reassure parents that their game
was not driven by money but consists of experiences that children find fun or interesting.

D14 - *"They should know that is certain that the game is not driven by revenue, but that
the gameplay or the experience in the game is actually so interesting that the children
themselves bother to do it."*

Accessibility. Accessibility was seen as another important factor when creating games for
children. Using features such as different difficulties (easy, medium, hard) to make the
game more accessible to a broader target group was important.

D14 - *"We figured that children as a target group is very diverse. As a result we imple-
mented different difficulties that the children could choose from. In this way the children*

would always see progression in the game and reach a higher level."

Additionally, some companies had implemented voice-overs to address the children who could not read and guide them in the game if they faced any difficulties or problems.

D6 - *"we couldn't rely on text because kids in that age group couldn't read so. So there would be a lot of voice-overs in the apps or like voices telling kids what to do."*

Usability. High usability was also claimed to be important since children as a target group are pretty diverse. The use of well-designed buttons and other UX elements was claimed as necessary among interviewees to make a game that children easily understand.

D6 - *"We have used a lot of symbols and made things really obvious as far as what they should tap, and we could not rely on instructional text on screen at all. That was the big challenge - how do you make sure kids know what to do with without any description."*

Also, as monetizing is at the core of the F2P-model, one interviewee claimed the need to address accidental purchases done by children. Another highlights the aspect of how monetizing features can affect the design of the game negatively.

D1 - *"So we both try to avoid the behaviors like children paying for things that may result in trouble and also teaching them useful stuff for their way."*

D15 - *"Um, I think one of the biggest things to ensure from a business perspective, is having a clear path to to income. And being straightforward and clear about that is very important."*

According to D15, this is important both for the developers and the players. Additionally, the game must be easy to understand, or else players will lose interest and stop playing.

D8 - *"The game must be easy to understand during the onboarding/tutorial because most player loss occurs during the first session."*

Immersion. Immersion was considered important for the game experience. According to many interviewees, Free-to-Play features such as advertisements and time restrictions can negatively affect the immersion and should be avoided. As a player, you want to be immersed in the game and avoid distractions.

D7 - *"I think like, as long as you don't put commercials into a game and break the immersion, in a sense, you could say the same thing about the timers, if you have to go away from the game for eight hours to wait for a timer or pay. That's also something that breaks the immersion. And to me, that's what games are really about."*

D7 - *"I think it's important if you can avoid having commercials in game, in general, that be a really good thing. Also, because it completely breaks the immersion."*

5.4.3 Choosing Features

Monetization Features. The interviewees had mixed opinions about what monetization features are considered suitable for children. As mentioned earlier, the use and combination of monetization features in a Free-to-Play game is crucial for its survival. Moreover, a too aggressive monetization strategy may lower the user base. On the other side, a passive monetization strategy may lead to companies losing income. There is a fine balance, especially when children are the target group. Features that were pointed out to be the worse were the ones that were related to gambling, typically loot-boxes.

E3 - *"The worst thing is gambling elements, where the player do not know what they will be getting, for example loot-boxes."*

Additionally, the use of Battle-Passes received criticism for creating purchase pressure and social pressure for the players.

E3 - *"If you do not have a battle-pass, you will be on the outside. You are not allowed to play in competitions that your friends play. There is extremely strong purchase pressure. I think that is the second most reprehensible thing. It is not the mechanism in itself that is the problem, but how it is used against the player to force sales, which is problematic for children. [...] It is inhuman for children to be exposed to, it is bullying."*

In-game currency was also seen as questionable mainly because it acts as a psychological barrier between real currency spent and virtual currency to make it inconspicuous how much money an item costs.

D12 - *"Using In-game currency is a psychological trick - a trick to make you not see the actual value you spend. Especially for children who, in a way, only look at it as In-game currency and do not see the real value that they put into the game."*

Similarly, Pay-to-Win was seen in a negative light by the interviewees. To be able to purchase upgrades or items that improve a player's ability to win compared to other players was seen as unfair and a way for companies to generate more revenue. Instead, use of cosmetics and purchasable upgrade-packs (including Battle-Passes) that gives the player more content was seen better, especially in a game for children.

E2 - *"I think that having features that not necessarily gives the player advantages, but rather improve the game experience or opens for additional content, and challenges is the way to go."*

Regarding features that are considered acceptable to include in children's games, there were many conflicting findings. E2 would avoid in-game purchases for children, but if he had to choose a monetization feature, cosmetics was the best option.

E2 - *"If I had to use some sort of monetization feature I would stick to a conventional store that sold skins/cosmetics, but placed in one location of the game without it appearing in-*

advertently."

Safety Features. Some interviewees suggested parental control or gate as a way of improving the F2P games for children. Several mechanisms were mentioned, but primarily the goal was the same; to separate the children from monetization features. One way is to let the parents create and use a password to limit access to parental control and deny the child from making In-game purchases.

E1 - *"You can implement parental control so parents easily can disable In-game purchases, and maybe have this option enabled by default. Also use of a code that the parents need to enter to access the parental control."*

Many companies that have developed games for children have also implemented a parental control panel inside the game where purchases are made. The aim is to avoid children being in direct contact with the monetizing mechanics. Several highlighted the importance of secure parental controls. One company has also used a password that changes overtime to ensure that the child does not access the password.

D1 - *"we ask like for a password that changes over time. And we have the numbers written down, we have like our screen who says write the numbers 556 in letters most of the kids can't read, so they don't understand that. And only the parents can do that. We are definitely sure that elder kids can access that."*

Moreover, password check, mathematical questions, or biometrics was suggested as a part of the parental control. E2 suggests that the in-game store should be separated from the actual game to enable parents to decide whether the store should be available or not.

D8 - *"Second, devices should not be set to allow purchases without inputting a password/biometric when children are allowed to play on them."*

Additionally, once an accidental purchase has taken place, it was seen as necessary that game development companies undertake good practices for reimbursing the player.

D8 - *"I also believe that any company that deals with free-to-play games should reimburse users in good faith when an erroneous purchase has been made."*

Some of the developers have already implemented age-gate as a way of hindering children from entering games that were not meant for them.

D6 - *"On some past projects, like we've had to implement age gates, were, basically in order to access certain parts of the app, you need to make sure that you're above a certain age, to ensure that certain content isn't shown to people under a certain age."*

Both experts and developers mentioned Roblox[4] as a good example of how to address chil-

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[4]https://corp.roblox.com/

dren in a game. Roblox is a platform where players can create, play and share experiences in a generated 3D world. The player can choose among several different game worlds and genres to play. Roblox has implemented a parent control to address children so that parents can limit or disable multiple different features spanning from the chat function to filtering out different game modes. They also have a reporting system where players can report inappropriate behavior and a chat filter to remove inappropriate chat messages between players. One of the interview subjects highlights Roblox as a good way of designing games for children. D12 mentions their parental gate as a good one.

D12 - *"I think that the Roblox model has done very well to address children and the parents."*

Avoid monetizing. Several of the interview subjects expresses that they do not think F2P is suitable for kids at all. Some are directly skeptical of the model, some to in-game purchases, and others to everything related to spending and kids. E3 highlights the problem of monetizing against children because of their lack of impulse control and regulating their feelings.

E3 - *"I do not think it is okay to monetize children at all. I think they do not have the ability to regulate and control their own emotions. [...] I think that premium products, where the parents purchase the whole game for their kids is the best."*

He states that premium games is better suited for them.

5.4.4 Process

The three experts had different input on how the process when creating F2P games should be.

Guidelines for developers. To create quality F2P games for children, following guidelines are essential according to E1. These guidelines should be used by the developers when developing games. Furthermore, he points out the usefulness of a good parental guide - guidelines provided by the game company for the parents, to increase children's safety when playing games.

E1 - *"You need to have guidelines. In Roblox, for example, there are guidelines that developers need to follow when creating games and how they advertise it"*

Include experts. E3 suggests using experts as a part of the process to create suitable games that the children love. Further, he states that this could help to create valuable games that the children could learn from.

E3 - *"I would have used child experts a lot to create a game that has meaning and something that kids love."*

Rapid Development. One of the problems when creating F2P games is the development time to a release product. Many of the big F2P companies have multiple F2P games that have been produced in a short amount of time.

D6 - *"The games were done in a pretty short timeline. So so there will always be more games released after and we wouldn't spend too long on a single game. "*

Moreover, due to rapid development and tight deadlines had an impact on the quality of the games.

D7 - *"I think there's also something about the quality of the games because everything has to be made super fast and you don't have time to finish anything so you start out making a game but you can only spend a month on it and then if the game fails then it's on to the next one."*

One highlights the importance of having more development time after the gameplay in the game has been tested. Developers did not have time to address all the collected feedback from the testing phase to improve the game before it went into production.

D6 - *"I think the biggest thing that can be improved about that would have been to allow for more development time after these play tests. [..] always making sure there's enough time to accommodate and address feedback after having played test."*

Testing. Most of the process-related findings to RQ3 were related to testing. Many of the interviewees stated that testing is important and should be done a lot and regularly in the process.

D1 - *"Every time you are designing any feature. You will desire to have children by to test it. So we really, really need children to be more involved in the process. You know, my company, if we could right now, we would test with kids, like once a week or twice a week, if we wanted to would be the optimal thing to do."*

Another aspect of testing was regularly testing pointed out by several developers. One developer said that testing early with many users are the way to go.

D7 - *"I think like really, the best thing you can do is always test a lot. Like as many kids you can get the game out to them better. If you can get a better version of the game out early. That will help a lot because that's the only way you can learn."*

5.4.5 Responsibility

A critical factor to address is related to responsibility for children's actions in F2P games. The thematic analysis revealed five main groups that should be responsible.

Parent responsibility. Several of the respondents said that it is the parents' responsibility to look out for their children, and be responsible for children's actions concerning in-game purchases, both accidental and on purpose. One developer claim that it is entirely the parents' responsibility to handle that children do not get access to monetization mechanics.

D6 - *"I feel like that's on the parents to be responsible and make make sure that purchases require a password and that the kids don't have the password."*

E1 highlights that the parents and their children took an active choice when downloading the game, but he also states that there is a lot for the parents to handle and that it can be challenging.

E1 - *"Ultimately, it is the parents and children who make the active choice to download the game. [...] but then there is so much else in between that makes you as a parent have little control. It is not as simple as just saying no."*

Developer responsibility. One of the problems with the F2P industry is how competitive it is. Restricting the monetization mechanics too much may lead to losing competitive advantages. This may impact to what degree developers take responsibility related to the issues between F2P and children.

E3 - *"I think the ones that can do something about it today is the developers, but they will not, because it's about competition and survival. "*

The results also revealed that one developer did not believe that children needed to be addressed differently than adults when designing F2P games.

D10 - *"I mean, from my perspective, children are just, you know, small adults and should be treated equally."*

Company responsibility. E1 could tell that the responsibility of the companies primarily is ethical because children are playing the game. Further, he states that the companies are not required by law to be ethical. However, he has observed improvements where several big companies take more responsibility for children and in-game purchases.

E1 - *"We have seen game consoles and developers that are taking more responsibility. More games have started to have parental control etc, so we see some changes in the gaming industry and it is starting to get better, but it is still a bit fresh and new."*

Furthermore, he states that to improve the situation, game companies could turn to parents and teachers when it comes to children. Additionally, the companies should be open for feedback.

E1 - *"Parents and teachers are the children's main spokesperson, so I think that addressing parents as a target group is in a way the most important thing. For the most part, the*

game must be accessible, the companies must address feedback from players. This is the best you can do."

Platform responsibility. E2 stated that the platforms have the best opportunity to improve the challenges regarding in-game purchases and children. They have some filters today, but he states that many games let through. Further, he wants better quality assurance.

E2 - *"I think in-game purchase is something that needs to be addressed by the platforms"*

E2 - *"Google and Apple have the ability to put certain restrictions on the source when it comes to access to their platforms. Apple is stricter than Google, but there is still a lot of bad games that gets out on these platforms, there is no quality control directly."*

Further, he states the importance of supervising and make sure that this is conducted correctly.

E2 - *"One must supervise these companies, and it must be done continuously and it must be done again and again. The companies are located in completely different places than in Europe. Then you have to supervise the platform that has offices in Europe, for example Apple, Google, and Microsoft."*

Legal responsibility. Especially, the experts called for more regulations regarding F2P games. E3 states that he thinks the responsibility is on the authorities. Further, he informs that the F2P industry is not regulated in Norway and is not considered dangerous to spend much time with. He states that he thinks there needs to be more regulations. E2 complements this and states that the gaming market does not get much attention from authorities.

E3 - *"I think the responsibility lies primarily with the legislature. I think they are the one who should go in and regulate this harder. [...] Today there is a very open market for this, and it comes from thinking that games and computer products and screens are actually not very dangerous if people use it a lot. In Norway there is very little regulation. "*

E2 - *"The gaming market has received very little attention from legislators and politicians. This gaming industry escalated very quickly and went under the radar."*

All the experts considered the loot-box as an issue. E2 points out the regulation of the loot-box that some countries have started with. He informs that Norway chose to regulate the loot box. Further, E2 states that partial international regulations could be the solution for regulating the loot-box. E1 substantiates this by stating that the loot box resembles gambling. He informs that a committee has examined the loot-boxes. The conclusion was that the loot-boxes were in a gray area. Further, he wishes for more regulations related to loot-boxes.

E1 - *"I hope and wish that there will be more regulation, and of course I hope these game developers will have stricter requirements for their games and how they design the game.*

Moreover, the parents need to get good information about the game and can use parental controls to set up settings to avoid children being tricked to purchase or avoid accidental purchases."

In general, E1 states that he thinks it should be more regulations for game developers. Such that the regulations ensure that they develop games for the children's best and give parents all the information they need.

5.5   Summary

Table 5.5 presents findings from the investigated developers and experts: (RQ1) *What is the reasoning behind the use of different monetization features in Free-to-Play games?* (RQ2) *How are developers addressing children in Free-to-Play games?* (RQ3) *What factors must be addressed to create suitable Free-to-Play games for children?*

Research Questions	Summary
RQ1	Findings reveal several reasons behind the use- and avoidance of monetization features. Developers mostly used features as incentives for the player to purchase and have additional content and experiences for the players. Moreover, some features were avoided because of the ethical aspect. Additionally, the monetization features needed to follow the core gameplay. Different features belonged to different genres. Some developers only used subscriptions to target the parents and not the children. Additionally, some companies claimed that they use a combination of features to give the player an alternative to make purchases (e.g., by watching advertisements instead). Some challenges were related to the competition in the F2P industry to generate revenue, which impacted what features to use and how aggressive the monetization strategy should be.
RQ2	Testing were seen as important among the developers. Many companies that developed children's games used children when testing to ensure that the game was fun and easy to understand. Some companies that did not target children had also done some testing on children, but the results varied. The most used testing methods were beta-testing and focus-testing. The use of external testing software such as *Playtest* was also used regularly. The use of guidelines varied across the developers; some based the design on experience, while others used internal guidelines created based on earlier feedback.
RQ3	Good design were was seen as important among the majority of the developers. Fun, usability, accessibility, and immersion were the most important factors here. Moreover, concerning what monetization features to use in the children's game, loot-boxes were seen to be the worst as they resemble gambling. According to the experts, the best feature to use is cosmetics that do not give advantages in the game. Moreover, psychological factors, especially concerning exploitation in F2P, were seen as big problems and must be addressed. The interviewees had different opinions regarding who should be responsible for children's actions in F2P. Most developers claimed parents to be responsible, while the experts claim developers and the platforms to be responsible. However, due to how competitive the F2P industry is, experts argued that developers would not be willing to take this responsibility due to reduced competitiveness in the market.

