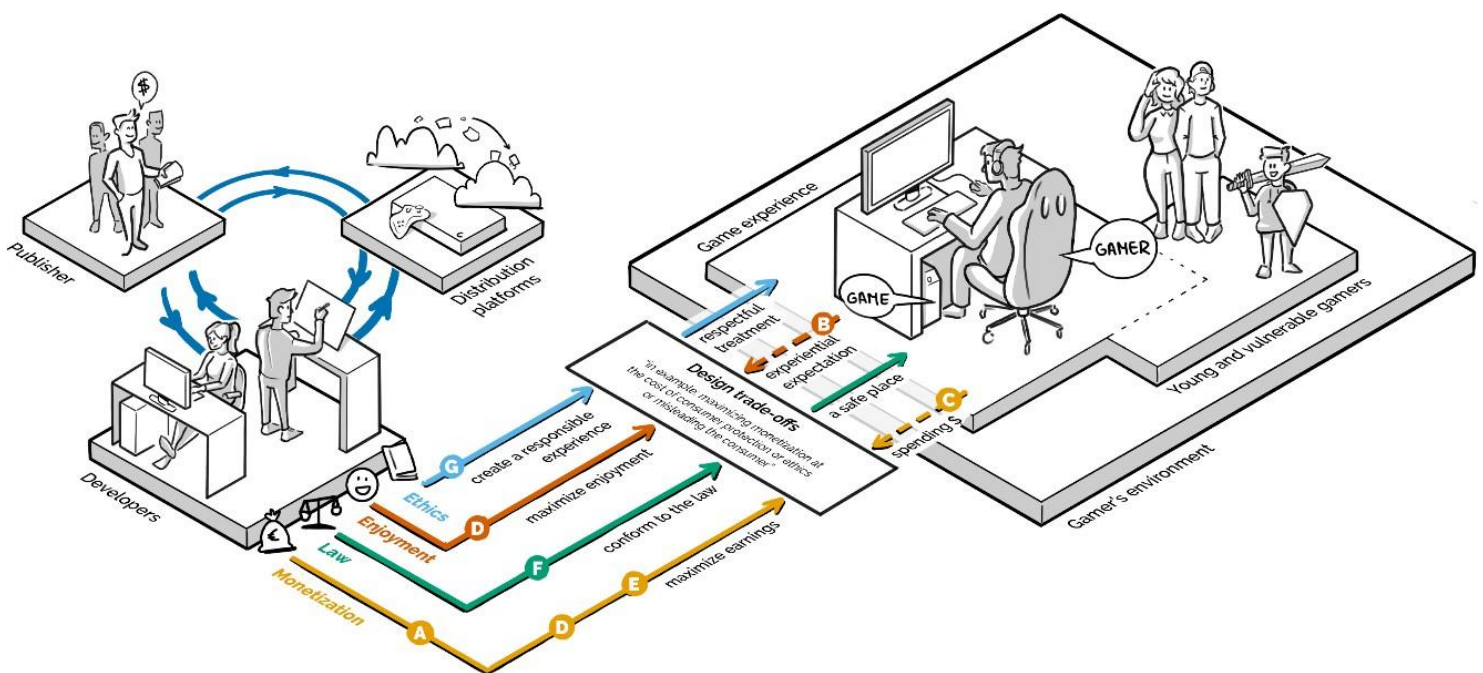


Behavioral design in video games

A roadmap for ethical and responsible games that contribute to long-term consumer health and well-being



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Table of contents

Abstract.....	4
Project aim	5
Section 1: Growth of gaming & evolving business models	7
1.1 Game business models impact gamer behavior	7
1.2 Monetization models	9
Game monetization models [box A]	9
1.3 Trends in monetization.....	16
1.3 A massive shift in game revenue streams.....	18
1.4 Young people’s vulnerability and need for protection.....	21
1.5 Towards responsible and ethical behavioral design	23
Section 2. Game, gamer, gaming.....	24
2.1 The game: game development.....	24
2.2 The gamer: harms and benefits, motivation, and behaviour.....	25
2.3 Harms and benefits associated with gaming.....	26
2.4 Motivations from play and gamer expectations.....	29
Why do gamers play games? [Box B]	29
Purchase motivations within games? [Box C]	31
2.5 The design of games to influence gamer behavior	33
Behavioral design patterns in games [Box D]	33
Behavioral change techniques [Box E]	36
2.6 Gaming: Gamer meets game design	40
Case examples: Fortnite, Clash of Clans and League of Legends	41
2.7 Digital balance: mental, social, physical and financial health	48
3. Game design and children’s rights	50
Legal principles in game design [box F]	50
3.1. Designing games in the child’s best interests	50
3.2. Game design and the right to play	52
3.3. Game design and the effects on children's health	54
3.4. Protecting children from exploitative game design	55
3.5. Game design and data protection	60
Section 4. Dealing with behavioral design in games.....	67
4.1 A taxonomy of behavioral design in video games.....	69
Ethical and responsible design principles [Box G].....	71
4.2 Policy agenda.....	74
4.3 Research agenda.....	77
Research aims: behavioral design in games [Box H].....	77
References.....	82

Abstract

Behavioral design in video games: A roadmap for ethical and responsible games that contribute to long-term consumer health and well-being

Project background. Game design has an impact on health and wellbeing. Young people and children are especially sensitive to the negative and positive impact of media design choices, due to their evolving capacities. To protect young people ethical and responsible game design practices are necessary. But what constitutes 'ethical' and responsible game design? Outside of the video game industry itself, game design