**Table 5.5:** Summary of the main findings regarding the research questions.

Chapter 6

The Free-to-Play for Children Framework

Based on the thematic analysis, the systematic analysis (Chapter 3), and other relevant research, we present the Free-to-Play for Children (F2P4C) framework. It is created with the motivation that developers have an ethical responsibility when creating games. The framework aims to highlight and guide developers to develop suitable Free-to-Play games for children. The framework focuses mainly on the game development processes and game design factors related to F2P and children, identified in the thematic analysis. Additional tools and guidelines should address other aspects of game development to create a quality game in general. The chapter proceeds as follows: Section 6.1 presents an overview of the F2P4C framework consisting of the conceptual model and presents the structure of the framework and its two dimensions (game design, game development process). Further, Section 6.2 presents the dimension of *Game Design* and its factors. Next, Section 6.3 presents the *Game Development Process*. The framework is presented in section 6.4.

6.1   Framework Overview

Notation. In this section, the structure, and notation of the framework are discussed (see Figure 6.1). The framework defines the most important factors when creating Free-to-Play games for children and distinguishes three levels consisting of dimensions, factors, and elements. The highest level consists of dimensions, and the lowest level is the elements.

- There are two main *dimensions*; Game Design (represented as a circle) and Game Development Process (represented as the large arrow).

- Game design consists of *factors*; represented as parts of the circle.

- Each factor consists of *elements*; represented as the squares.

- *Lines* between elements and factors indicate the relationship between them.
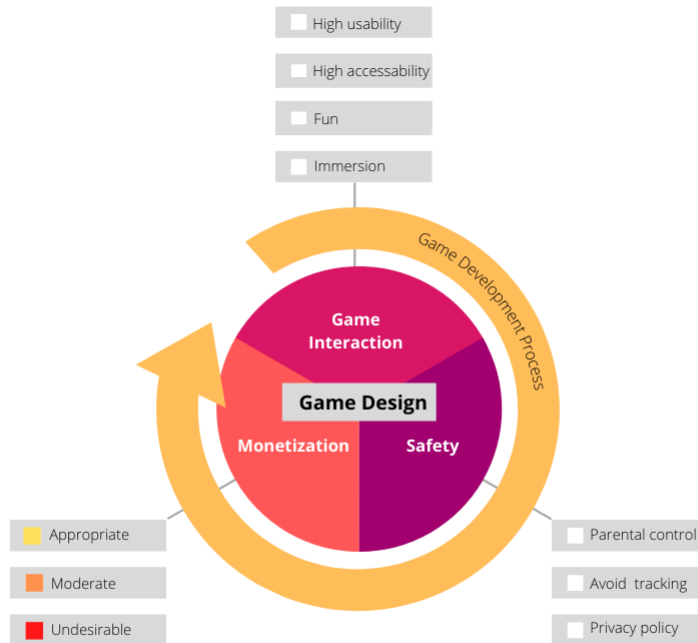
Figure 6.1: A conceptual model of the crucial aspects of Free-to-Play for Children, consisting of dimensions, factors and elements.

The F2P4C framework consists of two dimensions that emerged from the thematic analysis and is seen as important for F2P games for children; *Game Design* and *Game Development Process*. We define *Game Design* as every element from the game core to what the player can see or experience in the game. The framework divides game design into three factors consisting of *Game Interaction*, *Monetization*, and *Safety*. All factors are related to F2P and children. Additionally, *Game Development Process* involves several aspects to address children and to enhance the game design.

6.2 Game Design

The game design dimension can be seen as every element that constitutes a F2P game, from user interfaces, game genres to monetization features and strategies. This dimension is divided into three factors; (1) Gameplay, (2) Monetization, and (3) Safety. Each factor consists of essential elements when creating suitable F2P games for children and is described below.

6.2.1 Game Interaction

We define *Game Interaction* as every element of interaction that the user has with the game. Our findings revealed four elements that are important to address when creating F2P games for children.

Usability. High usability is considered crucial when creating games for children, especially when the game includes monetization features. Usability refers to make sure an interactive product is easy to learn, effective to use, and that the user finds it enjoyable to use (Rogers et al., 2011). Concerning F2P for children, the main focus should be a fun game. Further, there should not be any monetization features that are unclear for the children or hidden in the gameplay, leading to unwanted purchases.

Jakob Nielsen's usability heuristics can be helpful when wanting to achieve high usability (Rogers et al., 2011). Especially the heuristics of *user control and freedom* and *help users recognize and recover from errors* is essential when designing F2P for children. The game should support that the player can regret their purchases. Additionally, heuristic *error prevention* is essential as it should be a straightforward design for purchases. We suggest adding a warning before purchases where the parents must confirm before further purchases. Pinelle et al. (2008) has adjusted the heuristics by Nielsen and addresses usability issues in games as video games require constant interaction, which can be helpful for developers when creating F2P for children.

We recommend that developers focus on separating what elements are associated with the gameplay and what elements are associated with monetization. Children may have problems separating these elements from each other, thus leading to accidental purchases. Moreover, as stated in these heuristics, having good visualization of information, especially concerning in-game purchases, is essential.

Accessibility. When creating games for children, accessibility is crucial. Accessibility refers to *the degree to which an interactive product is accessible by as many people as possible* (Rogers et al., 2011). For the application to be usable, it needs to be accessible as well (Krug, 2013). Free-to-Play games are free and can be downloaded by everyone. It is therefore accessible to a broad audience and many children. Children develop differently, have different experiences, skills, and cognitive development Fitton and Read (2019). Furthermore, games are a social arena, and games should be designed to include all children. Therefore, the game must achieve high accessibility.

When designing for children, the game must develop interfaces and gameplay experiences that all children can interact with and understand. The use of different difficulties in the game can help adjust to a broad target group where everyone can feel that they can understand the games. Our findings reveal that the use of elements (e.g., buttons) that is easy to interact with and easy to read, text and voice-overs can be beneficial to achieve accessibility, which can be important for enhancing the design related to in-game purchases as well.

Fun. The thematic analysis revealed fun as a crucial factor when creating games for chil-

dren. *Fun* can be defined as the degree to which children enjoy interacting with a software product (Jaccheri and Morasca, 2021). We propose that GameFlow (Sweetser and Wyeth, 2005), a model for evaluating player enjoyment in games, should be used to achieve fun for the player. The model consists of 8 heuristics for player enjoyment; Concentration, Challenge, Player Skills, Control, Clear Goals, Feedback, Immersion, Social Interaction. The main motivation to create games should be to create a fun environment for children to interact with, which complements a vital aspect of usability. As brought up by several developers, the game must be experienced as fun such that the players think it is worth paying for the game.

However, in-game monetization can go at the expense of fun. Aggressive monetization can have several negative consequences (King et al., 2019). If the game demands many purchases, it can lead to social pressure and exclusion of children. As social interaction in the gaming context is vital for fun, monetization should not lead to negative experiences. Furthermore, Pay-to-Win (P2W) features can decrease the feeling of fun in two ways. Firstly, such features can divide the player base into two groups consisting of non-paying players and paying players Alha et al. (2014). If the game is based on social elements and some players pay to get better or look "cooler, " it can result in non-paying players being left behind and feel excluded. Secondly, paying to win can reduce the sense of achievement. Challenges with a clear goal that the player achieves by playing the game can increase self-esteem and are considered necessary for fun (Malone, 1980). Challenge is also one of the heuristics of GameFlow (Sweetser and Wyeth, 2005). Having P2W mechanics removes the challenge in the game. Furthermore, as highlighted by the interviewed psychologist, a good children's game is a game that has meaning and the children love.

Immersion. An essential element that should be addressed concerning F2P games is immersion. Including in-game purchases in a game where the player experiences immersion can be problematic, especially for children. The feeling of immersion results in an alteration in time and the user not sensing the surroundings (Sweetser and Wyeth, 2005). The thematic analysis revealed two aspects regarding the combination of monetization and immersion. The first is having monetization features that disrupt the gameplay and break the immersion. Examples of such monetization features are advertisements, special offers, and timers. Such monetization features can go at the expense of fun. The other aspect is monetization features that are a part of the gameplay, such as in-game currency. If the player experience immersion, it could be even harder to understand that in-game currency costs real money. Several of the cases with children spending in-game was related to in-game currency. We advise avoiding monetization that can be masked by immersion, as it can lead to several unwanted purchases.

6.2.2 Monetization

An important factor in designing F2P games for children is choosing which monetization features to include and avoid in F2P games for children. Based on the thematic analysis and the systematic literature review, we have categorized the different monetization features. Especially the ADD-framework by Fitton and Read (2019) and the opinions from the experts were important when conducting the categorization. A lot of the reasoning

is related to the elements discussed in section 6.2.1. The monetization features are categorized as *appropriate*, *moderate*, and *undesirable*. The *appropriate* category consists of features that do not alter the gameplay but increase the game experience. *Moderate* consists of features that add extended content, increase the game experience but may break the immersion. Lastly, the *Undesirable* consists of features that are related to gambling and elements that break the immersion. However, the thematic analysis revealed that the best for children is to avoid monetization features. The categorization is presented in Table 6.1.

6.2.3 Safety Features

In the F2P4C framework, safety features include safety related to privacy and having features to avoid unwanted purchases done by children. We suggest having mechanics to separate the children from directly interacting with the monetization features. Further, the game should be in line with COPPA, GDPR, or other regulations which apply where the game is released. The design of the safety elements should be in line with the elements presented in section 6.2.1.

Parental control. We suggest that all purchases go through a parental control to avoid that children purchase anything by accident. There should be a password or biometric such that only the parents can access the parental control. The parental control can have settings such that children can do spendings in-game up to a limit set by the parents. Further, we suggest that purchases in-game cannot be conducted if the parental control is not set up.

Tracking. A F2P game should not include tracking that violates COPPA, GDPR, or other regulations. This is also supported in the kid's section of Apple App Store[1]. *Online tracking* can be defined as the process of recording, measuring, and analyzing the behavior of individual users(Vlajic et al., 2018). In the research by Ekambaranathan et al., there was revealed that Apps from the family genre in the Google play store have the second-highest number of tracker hosts associated with them (Ekambaranathan et al., 2020). Additionally, getting information advantages (e.g., behavior tracking) to encourage data manipulations (e.g., price manipulation) to optimize offers to incentivize spending has the potential to exploit vulnerable users, such as children, and should be avoided (King et al., 2019).

Privacy Policy. Children's app should include a privacy policy, and this should be available for the parents. We suggest including it in the parental control and that the game cannot be played before this is set up. The most important aspects of the privacy policy should be presented in a user-friendly way. One potential challenge may relate to complex and comprehensive privacy terms, which may overwhelm the user and lead to the users accepting terms they have not understood (Ekambaranathan et al., 2020).

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[1]https://developer.apple.com/app-store/review/guidelines/#kids

Monetization Feature	Reasoning
Appropriate	
Cosmetics/Skins	Cosmetics that do not give the player any advantages in the game is seen as more positive than other monetization features. The reason being that this feature do not alter with how the game is played, and give the players extended content to interact with, and a way for the player to express themselves. However, this feature may lead to social pressure related to buying creating social differences.
Moderate	
Battle-Pass	This feature usually contain cosmetics that is only achievable through the Battle-Pass, as well as giving player extended content to play. As with cosmetics this feature do not alter with the gameplay, but may cause social pressure as player without the Battle-Pass are not able to play with their friends that have purchased.
Advertisement	Advertisement is being used in different ways. The positive aspect of advertisement alone is that it helps the company generate revenue without monetizing it's users. As our findings reveal, some companies give the player an option to watch advertisement instead of doing in-game purchases to unlock time-restrictions. In spite of this, advertisement breaks the immersion, and can potentially redirect the child out of the game. Additionally, the advertisement need to be appropriate for children to watch.
In-Game Currency	In-game currency may create confusion about the actual value of the purchasable items in the game. We believe that this might confuse children and parents. Use of In-game currency should be placed in a separate part of the game (e.g in a store) and it should state that these currencies cost real money. We believe that this feature should not be in a F2P game, but if these conditions are met this feature is more acceptable.
Pop-Ups	Pop-ups usually advertise about offers in the game. First of all this breaks the immersion and may confuse children.
Undesirable	
Loot box	Findings in the thematic analysis, as well as the systematic literature review reveal that loot boxes has a high resemblance with gambling, and we believe that this feature should be avoided at all cost.
Boosters, Power-ups, Time-restrictions	Time-restrictions is usually used to slow down the pace of the game, making the player wait a specific amount of time before continue playing. Booster and Power-ups is used in combination with time-restrictions letting the player skip the restrictions by purchasing booster and Power-ups (e.g extra lives). We don't think that this feature is appropriate in a game for kids, as this breaks the immersion of the game and completely stops the player's progression in the game. A game for kids should be fun and exiting with matching difficulty, and in many games the difficulty gets so hard that boosters or power-ups need to be purchased to continue. This is Pay-to-Win elements, which is not considered appropriate for children.

Table 6.1: A categorization of monetization features in children games.

6.3   Game Development Process

A thorough Game development process will be essential to achieve the Game Design presented in section 6.2. We propose conducting the game development in line with design thinking integrated with agile software development to achieve the game design factors and address the problems revealed in the thematic analysis related to rapid development, tight budgets, and short deadlines. A Systematic Literature Review on design thinking in Agile software development (Pereira and de FSM Russo, 2018) reveal that the integrated approach resulted in a better approximation towards the end-users. Furthermore, we suggest a focus on children as a stakeholder by including children as much as possible in the development process (Jaccheri and Morasca, 2021).

Agile software development is considered a user-centered approach (Gasson, 2003). The user-centered design focuses on three principles: *early focus on users and tasks, empirical measurements, and iterative design* (Guitton, 2020). Further, Corral and Fronza (2018) declare that there is no complete consensus of the formal definition of what design thinking is, but that it can be understood as an approach to creating solutions with a human-centric focus. The human-centered design takes a more socio-technical view than the user-centered design, focusing on both the social aspect of the interacting human and the technical system (Gasson, 2003). Moreover, Gasson argues that user-centered system design approaches are too limited for considering the aspects of context and socio-cultural significance that a system inquires to be human-centered. The study Seffah et al. (2005) emphasizes that adding a human-centered approach to software engineering addresses a need for shifting the focus in system development towards putting the goals, needs, and wishes of the users first. This perspective is in line with the development guideline from Jaccheri and Morasca (2021).

Further, agile practices aim to provide a lightweight, product-oriented solution in a fast-changing environment (Corral and Fronza, 2018). The thematic analysis revealed that most developers used an agile methodology, but only a few discussed having a human-centric focus. All actions made towards a more human-centric approach can help to address children better. In the study, Higuchi and Nakano (2017) it was observed that several aspects of Design Thinking already were used in game development. Further, it is stated that the combination of Design Thinking and agile can contribute to the efficiency of creating games (Higuchi and Nakano, 2017). A challenge discovered through the thematic analysis is that many F2P games have a rapid development, which can go at the expense of quality. We believe that this approach can solve some of the problems to enhance the quality of the game.

Testing is considered necessary in both agile methods and user-centered design, which was also an essential factor for creating suitable F2P games for children. Feedback is vital to ensure the quality of the game. Games that target children should conduct testing to ensure that there are no critical challenges that must be addressed. Testing should be conducted multiple times before it goes into production and should be included in all stages. One challenge revealed in the thematic analysis was that developers did not have time to test as much as they wanted. However, when there is a lack of time to conduct testing, we suggest

the mindset of Krug (2013) which states that *"testing one user early in the project is better than testing 50 near the end"*. Additionally, that a simple user test early is more valuable than an elaborate user test later.

The thematic analysis revealed essential aspects of validating the game to ensure it is suitable for children. Furthermore, several developers based their decisions on their own experiences. Validating using experts or guidelines could ensure that the game is created with children's best interest in mind and discover hidden issues. The use of guidelines as a part of the process can be a good way of creating games for children's best, such as *Designing for Children's rights*. Furthermore, the game needs to be validated by applicable laws and regulations related to children as a user group.

6.4 The F2P4C framework

The F2P4C framework presents guidelines, see Table 6.2. It consists of important aspects developers can address with concrete actions to create more suitable F2P games for children.

Focus on	Actions
High Usability	• Focus on creating an enjoyable game. • Provide the user with the opportunity to regret purchases. • Include warning before purchases and confirmation by parents. • Separate the gameplay from the monetization mechanics. • Good visualization of important information.
High Accesibility	• Implement different difficulties (easy, medium, hard) to meet children's abilities. • Use elements that are easy to read and interact with. • Text and voice-overs can be beneficial to meet the needs of those who cannot read.
Fun	• Do not choose monetization features that go at the expense of fun. • Avoid P2W (e.g., giving the player advantages over other players). • Avoid mechanics that build on social pressure.
Immersion	• Avoid including monetization features that break the immersion (e.g., Advertisements, pop-ups).
Choosing Features	• Appropriate: cosmetics/skins. • Moderate: battle-pass, advertisement, in-game currency, pop-ups. • Undesirable: loot box, boosters, power-ups, time-restrictions.
Parental Control	• All purchasing should be conducted through the parental control. • Use a password or biometric to access the parental control. • Can include allowing spending in the game up to a given limit set in the parental control.
Avoid Tracking	• Avoid tracking for information advantages (e.g., behavioral tracking) that exploits children by enhancing monetization by manipulating the design. • GDPR and COPPA should be followed to avoid illegal tracking.
Privacy Policy	• Privacy policy should be included in the parental control. • The privacy policy should be presented in a user-friendly manner. • GDPR and COPPA should be followed to ensure children privacy.
Process	• Use an integrated approach with agile and design thinking. • Focus on children as a user to meet children's needs. • Use an iterative approach to improve the game and ensure quality. • Include children in the development process as much as possible.
Testing	• Testing should be conducted with children. • Continuous testing should be done in all stages until production. • User testing should be conducted early rather than at the end.
Use expert knowledge	• Use domain experts to validate that the game is made in children's best interest. • Follow guidelines that have been thoroughly validated.

Table 6.2: The F2P4C framework consists of guidelines with concrete actions for developers.

Chapter 7

Discussion

In this chapter, we discuss the findings from Chapter 5 and Chapter 6. Section 7.1 presents the reasoning behind the different monetization features used in Free-to-Play (RQ1). Section 7.2 presents how developers address children when developing Free-to-Play games (RQ2). Additionally, Section 7.3 introduces the crucial factors that need to be addressed to create suitable Free-to-Play games for children (RQ3). Section 7.4 presents the limitation of the study. Lastly, we present implications of the thematic synthesis process and the framework in Section 7.5.

7.1 Reasoning behind the use of different monetization features in Free-to-Play games

The thematic analysis revealed six themes related to the reasoning behind the use of monetization features among the developers, see Figure 5.1. The different reasons were related to 1) the game genre, 2) incentives for players, 3) benefit the player, 4) the ethical perspective, 5) the perspective of children, and 6) barriers.

Genre-specific. The results revealed that many of the developers chose features for their games based on the genre. Some features were seen to work specifically well with one specific genre, while other features were considered compatible with most genres. Several developers claimed that their monetization strategy had to intersect with the core gameplay and genre. If not, the monetization features would be less valuable for the players. Hamari et al. (2017a) supports this claiming that the purchase motivation for different genres may vary, and therefore different features are needed. Furthermore, one developer highlighted the loot box as something that worked independently of the genre. This may be one of the reasons why loot box is widely used. Battle-passes were considered to work well with shooter games as they do not interfere with the gameplay but add additional value through cosmetics and extended gameplay elements. However, the findings also revealed

that developers experiment with different features to see what works well, indicating that the genre was not limiting the choice or reasoning of features to use.

Purchase Incentives. Not surprisingly, many of the respondents chose monetization features to create more incentives for players to make in-game purchases. This resemblance with the findings from the systematic literature review, which revealed that the majority of papers were related to purchase motivations and revenue maximization, shown in Figure 3.3. However, a variety of different tactics were used to get the player to make in-game purchases.

In-game currency was used among the majority of the developers, see Table 5.3. With a one-time payment, the player can buy a pack of virtual coins to purchase several virtual goods in the game. Hamari et al. (2020); Lelonek-Kuleta et al. (2021) discovered that F2P games tend to slice their virtual goods into small micropayments. This is, according to Gourville, J.T. (1998) a method that will, in the long run, generate more revenue. Developers used in-game currency because it simplifies the process of making purchases. Additionally, virtual currency may weaken the perception of the total amount a player spends, leading to more purchases.

Findings imply that a lot of F2P companies use dark patterns to create revenue, as presented by Zagal et al. (2013) and Fitton and Read (2019). Some companies intentionally used mechanisms that build on social pressure. By having friend mechanics where the players help each other, players want to contribute to everyone's success. The reason for choosing such features was that it was considered to increase the chance of people spending, such that they feel that they contribute in the friend group. Moreover, F2P games typically use features such as time restrictions and advertisements to slow down the game's pace. In the long run, developers expect players to purchase virtual goods such as boosters or power-ups that remove the time restrictions or advertisements. These features are examples of Pay-to-Win (P2W) features (Lelonek-Kuleta et al., 2021). P2W is a criticized aspect of F2P and considered as dark design (Alha et al., 2018; Fitton and Read, 2019). The use of repetition, where the player has to do boring tasks repeatedly, together with choke points, making the game too difficult, was also used to incentivize the player to make in-game purchases. These types of purchases are, according to Alha et al. (2018) one of most significant purchase motivations in F2P and are related to the player's motivation to play the game continuously.

Several companies did data-driven decision-making to enhance monetization. The companies tracked players' behavior in the game and used this data to adapt the monetization features to each unique player. Different players would receive various offers in the game to generate more revenue. This finding was also discovered in a study by King et al. (2019). He presents four ways of tracking behavior patterns that are used in F2P to encourage in-game purchasing. Unique special offers for a player in the game were one way to do so.

Benefit the player. The player experience was seen as very important when choosing

monetization features. One developer mentions that their focus is on creating the best experience for everyone and that they divide their players into two target groups; the ones who want to play for free and the ones that pay. The company emphasizes that they create the game for everyone but have implemented extra functionality for the paying players. Additionally, the developer state that the players who pay, enhances the experience for all the players. However, this statement conflicts with the study by Hamari et al. (2020) that Hamari et al. states that *"the quality of the freemium service does not seem to be associated with premium purchases"*. With premium purchases, he refers to purchasing in-game content. This is also supported by Alha et al. (2018) stating that this is not beneficial as it divides the players into two groups that are not seen as equal. Furthermore, companies have implemented alternative ways to monetize the user base due to players expecting to play the game for free. Many companies used advertisements to generate revenue instead of monetizing the players. Other games allow the users to watch advertisements instead of making in-game purchases to continue in the game. Additionally, cosmetics were seen as a positive monetization feature as it allows the players to create their own identities.

Ethical Perspective. When choosing monetization features, the ethical perspective was important for several developers. The findings revealed two important aspects concerning the ethical perspective. Firstly, dark design was seen as unethical as it is unhealthy and exploits the user, in line with Fitton and Read (2019). This implies that the ethical perspective is important among many developers. Secondly, unethical behavior was seen to be correlated with a bad company reputation. Therefore several companies mentioned that this is important and a driving factor that leads companies towards ethical behavior. One developer believes it is profitable to be ethical because the community can have a lower threshold to spend in-game. It is therefore considered crucial to be perceived as ethical and that this impacts the choice of monetization features.

Perspective of children. The findings show that the majority of the companies did not choose monetization features based on the perspective of children. However, some did, and the answers were quite diverse and contradicting. Some thought advertisements were suitable to include. Others meant that advertisements should be avoided because it interrupts the gameplay. Additionally, some used advertisements to address children not avoid monetizing children. In other words, many developers want to develop games for children's best interest, but have different approach. Lack of knowledge and use of guidelines could potentially be reasons why the developers had such contradicting opinions.

Barriers. Choosing monetization features were challenging for the developers, and the features were not always based on what they believed was the best ones. Some monetization features were expensive to implement, and for smaller companies, this was a reason for avoiding a specific feature. Additionally, developers claimed that it has been progressively harder to generate revenue due to the high competitiveness in the F2P industry. This challenge has impacted the reasoning behind the different monetization features. To compete in a rapidly increasing industry, companies are forced to maintain their competitiveness and must use features demanded by the market. According to one developer, advertisements that generated much revenue three years ago did not generate the same

revenue now, and other features had to be used to compensate.

7.2 Developers addressing children in Free-to-Play

The thematic analysis revealed that developers addressed children differently. Some focus primarily on children when creating games, others not at all. What approach that the companies used when creating games for children also varied a lot. Four themes evolved related to RQ2 and consists of: 1) target audience, 2) process, 3) guidelines, and 4) regulation (see 5.1).

Target audience. Addressing children was challenging among the developers when creating F2P games. Developers are not necessarily familiar with the given age group. This can be problematic for two reasons; developers might not have the knowledge or experience to decide what game elements to include or avoid when creating games for children. Additionally, problems might occur during the development that can be difficult to detect. Thus, the need for proper testing and guidelines during development is essential. One developer had a note on his desk saying "*Perspective of children*" to remind him to focus on the game's target group. Whether that leads to a children-friendly game could probably be up for discussion. Jaccheri and Morasca (2021) states that children and their stakeholders should be included as much as possible in the software development process. Furthermore, one of the main challenges with creating games for children is concerning whom to target to generate revenue. Children do not have a credit card, and developers, therefore, need to target the parents because they are the ones that can pay. To reach the parents, many developers try to make an appealing game that the children enjoyed, hoping that children will go to their parents to ask for them to pay.

Process. The most used methodology for the game development process was working agile. Working agile was considered suitable for rapid development and to combine with different test methods. Testing was considered necessary as it was valuable for the developers to get feedback on their game. The main motivation for most developers was to develop games that the kids enjoy and like. The testing types that the developers used were diverse. The majority used Beta testing and did testing using websites such as Playtestcloud, where they could reach a large number of test subjects. Other methods were focus-testing conducted in kindergartens and schools. Some companies used external agencies specialized in conducting testing. Using external agencies was mentioned to lead to higher testing quality, and it allowed the game companies to focus on developing the game. On the contrary, not all the developers of children's games test their games thoroughly, indicating that the importance of testing on children varied among the developers. Several mentioned that employees sometimes brought their children to the workplace to play and try out the game. Furthermore, some developers did not always test the game or involve children in the process because of tight deadlines. Similar findings were seen in the study by Ekambaranathan et al. (2020) that did a study on family app developers. Moreover, others did not conduct testing and developed games based on intuition and experience, indicating that children were not addressed at all through testing. Not validating against

children can be problematic as it is important to include children in the development process (Jaccheri and Morasca, 2021).

Guidelines. Several of the developers followed guidelines in order to develop suitable games for children. Not all developers used guidelines, and the ones that did, had a wide span of guidelines that were used. Design guidelines or guidelines regarding the gameplay were used, either standardized or created internally in the company. One company used many different guidelines in their company. They had specific guidelines to enhance diversity in their games, that were created by a group of professors and domain experts that the company had employed. Moreover, they had guidelines concerning what monetization features should be allowed when creating games for children and the combination of monetization features. The developer could not grant us access to the guidelines but came with a couple of examples. They had a no for randomized features and loot box features. Further, they followed some of the guidelines from Designing for Children's Rights[1]. This indicate that the way this company addresses children is with children's best interest in mind.

Every company that wants to release games on the Apple App Store or Google play needs to follow the platforms' guidelines to publish the game. However, concerning children, this is primarily content-related, such as violence and other things that are not considered suitable. In the study by Ekambaranathan et al. (2020), where developers of Android games for children were examined, the developers use Google's Developer Guide. However, Ekambaranathan et al. points out that these guidelines do not address children's best interest and that more guidelines explicitly made to address children were needed.

Except for platform-related guidelines that game developers need to follow, several developers did not follow any other guidelines. One stated that they used their gut feeling and based their decisions on experience. This indicates that children are not addressed optimally.

Regulations. There exist some regulations that force developers to address children, such as children's GDPR and COPPA. One developer enlightens that these standards need to be followed to release anything. However, as presented in section 2.2.2 the study by Reyes et al. (2018) revealed that the majority of free children apps violate COPPA. Based on this, there is reason to believe that not all games follow COPPA. Despite what was stated by the developer. Another developer researched COPPA and could inform that it required a lot from developers. The complexity of COPPA may result in developers violating the terms because it is hard to understand or demands much work. However, the thematic analysis did not reveal any examples of this.

Additionally, several developers mentioned the regulations on loot boxes, which also is discussed in the SLR where some countries have banned the loot box totally or partially (Kristiansen and Severin, 2020). The regulations on loot boxes led to the developers' inability to have loot boxes if they wanted to release their game in some specific countries. In

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[1]https://childrensdesignguide.org/

the study by Kristiansen and Severin, which looks at the use of loot boxes by adoloscents, they suggest that loot box purchases should be reduced. These regulations can be seen as a way of addressing children as the loot box is discussed as a feature with resemblance to gambling.

7.3 Factors that must be addressed to create suitable Free-to-Play games for children

The thematic synthesis process revealed five themes or factors that must be addressed when creating F2P games for children, see Figure 5.1. These five factors are: 1) exploiting psychological behavior, 2) game design, 3) choosing features, 4) process, and 5) responsibility.

Exploiting Psychological Behavior. The thematic analysis revealed exploiting psychological behavior as an essential theme. One of the problems with F2P games relates to the game being offered to the players for free, forcing game development companies to generate revenue in other ways. F2P has caused challenges due to over-aggressive monetization techniques using dark patterns to exploit the psychological behavior of the players to increase spending (Zagal et al., 2013; Fitton and Read, 2019). Moreover, the different monetization features that are currently being used in the F2P gaming industry allow for exploitation easily, making it possible for children or other players who are vulnerable to spend significant amounts in the game (Alha et al., 2018). Addiction due to F2P was claimed by the psychologist to be one of the most usual cases of addiction. The reason being the low threshold to enter the game and how accessible it is. Moreover, mechanics such as loot boxes was seen as unfavorable due to the resemblance with gambling and addiction as presented by Kristiansen and Severin (2020), that saw a significant positive correlation between loot box engagement and problem gambling severity. Mechanics that create peer pressure and punish the player for not purchasing, were mentioned as some of the worst manipulation techniques used in a game for children. From the SLR, such mechanics would be particularly inappropriate for younger users given their ongoing cognitive and social development that could easily be exploited. This is supported by Fitton and Read (2019).

Game Design. Regarding the gameplay and user-interfaces, *fun*, *accessibility*, *usability* and *immersion* were the most important elements when designing F2P games for children. *Fun* was an obvious factor for creating games, but the reasoning varied across the subjects. The majority of the developers wanted the players to enjoy themselves, and several mentioned fun as an important factor to achieve a successful game. Additionally, some of the subjects that had games based on subscription had to make the game fun to prove themselves to children and their parents that would eventually pay for the game. *Immersion* was also important for the game experience and made the game fun and exciting for the players. This factor is also mentioned by Sweetser and Wyeth (2005) as an important factor for achieving player enjoyment in the game. Advertisements were seen as the major

key for breaking immersion in a game and something that should be avoided. Moreover, *usability*, and *accessibility* is especially important when creating games for children. Children are pretty diverse, and it is crucial to make the game easy to understand and play by everyone. Many developers implemented voice-overs, confetti, and well-designed UX elements to make it easy for children to interact with the game.

Choosing Features. None of the monetization features mentioned in the interviews were seen as suitable for children, but some of the features were seen more positively than others. Battle-Passes and cosmetics were mentioned as more positive because they do not impact the gameplay but give the player optional content to extend the gaming experience. However, the psychologist highlighted the battle-pass as one of the worst features as it could create purchase pressure and social pressure for children. In a study by Zendle et al. (2020), players saw cosmetics as more acceptable than items that offered an advantage. Still, as mentioned above, it may strengthen peer pressure in a game to have certain cosmetics. The in-game currency can be considered one of the core elements of Free-to-Play as it is easily combined with other features. However, it was considered unsuitable for children because it may act as a psychological barrier between real currency spent and virtual currency. Thus, the player, especially children, can lose an overview of how much they spend.

To avoid children playing games that are not meant for them, as well as interacting directly with the monetization features in a game, many of the subjects had implemented age gates and parental control. The use of age gates is a familiar mechanic to use in a game, but the standard version does not hinder or stop a child from bypassing this mechanic, for example by entering another age. Some companies had used a different age-gate where the child was given a mathematical question or other types of questions to address problem of children bypassing the age-gates. The goal was to exclude the young children who could not read. However, this also limits elder children with reading disabilities and other disabilities from entering the game, which may be problematic and not optimal. Moreover, many of the subjects mentioned that they have no way to control once the age gate is bypassed to see if the player is an adult or a child. This can be problematic, especially when F2P games are highly accessible. Additionally, parent control was seen as an excellent way to separate the monetization mechanics from the children and give the parents more control of what features the child is interacting with inside the game. Many of the interviewees had used such parental control. Such safety features can potentially make the game more secure to interact with from a child's perspective and make the parents feel safer knowing that they are in control.

Additionally, parental guides provided by the game company could enable parents to create a safer environment for the children. Parents find it hard to manage the tension between keeping the children safe, allowing children to learn, developing media skills, and having fun (Nouwen and Zaman, 2018). Moreover, data analytics have made it increasingly difficult for parents to understand how platforms that their child use operates, in terms of in-game mechanics, personal data gathering, and in-app purchases (Nouwen and Zaman, 2018). Such parental guidelines could help parents to create a safer environment for their

children.

Process. The expert-subjects pointed out the importance of guidelines when creating F2P for children, especially for developers. Additionally, including child experts in the development process was highlighted as necessary by the psychologist. However, only a few subjects mentioned that they consulted with experts or teachers/professors in the development process. Many of the developers based their designs on intuition and experience. This was also revealed in the study by Ekambaranathan et al. (2020). The psychologist claimed that this would be helpful to develop valuable games that teach the children something. One of the problems is that many of these F2P games are not necessarily created for children, but children constitute a large part of the user base in many cases.

Agile methodologies, such as scrum, were used by most companies as this allowed for a faster software development life cycle. However, findings from the interviews reveal high pressure for releasing games. Developers usually do not spend much time on a specific game before moving on to the next. Rapid development lowered the quality of the games, according to the interviewees. Many of the companies did tests with the target group during development. However, the developers did not always have time to address all the feedback before the game went into production. In many cases, testing was done late in the development process. Earlier and more frequent testing can make up for the tight deadlines that developers face and improve the game quality (Sommerville, 2016).

Responsibility. Our study revealed a disagreement between the experts and the developers regarding who is responsible for the ethical aspects concerning children. Some developers claimed that the main responsibility lies in the hand of the child's parents. In contrast, the experts claimed that the authorities, developers, and the platforms such as App Store and Google Play should have the most responsibility. Some developers wanted to be ethical and create child-friendly apps, but it was hard to prioritize features that would not contribute to higher incomes due to tight deadlines and budgets. Similarly, Ekambaranathan et al. (2020) noticed that a lack of ethical monetization options might lead to a perception that trade-offs must be made between the commercial success of the game and the best interest of users. Platforms already have rules, but there might be a need to introduce more or stricter rules to reduce the trade-off that has to be done between being ethical and generating revenue. More legal or platform regulations could solve the different challenges to address whether or not developers or parents should have the most significant responsibility. However, Sommerville and Zagal et al. (2013) states that developers have an ethical responsibility when creating software, as presented in section 2.2.3.

7.4 Limitations

This study identified several limitations. One aspect that may have affected the result is the interview selection. Several of the subjects were chosen after a review of games on the App Store. Games on the other platform were not reviewed. Further, some of the interview subjects were localized through other interviewees, which may have resulted in finding persons with similar perspectives. The same goes for the people localized through

the professional network.

Moreover, not all participants had developed games explicitly for children despite having a low age limit. Furthermore, they did not have the expertise to conclude on what is good or bad for children. Additionally, the developers did not have a saying regarding the design or monetization strategy in some large companies. Decisions were made higher in the companies hierarchy. Therefore, speaking with the decision-makers rather than the developers could have been beneficial to the results. Additionally, when doing qualitative research, results are subject to bias. To restrain wrong interpretations or misunderstandings, both interviewers attended all interviews. Moreover, interviews were transcribed shortly afterward to ensure the subject's meanings were retained.

Another shortcoming to the study is the diversity and number of investigated companies and subjects. A more comprehensive collection of qualitative data could benefit this study, discover additional themes and patterns, and ensure more reliable conclusions.

The proposed framework has not yet been validated. Furthermore, the framework propose solutions to a wide set of problems. Some of the aspects are quite comprehensive, and could be a study of its own. To ensure higher quality of the guidelines (Table 6.2), a more narrow scope could have given an even more precise guide to each focus area. However, since there was a limited research in the field of F2P and children, a broader approach was considered the most valuable for this study.

7.5 Implications of the Free-to-Play for Children framework

Several researchers asked for more research and guidelines related to F2P and children throughout the systematic literature review. The F2P4C framework can be a considered an answer to this need. It presents several essential aspects that should be considered when creating F2P for children. Furthermore, it gives attention to the discovered problems with F2P and children.

We hope the framework can motivate others to do further research in this area. Either by validating the framework, iterating on the framework, or present contradicting research. More research will help the search for how to create suitable F2P games for children. Furthermore, the framework can stimulate research that involves some of the other counterparts, not just developers. Additionally, the F2P4C framework contributes to research that focuses on the children's best interests rather than revenue maximization.

The F2P4C framework can help the developers take specific actions to create suitable F2P games for children. The categorization of monetization features is tangible. By avoiding undesirable features, the game becomes more suitable right away. Overall, the F2P4C framework focus on solutions. Developers can choose to focus on the whole framework or just parts of it. Either way, it will be a step toward suitable F2P games for children.

Chapter 8

Conclusion

This research aimed to identify the most critical factors towards creating suitable Free-to-Play games for children. We conducted a systematic literature review and an exploratory study together with thematic analysis to achieve our goal. The findings led to a proposed framework to be used by practitioners when creating Free-to-Play games for children.

The systematic literature review aimed to examine to what extent children are addressed in Free-to-Play games and explore what features are common in Free-to-Play games for children. The findings did not answer what features were typical to use in Free-to-Play for children. However, several studies were related to different aspects of the monetization features. This motivated to examine developers' reasoning when choosing monetization features in the game. Furthermore, the systematic literature review revealed that children are addressed in different ways, and in many cases – not at all. Much research revolved around revenue maximization, but the findings also indicate concerns about Free-to-Play and children. Several researchers asked for more research regarding the effects of Free-to-Play on children and guidelines to be used by Free-to-Play developers. Thus, this motivated to investigate further how developers address children in Free-to-Play games and the critical factors needed to create suitable Free-to-Play games for children.

We conducted an exploratory study investigating Free-to-Play developers and individuals who work with or have knowledge about the effects of Free-to-Play for children. In total, 18 subjects were interviewed, three domain experts and 15 developers. The findings related to the reasoning behind monetization features were quite diverse. Our research indicates that the Free-to-Play industry is a competitive market where only the most popular games make solid revenue. With Free-to-Play games being initially free, the companies need to create incentives for the player to make in-game purchases. This has, in many cases, led to over-aggressive monetization strategies and the use of dark design to exploit the player's behavior. However, many companies try to be ethical when choosing features, but there seems to be a perceived trade-off between being ethical and competitiveness in the market. The results revealed that the extent developers address children in Free-to-Play

games varied. Many developers targeted the parents, followed guidelines and regulations to address children. Testing was also important among the companies, but not necessarily to ensure the ethical aspect, but to ensure an exciting and fun game for its players. Many companies that had developed children's games routinely tested throughout the development process with children. However, in some cases, due to tight deadlines for wrapping up games, testing and inclusion of children in the development process were not always undertaken as much as the companies wanted.

The thematic analysis revealed five crucial factors that need to be addressed to create suitable Free-to-Play games for children: 1) exploiting psychological behavior, 2) game design, 3) choosing features, 4) process, and 5) responsibility. With the motivation that developers have an ethical responsibility when creating games, a framework was created based on the systematic literature review, the thematic analysis, and other relevant research. The proposed Free-to-Play for Children (F2P4C) framework (Chapter 6) provides essential aspects of Free-to-Play games with guidelines that developers can follow to work towards suitable Free-to-Play games for children, as shown in Table 6.4. The framework can motivate researchers to further investigate Free-to-Play games for children's best interest. Increasing the data collection by investigating more Free-to-Play companies, and experts may improve the reliability of the results. Furthermore, a study including children may strengthen the validity of this research. Overall, this study contributes to research in the field of Free-to-Play and children.

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Appendix A

Interviews

A.1 Consent Form

Would you like to participate in the research project "Evaluation of children's role in the development process of Free-to-Play games"?

This is an invitation to participate in the research project, with the goal to evaluate children's role in Free-to-Play games. Information about the project and the interview can be found below.

Goal

This project is a part of a master thesis in informatics/computer science. The goal of this study is to evaluate to which degree children are a part of the development process of Free-to-Play games, and how it can be improved. Your participation will be in an interview.

Who is responsible for the research project?

This project is part of a master thesis written at NTNU, Norwegian University of Science and Technology. This project is performed by Andreas K. Melzer og Anna K. Roarsen. Supervisors of this project are Letizia Jaccheri and Juan Carlos Torrado.

What does it mean for you to participate?

If you chose to participate, you will be a part of the follow activities for data collection:
● Semi-structured interview, most of the questions is pre-defined. There will also be follow-up questions.

It is voluntary to participate
It is voluntary to participate in this project. If you choose to participate, you can withdraw from the process at any time without any reasoning. All information stored about you will be anonymized. There are no negative consequences as a result of withdrawing or not participating in this project.

Your privacy - How we store and use your information
We will only use the information we received to fulfill the purpose that is described here. All information will be treated as confidential and in accordance with the privacy regulations. It will only be students and supervisors, mentioned earlier, who have access to the information. Names and contact information about you will be replaced with a code stored on a separate name list separated from other data. Participants will not be recognized in the publication. What happens to your information when we end the research project? The project is scheduled to end on 31.12.2021, and after this the data material will be anonymized.

Your rights
As long as you can be identified in the data material, you have the right to:
-        access to all personal information stored about you,
-        to have personal information about you corrected,
-        have personal information about you deleted,
-        receive a copy of your personal information (data portability), and
-        to send a complaint to the Data Protection Official or the Data Inspectorate about the processing of your personal information.

What entitles us to process personal information about you?
We process information about you based on your consent.
On behalf of NTNU, NSD - Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with privacy regulations.

Where can I find more information?
If you have questions about the study, or want to use your rights, get in touch
with:

● NTNU - Norwegian University of Science and Technology by Letizia Jaccheri on email:
(letizia.jaccheri@ntnu.no) eller telefon: 73 59 34 69
● NTNU - Norwegian University of Science and Technology by Andreas K. Melzer on email:
(andrekm@stud.ntnu.no)
● NTNU - Norwgian University of Science and Technology by Anna K. Roarsen on email:
(annakroa@stud.ntnu.no)
● Our Data Protection Officer: Thomas Helgesen at thomas.helgesen@ntnu.no
● NSD – Norwegian Centre for Research Data AS, on email(personvernombudet@nsd.no)
or phone: +47 55 58 21 17.

Kind Regards,

Letizia Jaccheri,   Andreas K. Melzer, Anna K. Roarsen

Project manager
(Professor/supervisor)   (Students)

Declaration of consent
I have received and understood information about the project "Evaluation of children's role in
the development process of Free-to-Play games", and have had the opportunity to ask
questions.

I agree to participate in an interview and that my information will be processed until the
project is completed, approx. 31.12.2021.

(Signed by participant, date)

A.2 Interview Guide - Developers

Interview Guide - Developers

General Information

Note: We wish that you as an informant avoid describing specific events and situations where individuals may be identified. Try to speak in a general manner, instead of speaking of different individuals.

In the interview we will ask for information about you and your profession in game development.

Practicalities
1. Date:
2. Duration:
3. Interviewers:

Interviewee
1. Interviewee Id:
2. Company:
3. Gender:
4. Age:
5. Number of kids:
6. Profession:
7. Educational background:

Games created
1. What kind of games have you created or been a part of creating?
2. Any Free-to-Play games?
3. What was the main audience of the games?
4. Were any of the games children's games? If so, what age group?

Main interview

Advantages/disadvantages

1. What do you see as the advantages of free-to-play games?
2. What are the disadvantages?

Features

3. What are the most used Free-to-Play games features that you use? And why do you use them? (By features we mean such as ads, in-game currency, virtual goods, loot-box etc)

Factors

4. What factors do you believe are important to avoid or include when creating Free-to-Play games for children?
5. How do you balance between revenue maximization and the ethical perspective concerning the users of the game?

Game Development Process

6. How is the game development process at your company?
7. To what degree are the perspectives of children included in the game development process? Are they directly involved in the process?
8. Do you follow any guidelines when creating games for children? If so, what kind of guidelines are these?
9. Do you follow any guidelines when creating Free-to-Play games?

Improvements
10. What do you think could be improved to get a better perspective for children in your company?

Extra questions (Optional)
If you like to you can answer some of these questions as well.

11. Does your company measure user satisfaction with your games? If so, how?
12. How do you deal with different regulations in different countries?
13. Do you experience that regulations are limiting the options of different games?
14. Do you have internal regulations when creating games for children?
15. Several families have experienced that their children buy in-game without the parents knowing, do you have a safety net to help avoid unwanted purchases?

If the participant have children:
16. Does having children affect your choices as a developer/designer?

A.3 Interview Guide - Experts/Organisations

Interview Guide - Game Organizations/Experts and Other

General Information

Note: We wish that you as an informant avoid describing specific events and situations where individuals may be identified. Try to speak in a general manner, instead of speaking of different individuals.

In the interview we will ask for information about you and your profession in game development.

Practicalities
1. When:
2. Duration:
3. Interviewers:

Interviewee
1. Interviewee Id:
2. Company Id:
3. Gender:
4. Age:
5. Number of kids:
6. Profession:
7. Educational background:

Advantages/disadvantages
1) What do you see as the advantages of free-to-play games? What are the disadvantages?

Monetization Features
2) What is your opinion regarding the different free-to-play monetization features?

Factors
3) What factors do you believe are important to avoid or include when creating Free-to-Play games for children?

Game Development Process

4) What are the responsibilities of game developers concerning the combination of children as a target group and revenue maximization?

5) What do you think is the most used/popular game development process?

6) Do you know if there exist any guidelines when creating games for children? Free-to-Play?

7) To what degree do you think children are included when creating games?

Improvements

8) Do you see any limitations or future improvements that could enable firms to address or include children in the development processes? If so, in what way?

A.4 NSD Approval

Interview Guide - Game Organizations/Experts and Other

General Information

Note: We wish that you as an informant avoid describing specific events and situations where individuals may be identified. Try to speak in a general manner, instead of speaking of different individuals.

In the interview we will ask for information about you and your profession in game development.

Practicalities
1. When:
2. Duration:
3. Interviewers:

Interviewee
1. Interviewee Id:
2. Company Id:
3. Gender:
4. Age:
5. Number of kids:
6. Profession:
7. Educational background:

Advantages/disadvantages
1) What do you see as the advantages of free-to-play games? What are the disadvantages?

Monetization Features
2) What is your opinion regarding the different free-to-play monetization features?

Factors
3) What factors do you believe are important to avoid or include when creating Free-to-Play games for children?

Game Development Process

4) What are the responsibilities of game developers concerning the combination of children as a target group and revenue maximization?

5) What do you think is the most used/popular game development process?

6) Do you know if there exist any guidelines when creating games for children? Free-to-Play?

7) To what degree do you think children are included when creating games?

Improvements

8) Do you see any limitations or future improvements that could enable firms to address or include children in the development processes? If so, in what way?

Appendix B

Publication

B.1 Understanding Free-to-Play for Children: A Systematic Literature Review

Understanding Free-to-Play Games For Children: A Systematic Literature Review

Anonymised for blind-peer-review

Anonymised for blind-peer-review

Abstract

The availability and number of video games is increasing. It has become easier to create and publish them. However, developers' motivations can vary, and not necessarily be in the player's best interest. Free-to-Play is a much-used revenue model where parts of the software are offered for free, but further functionality needs to be purchased. Several researchers are questioning the combination of this revenue model and children. This study aims to review the scientific literature about how children are addressed in Free-to-Play games. For this purpose, we present a systematic literature review (SLR) in order to ascertain 1) what the most common features used in Free-to-Play games for children today are, and 2) to what extent children are addressed in Free-to-Play games today. A total of 19 papers from 2015-2020 were assessed and classified. Much research turned out to revolve around revenue maximization and purchase motivations. Additionally, loot-box and in-game currency were discovered to be problematic for children due to similarities with gambling. Further pay-to-win features are discussed by many papers and other dark design aspects in games for children, which focus on revenue-maximizing. The majority of the research highlights a need for restrictions, more precise guidelines, and further research in Free-to-Play and children.

Keywords: Free-to-Play, Freemium, Game Development, Dark Design, Children

1. Introduction

₂   There is an increasing number of games available on Apple's App Store
₃ and Google Play Store. Games can be uploaded by anyone and accessed by

everyone. This is supported by Hamari et al. [1] saying that *"Virtual goods and other forms of in-game content have rapidly become one of the biggest forms of online consumption for gamers and de facto revenue model for game publishers"*. The revenues of in-app purchases in the last decade have had a significant increase. In 2013, the global in-app purchase revenue was estimated at \$4.6 billion [2]. Six years later, in 2019, the revenue increased to \$83 billion [3].

An analysis of the top 300 apps on the App Store reveals that most of these apps use Free-to-Play as a revenue model [4]. This has caused an impact on the design philosophy of games [5]. It is questionable whether developers of Free-to-Play games try to create the best possible game or create games that entice the users to purchase in-game content as frequently as possible. Alha et al. [6] mention that the combination of children and Free-To-Play games could be ethically problematic, as the concept of money might not yet be clear to children. Hence, this could cause issues when creating games for such an audience. There have been observed several examples where children spend money in-game without their parents knowing. One example is when an eight-year-old spent £602 on Roblox's gaming platform without realizing they were spending real money [7]. A study by King et al. [8] emphasizes that issues arise across many jurisdictions when evaluating consumer rights regarding in-game purchases. One example is whether a virtual good should be considered equivalent to tangible real-world products. Hence, there exists a need for an up to date overview of the available research to identify research gaps and suggest potential research topics within the field.

This study aims to research the implications of children playing Free-to-Play games. With insufficient information from previous studies and their ability to understand how Free-to-Play games target children as their users, this study investigates two aspects. First, the typical concepts and functionality used in Free-to-Play games that target children. Second, how children's rights and needs are addressed in the available literature, specifically for the game development process. This has led to the following research questions.

RQ1 What are the most common features used in Free-to-Play games for children?

RQ2 To what extent are children addressed in Free-to-Play games?

Features include both specific functionalities but also different design aspects and concepts within Free-to-Play. Using the guidelines from Kitchen-

ham [9], a Systematic Literature Review (SLR) was conducted to address these research questions. The SLR's primary purpose is to get insight into previous studies performed in the research field for the benefit of research and practice.

2. Related Work

This section aims to give an overview around the concepts that surround Free-To-Play games, as well as the main perspectives in the literature related to this paper.

2.1. Freemium

The Free-to-Play approach belongs to the Freemium business model, which refers to a product or pricing structure where the core service is free. The revenue is generated through sales of additional products and premium services [10]. The term comes from the combination of *"free"* and *"premium"*, because of the strategy of providing a free version and having additional features that can be purchased [11]. The Freemium concept dates back to the 1980s when software firms like Adobe started to publish software in *"light"* versions [10]. These versions were free of charge but did not include all the functionality. A registration key could be purchased to gain access to all features. Over the past few years, Freemium has gained popularity and seems to be the answer to earning money from content on the internet. Today, the Freemium business is being used in various sectors such as music, social networks, data storage, virtual worlds, and most pertinently, the gaming industry [10].

2.2. Free-to-Play

Games that use Freemium as a revenue model are usually denoted Free-to-Play (F2P) or Free-to-Play games. F2P has been discovered to be a promising revenue model for the gaming industry to compete with classic models, such as one-time payment and subscription-based models that require a financial investment [12]. F2P games are distributed and played free-of-charge where the players are monetized, in particular, via real-money transactions and in-app purchases during game-play [13]. These goods range from time advantages, items to build a more sophisticated and unique character, or access to other features that increase the game experience. The features described limit the free version down to the core features.

3

F2P has found its way into various genres such as Massive multiplayer on-line games, multiplayer shooter games, gambling-related games, and mobile casual games utilized on multiple platforms such as computers and gaming consoles, and mobiles. Additionally, Facebook games became very popular due to the social network integration and F2P revenue model, which provided a virtual distribution channel and easy access to games. Examples of F2P games that became successful, gathering millions of players are: *Farmville*, *CityVille*, and *Candy Crush* [6].

Paavilainen et al. [14] point out two significant advantages of the F2P model. Firstly, the game's virtual goods allow for flexible price points for customers with different willingness to pay for additional content. Secondly, it allows for a more comprehensive segmentation of players as the entry is free, and the virtual goods can be tailored to different audiences. In addition to these advantages, the F2P model makes it possible to create positive net-work effects, with a large user-base even if they do not contribute to in-game purchases. More users exchanging information and experiences will subse-quently lead to increased visibility and attract more users. Consequently, the greater the user base potentially means more players converts to paying players, which leads to increased revenue and profit [15].

2.3. Premium

The 'premium' part of the Freemium model consists of paying for addi-tional features of a product to get the full version [11]. One example is an advertisement in a product with free content, where the premium version will give the player a product free of all advertisements. The advertisement can be seen as an annoyance and encourage to buy premium. Another example is paying for special features such as items, maps, and extended options. Games can often have different restrictions, such as limited time and turns. The player can bypass these restrictions by purchasing coins or other virtual currency to unlock these restrictions, which can also be seen as premium.

2.4. Pay-to-Win

A subset of F2P is Pay-to-Win (P2W). P2W is a billing system where paying in-game has an impact on the results of the player [16]. In P2W, the user can pay for in-game content that makes the game easier to play or achievements can be reached faster [17]. P2W has been criticized by many players because paying players are getting advantages over the non-paying players [16].

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2.5. Ethics and Dark Design Patterns in Game Development

It has been stated that developers have an ethical responsibility when creating software [18]. Moreover, technical competence should not be used to behave dishonestly. Still, it has been observed that not all developers may have the user's best interest in mind [13]. Instead, this indicates that the developers want to make as much money as possible. Additionally, developers can have different perceptions of what they consider ethical game development. Features of games can be considered hindrances or psychological traps used to motivate them to spend money. A former CEO of the American game developer company Zynga has stated, *"I did every horrible thing in the book, just to get revenues right away"* [13]. Ethical dilemmas may arise when people have different views of a situation or the way things are done. In today's gaming market, anyone can create a game and upload it to the App Store or Google Play Store independent of their background, leading to games that exploit the user, as the CEO from Zynga admitted.

Another ethical aspect that has been observed is dark game design patterns. A dark game design pattern is defined as a pattern intentionally designed by a game creator to cause negative experiences for players, which are against the player's best interest and likely to happen without the player's consent [19]. Zagal et al. [19] substantiates Sommerville [18] and states that game designers typically are regarded as the player's advocates. However, the authors point out that the game creator does not necessarily have the same interest in the games as the players. Additionally, the paper by Zagal et al. states that if the player is aware of the design pattern's effect and can give their consent, the pattern is no longer dark. Zagal et al. does not address dark patterns targeted at children in particular.

2.6. Free-to-Play and Children

Ladeira et al. [20] state that exposure to various advertisements and different game creators is challenging with F2P games and children. They suggest there should be developed public regulations and policies for designing advertisements for children. Another experiment that involved children proved that advertisement in-game had a significant effect [21]. The experiment consisted of having the children play a game for 4 minutes. During the gaming period, there was shown an advertisement. Afterward, the children were asked to choose between several snacks, and the results showed that the children were more likely to choose a specific snack if they saw an advertisement for it.

Additionally, a study on how children make purchase decisions in a supermarket revealed that most children behaved without purpose when making decisions regarding purchasing [22]. Most of the children were distracted by all the stimuli in the simulated supermarket. The study enlightens that before the twentieth century, children were not seen as purchasers. The study states that in 2012, pocket money's annual income of German children aged 6 to 13 years added up to 1.85 billion euros. Further, their buying power was estimated at 6 billion euros, which has led to children being more targeted by marketing. Additionally, the increasing use of media for children has led to increased exposure to advertisements. An important factor is the children's ability to understand the advertisement's persuasive intention. Understanding can reduce the negative effect, which has similarities with the effect of dark patterns. The paper states that if the children are very engaged in the game, they are less critical [19].

The ubiquitous and often intrusive use of microtransactions in F2P games has caused children to either inadvertently or deliberately pay large amounts of virtual goods, often for high amounts of real money [23]. Each microtransaction is usually so small that they fall within the Pennies-a-day theory of mental accounting. The Pennies-a-day theory is when a more considerable expense is converted into a series of smaller amounts, which leads the customer to view a series of small expenses as less painful than a substantial one-time payment. This element is probably the central ethical issue attached to the industry, especially for children. In February 2013, Apple had to refund a British family £1700 after their son had racked up countless microtransactions while playing the game Zombies vs. Ninjas [24].

It is observed that children do not have a position in software engineering. Moreover, the ethical aspects are challenged when everyone can create and upload apps. Additionally, the Free-to-Play model's use is increasing as it is a promising revenue model for game creators. In combination with the increasing availability for children and children's purchasing nature, this can create new challenges within children's rights and needs.

3. Research Method

A systematic literature review was chosen to obtain a thorough understanding of the topic and to identify potential areas for research. Several steps based on Kitchenham and Charters [9] guidelines for systematic literature review were followed to carry out the systematic literature review.

A review protocol was defined to help indicate the research questions, data collection, inclusion, exclusion, quality criteria, and finally, data analysis.

3.1. Data Collection

We selected the following databases for our search: Association for Computing Machinery Digital Library (ACM), Science Direct, IEEE Xplore, and SpringerLink. The search query used can be seen in Table 1. The same search string was used for ACM, Science Direct, and SpringerLink, except for IEEE Xplore, where the search string was simplified to get more hits. This gave in total 584 total, see Table 2.

Online Library	Search strings applied
ACM	(Free-to-Play OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)
Science Direct	(Free-to-Play OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)
IEEEXplore	"in-app purchase" OR "in-game purchase"
SpringerLink	(Free-to-Play OR "in-game purchase" OR "pay-to-win" OR "in-app purchase") AND (children)

Table 1: Search strings applied in different online libraries

3.2. Inclusion/Exclusion Criteria

We defined a filter criteria to retrieve the most relevant articles to the research problems in this step. On-going studies, short papers, books, duplicates, and articles published before 2015 were excluded. Papers with unrelated topics were excluded. Furthermore, studies that did not show empirical evidence were removed. Both qualitative and quantitative studies were included. We focused mainly on the title and abstract to decide whether a

Online library	Number of hits
ACM	70
Science Direct	132
IEEE Xplore	7
SpringerLink	375

Table 2: Number of hits in each online library

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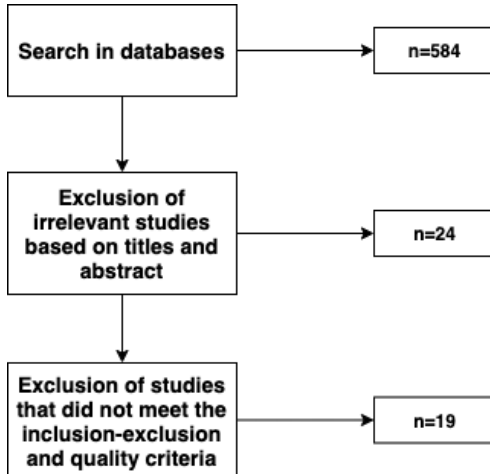
Figure 1: Study selection process

paper was inside or outside the scope. The inclusion and exclusion criteria can be summarised as:

1. The publish year of the article should be dated after 2015: Technology used before 2015 could potentially be no longer available.
2. Remove duplicates: Articles that appeared in the search for more than one online library.
3. The study's main concern is relevant to the research questions.

This process decreased the number of articles in our data collection while increasing the relevance of the remaining articles. Only one papers from SpringerLink met the criteria. The distribution can be seen in table 3. Finally, we ended up with 19 studies, which can be seen in figure 1.

Online library	Number of hits
ACM	6
Science Direct	9
IEEE Xplore	3
SpringerLink	1

Table 3: Distribution of primary studies that met the inclusion and exclusion criteria

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3.3. Quality Assessment

According to Kitchenham's guidelines [9] there are three main criteria to perform empirical research in software engineering; (1) *rigorous*; (2) *credible*; and (3) *relevant.* "rigorous" refers to the appropriate use of research method applied to the study, "credible" points to the presentation and validity of the findings, and "relevant" indicates whether the findings of each study points towards education science, as well as computer science education research communities. Three additional criteria were selected to assess the quality of the studies:

1. The study is a primary study presenting empirical results.
2. The study has a precise and well-described method.
3. There is a clear statement of the aim of the study.

In total, 19 studies met the inclusion, exclusion, and quality criteria. Concerning our critical examination of the papers, fields were defined to represent the content of each study. These fields are derived from consideration of different aspects related to the type of Free-to-Play, methodology used, instruments, and findings. The categorization enabled us to document all the details needed from each paper of the literature review to address the research questions, as explained in the next section.

3.4. Data Analysis

When going through the primary studies, the following info was extracted: conference or journal, year of publication, author, area of study (purchase motivation, company motivation, ethics, regulations), type of methodology (qualitative, quantitative, mixed), instruments used (e.g., surveys, interviews, observations), sample size, duration, age of participants data analysis, main findings, experimental design, and the Free-to-Play type and features discussed in the papers. According to the coding scheme, all 19 studies were analyzed in detail, and data were extracted to answer the research questions better. Not every paper included all this information, and there was also a variety of studies using adults and children. Studies with adults were also considered relevant since there were not that many studies that met the criteria. Further, issues for adults are most likely issues for children as well.

4. Results

This chapter presents results extracted from the primary studies' data, from initially 584 papers to the final number of 19 papers. For better visualization and presentation, the most relevant findings are divided into six sections consisting of topics discovered in the systematic literature review: features, players purchase motivations, company motivation, ethical considerations, and regulations.

Appendix A presents the primary studies organized around year of publication, authors, title, conference or journal, method, sample size, and participant type and age. Appendix B presents the main findings of each study, the type of Free-to-play, and the main area (Company Motivation, Regulation, Ethics, Purchase Motivation).

4.1. General Results

Figure 2 presents the different methodologies used in the primary studies from the SLR. As mentioned in Section 3.4, we included studies with qualitative, quantitative, or mixed research methods. 7 out of 19 papers had a qualitative methodology, 8 had quantitative, and 4 papers used mixed methods. The most used research strategies were surveys, and questionnaires were the most used data generation method. The second most used data generation method were interviews. Moreover, 2 of the quantitative studies used machine learning to analyze data. The majority of the mixed studies consisted of a combination of a survey and interviews.
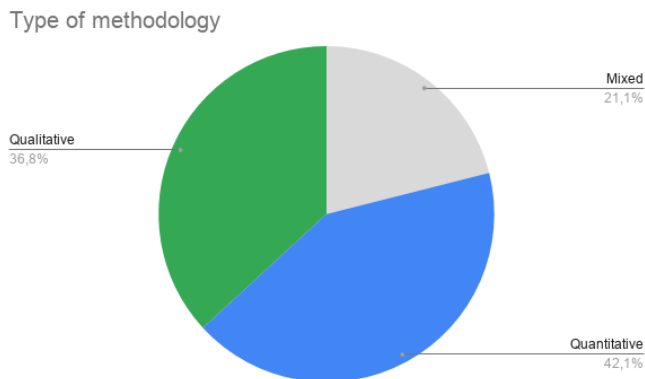
Figure 2: Different types of methodology in the Systematic Literature Review

The distribution of papers is from 2015 to 2020, see Figure 3. There is an apparent increase in the number of papers. More than half of the papers are from the last two of the six years.
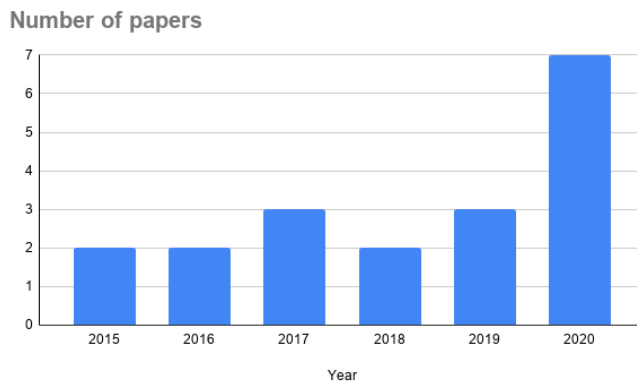
Figure 3: Numbers of papers in the literature review, published from 2015 to 2020.

Figure 4 presents the distribution of different journals or conferences in the SLR. The publication venues are mostly different, except Computers in

Figure 4: Distribution of conferences/journals

Human Behavior, which contained four primary studies.

All the papers look into the perspective of F2P. Further, most of the papers look into in-game purchases, and several papers look into different kinds of features. Additionally, different papers have different perspectives. These are categorized into purchase motivation, company motivation, ethics, and regulations, shown in appendix B. The distribution of the different perspectives is presented in figure 5. A paper can contain several perspectives.
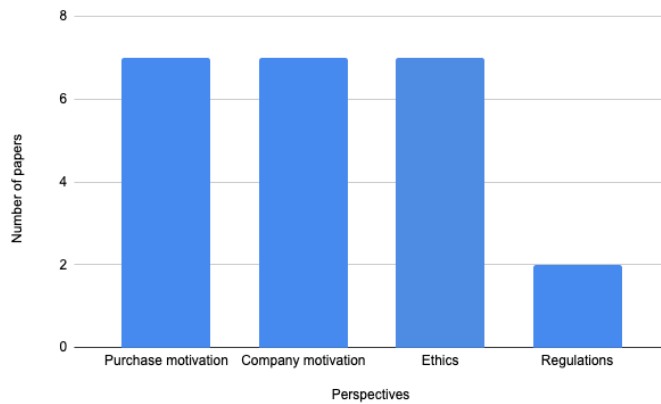
Figure 5: Different perspectives found in the SLR

4.2. Features

This section presents the SLR findings regarding F2P features. Features include both specific functionalities and different design aspects and concepts concerning F2P. The different types of F2P in the SLR are presented in the column "Type of Free-to-Play" in appendix B. The majority of the papers do not discuss specific features but rather the concept of in-app purchase or F2P in general.

The study by Liu et al. [25] revealed that among 67,778 apps targeting children, 22.5% of them offer in-app purchases and 53% of them used targeted ads. The analyzed apps were free and mentioned to be a possible reason for the high percentage of ads. Another study done by Fitton et al. [26] had similar results regarding ads. Data was collected from 39 girls between the ages of 12 and 13. The study concerned interruptions or annoyances in the apps or games the girls used. The results are presented in Figure 6 and show that ads came out as the most frequent feature in apps and was mentioned by 29 out of 39 girls. These consisted of general adverts that could not be specified. Additionally, adverts that interrupted were also typical, as well as unsuitable adverts. Another finding shows that Pay-to-progress was quite common, followed by premium services and pay to enhance the experience [26]. The girls in the study answered their strategies for dealing with interruptions, such as ads, in apps used. The most prevalent behavior was to delete the app, pay, restart the app, and turn Wi-Fi off. The results in this study were from F2P apps and not games in particular.

Several papers researched the loot-box concept. Kristiansen et al. [27] had 1,137 participants aged 12-16 was a part of the research. The results showed that nearly half of the participants involved with gaming the past year had also engaged in loot-boxes. Additionally, the majority of the users that engaged with loot-boxes were male. 93% of the males had earned, bought, or sold items from a loot box compared to 15% of the females that expressed engagement with loot boxes.

Four papers from the systematic literature review mention in-game currency somehow, indicating that an essential feature for F2P games is the in-game currency. Based on these studies, most of the features used in F2P games relate to in-game currency, especially loot-boxes [28]. Some games let the player open loot-boxes using real-world money, while most other games do not directly use real-world money. Instead, a form of scrip has to be purchased: a 'middleman' in-game currency [28]. This type of currency is bought with real money or earned by playing the game. Moreover, many F2P

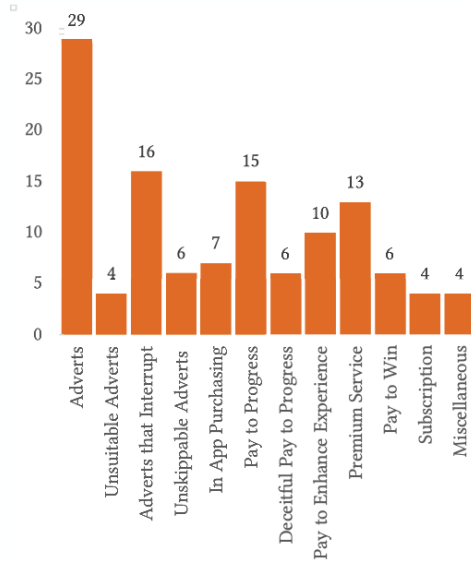Figure 6: Results of answers in the study by Fitton and Read

games have created possibilities for the user to earn in-game currency. One example is by advertising the game to other friends or to watch additional advertisements in the game [1].

Fitton et al. [26] expanded the framework created by Zagal et al. [19], described in section 2.5, to make it suitable for children. The framework is shown in Figure 7. It presents what they consider to be not suitable for children. One concept mentioned in the framework is P2W, which is also addressed in the paper by Lelonek et al.[29]. In the study of the latter ones [29], the research consisted of two sub-studies. The first one had a representative sample of adults from the population, and the results revealed that 1.7% participants had played P2W games, whereas 20% of these made payments in the games. The second one consisted of people who had either gambled online in the last 12 months or spent money in F2P games. The results revealed that 67.9% made payments in P2W games and 59.2% made payments to increase their chances in the game. It was concluded that the frequency of micro-transactions related to P2W could be a problem for players.

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Category	Types
1. Temporal	Grinding Play by Appointment Interstitial Non-app Content
2. Monetary	Pay for Permanent Enhancements Pay for Expendable Updates Pay to Skip/Progress Pay to Win Subscriptions Intermediate Currencies
3. Social	Impersonation/Friend Spam Prompts to Share/Review Social Pyramid Schemes
4. Disguised Ads	Advergames Characters Placement
5. Sneaky Ads	Difficult/Deceptive to Dismiss Camouflaged Game Items Notification-based Ads
6. Inappropriate	Unsuitable Adverts Encouraging Anti-Social Behavior Psychological Manipulation Persuasive Design Developmentally Insensitive

Figure 7: ADD framework adjusted for children [26]

Further, a study done by King et al. [8] presents a summary of 13 patents that refer to systems and methods that encourage repeating in-game purchases. The description of 12 of these patents were sophisticated systems that collect player data and analytics to present individually tailored offers or purchasing opportunities. Further examination of the patents indicated that the player data was a source for other sales tactics. One tactic was *solicitations*, or purchasing offers that appear on the screen at calculated intervals that may interrupt play, employing 'pressuring' tactics. An example is a limited-time offer with a countdown timer, and be positioned in a central, unavoidable location in the game, which gate-keep or accompany player access to non-monetized content. Additionally, the authors mention that the

typical feature across patents is a calibration of the game system to present in-game offers based on two primary sources: (1) Individual player metrics; and (2) population metrics. Individual player metrics are typical characteristics and play patterns, such as the amount of time spent every day. If the player does not spend money on microtransactions, the system may draw upon its population data (other players with comparable characteristics).

4.3. Players Purchase Motivations

An empirical study by Hamari et al. [1] focused on specific purchase motivations, based on previous literature, receiving input from industry experts, and creating a survey. The final data set consisted of only the respondents that had purchased in-game content. An analysis of the data from the survey resulted in six dimensions of purchasing reasons: 1) Unobstructed play 2) Social interactions 3) Competition 4) Economical rationale 5) Indulging children 6) Unlocking content. The results revealed that unobstructed play, social interaction, and economical rationale were positively associated with how much money each player spent on in-game purchases. In contrast, the other dimension had no connection with the amount of spending. The unobstructed play relates to continuous gameplay without facing obstacles or distractions. Economical rationale consists of motivations related to purchases such as reasonable pricing, special offers, or supporting a good game. The indulging children's dimension suggests that there is not clear which type of in-game content is purchased for children. At the same time, purchasing content for children is declared as a motivational factor. In the study, indicators show that parents have the motivation to spend money on their children when the child could potentially miss out on content. However, nearly none of the respondents reported having purchased in-game content for children within the data set. The authors highlight the participants' age as a potential reason for this since 95% was under the age of 40, and the age group, 20-29, was the most represented.

Similarly Hamari et al. [30] researched players perceived value, continued use, and purchase intentions in F2P games. An online survey with 869 participants revealed that the more enjoyable the players perceive the service, the more they are willing to use it, but the less they are willing to purchase premium content. Moreover, the perspective of social values is the crucial influence on purchasing decisions. The authors confirmed a positive correlation between social value and in-game purchases. Furthermore, the quality of the F2P service did not seem to be associated with purchase intentions.

Alha et al. [31] examine the attitude against F2P by interviewing 11 play-ers considered high spenders. The attitude against F2P games was mostly positive, but the author states that this can be because all the participants are high spenders. The players see the games as a gaming experience worth paying for. Further, the perspective was that even more considerable sums were reasonable in light of how much they received from the game. However, spending on F2P games was more spontaneous than buying other games. Some of the participants mentioned that they were addicted to purchases. The F2P model was mostly seen as positive and ethical by the players. How-ever, some highlighted problems concerning paywalls, P2W mechanics, con-tent only gained through paying, and aggressive monetization. Additionally, some games post on social media without the player knowing was pointed out as annoying. Furthermore, this can be an ethical issue.

A study on online shopping behavior and the influence of their age was conducted by Thaichon et al. [32]. 35 children in the age of 8-15 years old and 28 parents contributed. The interviews were semi-structured. The study revealed that several factors affected children's shopping behavior. Examples of such factors are age, parental guidance, social networks, and peer influ-ence. Social media have become an increasingly influencing factor. Children in the study could tell that they had purchased several products based on recommendations from celebrities they followed on social media. The authors highlight that children's perceptions, behavior, and their role as consumers online are not researched a lot in the marketing literature. The younger children in the study were mostly attracted to new products and original content. In contrast, the older group of children enjoyed online shopping because of the flexibility of it.

4.4. Company Motivation & Revenue Maximization

Two complementary studies, by Chen et al. [33, 34], identified important factors to influence in-game purchases. Based on the available literature, questionnaire, and the use of neural networks, the first one [33] found nine crucial factors for influencing in-app purchases. The factors were; Perceived ease of use, Compatibility, Result demonstrability, Trial, Mass media, Inter-personal channels, Perceived enjoyment, Cognitive concentration, and Per-ceived Risk. Furthermore, the collected examples from the questionnaire were divided into three groups to analyze their differences. The three groups con-sisted of; (1) leading group (innovators, early adopters), (2) Majority group (an early majority, a late majority), and (3) laggard group (Persons that

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makes slow progress). What was discovered is that these nine factors identified have a different impact on the groups mentioned. Users think perceived ease of use, trial, perceived enjoyment, perceived risk, and use context is important for the leading group. In the majority group, users find perceived ease of use, result demonstrability, trial, image, and perceived risk necessary. For the laggard group, the crucial factors are compatibility, trial, perceived enjoyment, perceived risk, and use context. Similarly, the main findings from the second study [34], consist of 7 crucial factors; social value, satisfaction, compatibility, perceived enjoyment, animation, scenario, character, and innovation. The first three elements belong to the game as a whole, and the last four are related to game design. Paying attention to these factors could increase the companies' profit.

Yang et al. [35] focused on predicting the purchase probability of paying players and map the most important features related to the player's playing and purchase behavior. Moreover, two different models were used to predict the survival probability. One model for the players and one to analyze the importance of features. This probability would help the companies develop corresponding marketing strategies and incentives to retain paying players' paying habits. Using data collected from the free online PC game *Game of Thrones Winter is coming*, player's in-game progress was seen as the most important variable related to player purchase decision in the gameplay experience. Another important factor that impacted the methods used was the mouse clicked count used to cancel the in-game purchase.

Georgieva et al. [36] explored how the casual game business models, more specifically Free-to-Play games, could be transposed into the severe game sector. A survey with 237 participants shows that the core motivation to play casual games is to pass the time when bored, for fun, and to relax or de-stress. The player's satisfaction factors were ranked as either not important, important, or extremely important. The fun factor and ease of use was seen as extremely important. Moreover, graphics and design were graded as important. Lastly, the majority considered offers of free virtual goods as either extremely important or important. The findings show that 45% responded yes to the likelihood of watching an advertisement. Interviews were also conducted with three-game development companies. From the interviews, the companies mentioned five strategies. The first strategy is to observe the "whales". They are the minority group of the players that account generate most of the revenue. Another strategy is to analyze which items work for "whales" in other games. Moreover, optimizing the funnel is

essential, how many players leave the game, and why. The last strategy is to track critical metrics consisting of *DU* (average revenue per paying user), *MAU* (Monthly average user), and *ARPU* (Average revenue per registered user).

4.5. Ethical Considerations and Regulations

King et al. [8] conclude that "*appropriate policy and consumer protection measures, psychologically informed interventions, and ethical game design guidelines are needed in order to protect the interests and well-being of consumers, particularly adolescents who tend to be most avid players but may also be the most vulnerable and least well-informed consumer group*". The study revealed that some of the systems with in-game purchases were described as unfair or exploitative.

According to Liu et al. [25] using a survey, 75% of children under age eight are using mobile devices in 2013. New apps and games have rich capabilities, including personal data, photos, sensor data, and microphone, which has led to many new kinds of privacy concerns and intrusion. The authors researched the area concerning privacy for children using machine learning. The model identified 67,778 children apps based on 1 million free apps from Google Play. Additionally, the model tested 1,728 apps that cost money from Google Play and achieved 95% accuracy. The goal was to create a system that would be a helpful tool to enforce the Children's Online Privacy Protection Act (COPPA). Moreover, this would help parents understand what potential problems are related to an app and help app store administrators better label what apps are suited for children. Using *privacygrade.org*, a scale for grading privacy in smartphone apps [37], resulted in the distribution seen in Figure 8. 10% of the identified apps had a privacy grade of either C or D.

Nouwen et al. [38] created design guidelines that enable parents to play a meaningful role in young children's online interactions. The insight is based on interviews with 11 parents with at least one child at 4-10 years old. Additionally, workshops were conducted with design teams. One of the parents said that "I find it easier to assess when it happens physically. [...] But online, you have no idea whatsoever, no holdover, no control." Most of the parents in the study felt this way. The results revealed that the parents and the companies had varied perspectives of what was important, presented in Figure 9. Statements marked in green are for safety concerns, and yellow is involvement. Parents in the study were most concerned about the children that have learned to read. The paper proposes two guidelines
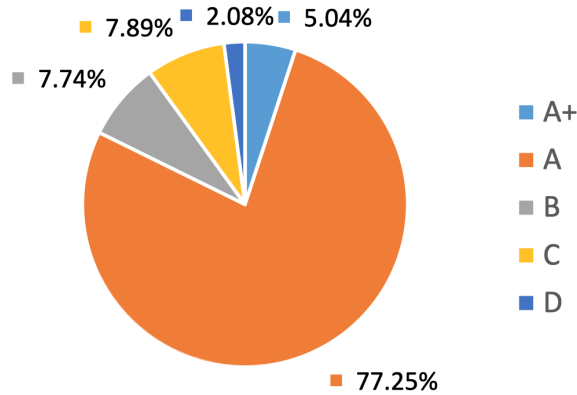
Figure 8: Distribution of Privacy Grades in children apps [25]

for achieving meaningful involvement in the children's online interactions [38]. Firstly, platforms for young children should give parents concrete clues about how the platforms' mechanisms define the child's possibilities to play and communicate. Secondly, new functionalities should enable parents to engage online with their children in well-described activities.

Specific monetization mechanics in mobile games are banned in Japan due to government legislation [31]. Additionally, loot-boxes have been banned or are under investigation in several European countries. Kristiansen et al. [27] states that there is an ongoing national debate about the classification of loot-boxes. In Belgium, loot boxes purchased for real money has been considered a form of gambling by the Belgian authorities. Denmark and the Netherlands consider loot boxes that offer cash out to be gambling.

Zendle et al. [28] aimed to determine the link between loot boxes and gambling. A survey with 1200 valid samples, whereas 237 were aged 18-24 were collected. The findings show that the more gamers spend on loot boxes, the more severe their problem gambling is. Furthermore, gamers who paid with real money for loot-boxes scored more than twice as high on problem gambling measures. Moreover, the authors emphasize that the different types of loot boxes share many of the same features as gambling, rendering them particularly attractive to problem gamblers. Gamblers are characterized by their disordered/excessive involvement in gambling activities.

Table 1

Stakeholder values, highlighting the values related to the design challenge (green for safety values, and yellow for involvement values).

Corporate values (phase 1)	Parental values (phase 2)
COMMERCIAL SUCCES. "They have to pay for it. We are a commercial company, you know." (game designer)	CONTROL for SAFETY. (9) "I think you have to be able to intervene as a parent." (P2)
EDUCATION. In a FUN way. "We call it 'get smarter by having fun'." (digital project manager)	INVOLVEMENT. (7) "Just because it's great to see how they develop and change." (P4)
QUALITY. "A lot of people know that if you go to a show, you get value for money." (game designer)	MORALITY. (5) "To not say: don't do that. (...) I try to teach them values." (P7)
TRUST. "[Parents] will gladly spend money every month and get something they can trust in return." (game designer)	INDEPENDENCE. (5) "Just paddling one's own canoe." (P2)
SAFETY. "I really tested it [chat function], as if I was of bad faith. I can't get through." (game designer)	FUN. (4) "Once in a while it is fun to do that together with the kids." (P5)
ENVIRONMENT. "Actually, we shouldn't promote potato chips. We should go to the fruit auction and promote fruits." (digital project manager)	

Figure 9: Results from the study about parents in [38]

Further, another study points out a positive correlation between a problem with gambling and loot box engagement [27]. Results showed that the risk of a gambling problem was higher among those who had purchased or sold items from a loot-box. The results of this study among adolescents showed resemblances with results from studies conducted with adults. The study by Von et al. [39] is one example of those that study loot-boxes and gambling among adults.

5. Discussion

In this section, the results from the systematic literature review are discussed.

5.1. General results

The overview of the different methodologies in Figure 2 shows a variety of them. Figure 4 presents the distribution of journals and conferences. There

was only one journal that had several of the papers. The journal Computers in Human Behaviour had four out of 19 papers. Computers in Human Behavior is dedicated to examining the use of computers from a psychological perspective. The primary message from most of the papers is regarding human behavior [40]. This journal could be well represented in the SLR because of the focus on children, which was used in the search string.

5.2. RQ1: What are the common features used in Free-to-Play games for children today?

The results from the SLR show that the majority of papers are related to in-game purchase in general and not specific features, see Appendix B. The loot-box was one feature that several papers discussed in-depth and mentioned as problematic due to its similarity with gambling [27, 39]. Based on the SLR, it is hard to conclude if the loot-box is a common feature in F2P games, but the SLR indicates that it is somehow problematic. Further, since it is an ongoing international debate about the loot-box, and it is getting much attention, this may indicate that it is quite common. Several of the papers mention in-game currency. In the study by [26], ads were the most occurring interruption or annoyance. Additionally, the study by [25] substantiates this with 53% of the children apps having targeting ads. Furthermore, several papers from the SLR mentions premium as a feature.

Findings from Fitton and Read [26] shows a classification of dark design aspects in F2P apps for children, shown in Figure 7. The different types, shown in the right column, are concepts or features typical to find in games for children. Several of the features mentioned is also included in this framework. Hamari et al. [1] revealed that unobstructed play, social interaction, and economic rationale were three of the six dimensions most related to how much money each player spent. Paying for unobstructed play can be seen as pay to skip/progress, which is mentioned in the ADD framework [26]. Social interaction is mentioned as one of the eight essential factors to achieve game flow [41], which in light of enjoying and being invested in a game can be seen as a good thing. According to Sweetser and Wyeth [41], this could be through cooperation or challenge, and the game could provide a way to communicate. However, social interaction is also considered a potential dark design aspect of apps [26]. One example is that the game encourages to spam friends, or the game does impersonations of one of their friends. Another example

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is pop-up alerts that want the player to share or review the game. Lastly, social pyramid schemes are mentioned as a negative social aspect to incentivize users to recruit others through social networks. The last dimension, by Hamari et al. [1], is called economical rationale, and consisted of purchasing functionality such as reasonable pricing, special offers, or supporting a good game. This indicates that the concepts mentioned in this section are typical in F2P games for children.

In the paper by Alha et al. [31], 11 high spenders contribute with their perspectives on F2P. Their perspective was that spending in F2P was not necessarily seen as negative if they felt that they received a lot in return. This relates to the example of supporting a good game mentioned in the study of Hamari et al. [1]. However, some of them mentioned that they were addicted to purchases. In such cases, there seem to be reasons to question the design of the games they played. Similarly, as the ADD framework is shown in figure 7, paywalls, P2W, and other content only accessed through paying were seen as problematic. Additionally, posting on social media was also mentioned, which is also considered a dark design aspect in the paper by Fitton et al. [26]. This supports the fact that the features in the ADD framework are typical features in games for children.

5.3. RQ2: To what extent are children addressed in Free-to-Play games?

The systematic literature review revealed that children were addressed in different ways. One aspect concerns the role of parents when their children play games. Another is how the developers and the companies that make the game have the children's best interest in mind. Results also indicated that some games had not addressed this at all. In light of this, several papers were critical to features and in-game purchase designs in children's games. Further, several papers expressed concerns about the ethical aspects and that regulations were needed regarding children and F2P games.

5.3.1. The Role of Parents

Thaichon [32] revealed that age, parental guidance, social networks, and peer influence affected children's shopping behavior. Regarding parental guidance, the study shows that the parents' point of view and purchase behaviors will probably have an impact. The big spenders mentioned above had an overall positive attitude against F2P games, which could affect if they had children. In the study by Hamari et al. [1], parents can be motivated

to spend money if they feel their children are missing out on content. This indicates that the parents may worry that avoiding purchasing can affect the children's well-being. However, most of the study respondents did not have children. Hence, this study can not necessarily be used to conclude this. On the other hand, design or functionality hidden behind a paying mechanism is considered unethical in both the ADD framework and the study of the big spenders [26, 31].

In the study by Nouwen and Zaman [38], the parents felt a lack of control regarding their children's online use. This may be an important aspect when discussing who is responsible for children's best, such as security and well-being. The results of the paper, which are two design guidelines for making it easier for parents to engage in children's online use, indicate that the parents play an important role. If the children from the study used the patents described by King et al. [8], this could be problematic. The results of the two papers have similar findings, regarding that both conclude that there should be designs that make it easier for users, parents or children, to understand what they have given their consent to. Also, there can be relevant to have in mind that it varies how much parents understand. Therefore too much responsibility should maybe not be on them as it can affect the children's well-being and security. Another interesting finding from the study of Nouwen et al. [38] is the parents' and the corporate's different perspectives, shown in Figure 9. This shows that the corporate's focus on the economic aspect. In contrast, parents mostly focus on their responsibility regarding their children's internet use. However, the corporate's seem to have good intentions when creating games, but revenue is an important factor.

5.3.2. Company Strategies

The SLR found that a lot of the research focus on analytic tools to benefit from the Free-to-Play model. The advancement in technology, especially concerning machine learning and artificial intelligence, has opened new ways to investigate topics and predict specific outcomes. Furthermore, the Free-to-Play model has become beneficial not only as a monetization tool but also to explore the preferences of their potential users [36]. As a result, data analysis and the use of metrics have become essential factors. Four primary studies tried to find factors that influence the player's purchase behavior [35, 34, 33, 36], which indicates a focus on revenue maximization. Further,

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the study by Hamari et al. [1] revealed six dimensions for players' purchase motivations. Moreover, Hamari et al. [30] examines further in-game content related to purchasing. Both of these studies also support the perspective of creating games that invite to in-game purchases, and these studies could be useful for companies that make games to increase revenue. A total of 7 out of 19 papers address what makes the player want to buy in-game or increase the number of purchases. The perspective with revenue-maximization and player purchase motivations in these papers does not address the children's best interest.

When creating F2P games, one potential problem concerns the relationship between revenue maximization and how it affects its user. Games with high revenue streams might not necessarily be good games when evaluating it using GameFlow [41]. The use of advertisement that regularly distracts the user from the game, or the use of discontinuous gameplay that forces the player to wait a certain amount of time before they could continue to play, does not meet the criteria of GameFlow. On the other hand, a game that focuses on GameFlow and offers in-game purchases could be problematic, especially for children. Several examples in the section of related work showed that children bought for huge amounts without knowing. There could be a reason to believe that GameFlow, combined with in-game currency, could lead to the child having trouble understanding that in-game currency represents real money.

5.3.3. Ethical Considerations & Regulations

In-game purchasing systems have generated a great deal of debate on the need for specific regulation and consumer protection across many jurisdictions [8]. Furthermore, King et al. point out that, despite the concern, one of the biggest challenges for online gaming regulations is the lack of clarity regarding the legal status of certain types of in-game purchase. One example is whether the "loot-box" mechanic should be considered gambling. Lelonek-Kuleta et al. [29] states that also the concept of P2W could be considered gambling. This is for those who regularly spend money in P2W, which can be problematic when it comes to children as players.

Eight out of 13 utility patents discovered in the study by King et al. [8], specified that the products have age-restriction for players below the age of 13. Moreover, these users need consent from parents or a legal guardian to

make in-game purchases. Each document also states that sales are final and that there are no refund entitlements, except for erroneous charges. One could argue that this could potentially harm children or parents if the terms of use are not read carefully. The documents also state that the users do not technically 'own' or possess in-game goods and that virtual currency has 'no value', which leads to no compensation for loss of in-game content. Even though different consumer protection frameworks have been provided to evaluate the rights of the consumers of in-game purchases, there is one critical issue concerning the status definition of virtual goods: whether a virtual good should be considered equivalent to material products or services [8]. More appropriate policy and consumer protection measures would be needed to protect the interest and well-being of the consumer.

Furthermore, the study by Liu et al. revealed that 10 % of 67,778 apps for kids had a privacy grade of C or D, figure 8 [25]. Moreover, the distribution shows that there are no common privacy standards for the apps or, in case there were ones, not all the apps are following them. Based on this research, it does no seem like there are common regulations for privacy in several countries. This study is the only in the SLR that targets privacy, which can show that it has not been much researched yet. Additionally, it can be seen as problematic that the results revealed that almost 7000 children apps had a bad privacy grade. The paper by Alha et al. enlightens the debate about classifying the loot-box [31], but the SLR has not revealed anything about regulations regarding privacy for kids or games for children in general.

In general, the SLR indicates that there are several concerns regarding children in F2P games. Many developers have different perspectives than the children or their parents. Several features can be classified as dark design, indicating that children's best interest is not the focus.

5.4. Limitations

The data collection resulted in 584 studies. However, applying inclusion/exclusion criteria and quality assessment resulted in 19 papers. There may be multiple reasons for the limited number of papers. Firstly, one possible reason is the lack of research concerning the topic. Secondly, the search strings used for data collection could have been too specific, which excluded relevant papers for the research project. Further, the expressions freemium and F2P were used interchangeably in the literature. It varied what the

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authors used to denote the games. However, F2P was not included in the search string, which can have resulted in some papers being left out. Of the papers retrieved, only one had only F2P in the keywords without freemium as well. Therefore, the search string could potentially have limited the number of relevant papers.

A variety of research perspectives can help get a general understanding of the research topic, but not necessarily a deep understanding. Furthermore, not every paper found in the systematic literature review targets children in particular. They were considered relevant as many games today are not made directly for children but are available for them. Without the papers that did not directly target children or conducted research directly concerning children, the search results would have been too limited.

6. Conclusion

A systematic literature review was conducted to analyze the literature related to Free-to-Play games and children. A total number of 19 primary papers from 2015 to 2020 have been analysed.

6.1. RQ1: What are the common features used in Free-to-Play games for children today?

The results of the systematic literature review did not reveal a straightforward answer to the research question. Many of the papers discussed in-game purchases in general, and several of them mentioned different features and concepts. Several papers discussed the loot-box feature due to its similarity with gambling. Additionally, P2W was also discussed as a problematic concept. Both ads and in-game currencies were mentioned in several papers as well as dark design aspects in games. The literature review revealed that several features could negatively impact or trick the player into buying.

6.2. RQ2: To what extent are children addressed in Free-to-Play games?

Figure 3 shows an increase in relevant papers from 2015 to 2020, as more than half of the papers were from the last two years. This may indicate that the topic is becoming more researched and will probably increase over the years. The 19 papers show a broad aspect of different content, as shown

in Figure 5. The findings revealed that children are addressed in different ways. However, many of the primary studies relate to revenue maximization and influential factors to make in-game purchases. Several of the studies expressed concern regarding how games target children. Further, there were revealed several dark design aspects. Some of the features were discussed to have resemblances with gambling, which indicate a negative impact. The parent's role concerning children's rights was discussed in some of the papers. However, no one concluded that it was their responsibility. Several researchers concluded a need for restrictions, more precise guidelines, and further research in the area.

6.3. Further work

Several researchers agree that further research and guidelines are needed and that children are especially vulnerable. Overall, none of the results reveals solutions to Free-to-Play games targeted at children. Hence, based on the literature review, the critical aspects of Free-to-Play games for children should be investigated further.

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Appendices

A. Overview of Primary Studies

No.	Year	Authors	Title	Conference/Journal	Method	Sample Size	Participant type
1	2016	Chen et al.	A Decision Tree Based Method for Extracting Important Elements of In-Applications Purchase	2016 Third International Conference on Computing Measurement Control and Sensor Network	Mixed (Pre-test questionnaire)	217	<18 (3%) 18-30 (48%) 31-40 (14%) >40(35%)
2	2015	Chen and Lin	Purchase Prediction in Free Online Games via Survival Analysis & Key Factors of In-App Purchase for Game Applications	7th International Conference on Emerging Trends in Engineering & Technology	Mixed	205	<18 (0%) 18-30 (95%) 31-40 (4%) >40 (1%)
3	2019	Yang et al.	Purchase Prediction in Free Online Games via Survival Analysis	2019 IEEE International Conference on Big Data (Big Data)	Quantitative	-	-
4	2016	Liu et al.	Identifying and analyzing the privacy of apps for kids	Proceedings of the 17th International Workshop on Mobile Computing Systems and Applications	Quantitative	-	-
5	2019	Fitton and Read	Creating a Framework to Support the Critical Consideration of Dark Design Aspects in Free-to-Play Apps	18th ACM International Conference on Interaction Design and Children	Qualitative	39	12-13 years
6	2020	Lelonek-Kuleta et al.	Pay for play–Behavioural patterns of pay-to-win gaming	Computers in Human Behavior	Quantitative	2000	15-94 years

No.	Year	Authors	Title	Conference/Journal	Method	Sample Size	Participant type
7	2018	Alha et al.	Free-to-Play Games: Paying Players' Perspective	22nd International Academic Mindtrek Conference	Qualitative	11	24-44 years
8	2020	Ekambaranathan et al.	Understanding Value and Design Choices Made by Android Family App Developers	CHI 2020 Late-Breaking Work	Qualitative (Interviews)	20	
9	2020	Wijanarko and Dewanto Hadisumarto	Online Video Games as Distribution Channel for Retail Brand Voucher	ICEEG 2020	Qualitative	523	
10	2020	Kristiansen and Severin	Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey	Journal: Addictive Behaviors	Quantitative	1137	12-16 years
11	2018	Nouwen and Zaman	Redefining the role of parents in young children's online interactions. A value-sensitive design case study	International Journal of Child-Computer Interaction	Qualitative (Workshop)	Not specified	Parents
12	2017	Thaichon	Consumer socialization process: The role of age in children's online shopping behavior	Journal of Retailing and Consumer Services	Qualitative	63	8-15 years
13	2020	von Meduna et al.	Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey	Technology in Society	Quantitative	6000	All ages, mostly adults
14	2019	King et al.	Unfair play? Video games as exploitative monetized services: An examination of game patents from a consumer protection perspective	Journal of Computers in Human Behavior	Qualitative	13 patents	-

No.	Year	Authors	Title	Conference/Journal	Method	Sample Size	Participant type
15	2017	Hamari et al.	Why do players buy in-game content? An empirical study on concrete purchase motivations	Journal of Computers in Human Behavior	Mixed	519	19-49 years
16	2015	Georgieva et al.	Transposing freemium business model from casual games to serious games	Journal of Entertainment Computing	Mixed	240	18-34 years
17	2020	Zendle et al.	Paying for loot boxes is linked to problem gambling, regardless of specific features like cash-out and pay-to-win	Journal of Computers in Human Behavior	Quantitative	1200	18-40 years
18	2020	Hamari et al.	"Why pay premium in freemium services?" A study on perceived value, continued use and purchase intentions in free-to-play games	International Journal of Information Management	Quantitative	869	<40 years
19	2017	Lin and Chakraborty	A Study of Crucial Factors for In-App Purchase of Game Software	JSAI International Symposium on Artificial Intelligence	Qualitative	361	-

B. Main Findings from Primary Studies

No.	Main findings	Free-to-Play type	Area
1	7 crucial factors for influencing in-App purchase; social value, satisfaction, compatibility, perceived enjoyment, animation, scenario, character, and innovativeness. The first three factors belong to the whole game App, and the last four factors related to game design.	In-App Purchase	Company motivation
2	9 important factors for predicting purchase behavior; perceived ease of use, compatibility, result demonstrability, trial, mass media, interpersonal channels, perceived enjoyment, cognitive concentration, and perceived risk. The discovered results can provide game App developers to design products in the future.	In-App Purchase Premium Advertising	Company motivation
3	Payers' in-game progress is the most important variable related to player purchase decisions in the gameplay experience.	In-App Purchase	Company motivation
4	A classifier was designed and evaluated to predict whether an app is designed primarily for kids. Several features from the detail page of app were extracted and evaluated the classifier on a set of 1700 labels, achieving 95%. Moreover the classifier were used on a large set of apps to generate a list of apps for children.	In-App Purchase Advertising	Regulation
5	The qualitative study supports the ADD framework considering Dark Design Aspects in Free-to-Play apps. Analysis of the data collected from the participants showed a range of emerging themes both supporting and utilizing the initial framework, and identification of a new category within the framework.	In-App Purchase Premium Advertising P2W In-Game Currency Time restrictions	Ethics

No.	Main findings	Free-to-Play type	Area
6	Five patterns of user involvement in the game was identified among players in P2W games: regular very involved/high payments, regular involved/low payments, occasional moderately involved, regular uninvolved, occasional uninvolved. Moreover, P2W gamers that paid to increase their chances of winning on average played several times a week, bought additional options on average once a month with average gaming session on 30-60 min.	In-App purchase Premium P2W Virtual Goods	Purchase motivation
7	Faster advancement in a game is worth the money. The participants saw their use of money generally in a positive light. Participants that had used several hundreds of euros, did not feel that it was problematic, considering how much time they had spent in the game. The F2P players experienced the F2P model as positive and ethical, but it included characteristic problems: paywalls, Pay-to-Win mechanics, content gained only through paying, aggressive monetization, and making exploitation easier.	In-App Purchase Premium P2W Paywall	Ethics
8	In general the developers values have the best interest of users in mind, they often have to compromise because of market pressure, lack of monetization options and the use of biased design guidelines. The paper propose a need for guidelines and important directions for HCI research to support end-users' and developers values.	In-App Purchase Advertising Game Promotions	Ethics
9	The results indicated that reasons for purchasing consisted of 6 dimensions: Ostentaious, Addiction, Generosity, Eagerness, Personal value, Indulgence. Further these factors in light of Behavioral Aspects and Intention to use cashback digital voucher was investigated - and revealed that the dimensions of Generosity and Personal Value could have an impact.	In-Game Purchase Cashback Virtual Goods Vouchers In-Game Currency	Ethics

No.	Main findings	Free-to-Play type	Area
10	56.1% were engaged in loot boxes at some level. 93% of males had earned, bought or sold items, 15% of the females reported engagement with loot boxes. New patterns between loot box engagement and and problems with gambling. 42.5% reported experience with obtaining a loot box, 19.8% indicated experience with purchasing a loot box, 10.6% reported experience with selling virtual goods from a loot box - requires greater engagement. The latter had the highest risk of gambling problems.	Loot Boxes	Ethics
11	Design guidelines based on the study: 1. Platforms for young children should provide concrete clues to parents about how the platform´s mechanisms define the child´s possibilities to play and communicate. 2. New functionalitites should enable parents to engage online with their young children in concrete, well-defined activities.	In-App Purchase	Ethics
12	Children aged 8-11 and 12-15 were different in their behavior and perceptions of online shopping. The results of the interviews suggest that the level of children´s online shopping varies and is influenced by many factors such as age, parental guidance, social networks, and peer influence.	-	Purchase motivation
13	Typical loot boxes are young, employed, have a low level of education but an average household income. They gamble with both real and play money are likely to be problem gamblers/gamers. Loot box users are an average age of 36.7 years	Loot Boxes P2W	Ethics
14	Many of the 13 patents used advanced data analysis tools to make the players do more purchases in-game. Appropriate policy and consumer protection measures, psychologically informed interventions, and ethical game design guidelines are needed in order to protect the interest and well-being of consumers, particularly adoloscents who tend to be most avid players but may also be the most vulnerable and least well-informed consumer group.	In-Game Purchase	Regulation Company Motivation Purchase Motivation

No.	Main findings	Free-to-Play type	Area
15	Purchasing reasons converged into six dimensions: Unobstructed play, Social interaction, Competition, Economical rationale, Indulging the children, Unlocking content. The relationship between these factors and how much players spend showed that the purchase motivations of unobstructed play, social interaction, and economical rationale were positively associated with how much money players spend money on in-game content. The design affects how much players spend.	In-Game Purchase Virtual Goods	Purchase motivation
16	An effective model for analysing the players and their preferences tend to be the Free-to-Play model used as basis in particularly within the social gaming domain. The model can be very attractive; needs several iterations before starting to pay off in terms of revenue streams.	In-Game Purchase Virtual Goods	Company motivation
17	Correlation analysis showed that the greater the level of an individual's spending on loot boxes, the more severe their problem gambling. Cash out, near-misses, and using in-game currency strengthened links between problem gambling and loot box spending.	Loot Boxes P2W In-Game Currency	Ethics
18	The more enjoyable the players perceive the service to be, the more they are willing to use it, however, the less they are willing to purchase premium content. As expected, social value was found to be positively associated with purchasing game content. The quality of Free-to-Play service interestingly does not seem to be associated with the intention to continue using the Free-to-Play service. The economical value of the Free-to-Play service had an in-direct association with purchases through the increased willingness to continue using the Free-to-Play service.	In-Game Purchase	Purchase motivation
19	The results revealed 6 cruical factors for In-Game Purchase; social value (SV), perceived enjoyment (PE), affective involvement (AI), animation (GA), scenario (GSC) and innovativeness (GI)	In-App Purchase Advertising Paywalls In-Game Currency Virtual Goods	Ethics

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Toward Suitable Free-to-Play Games for Children

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Science and Technology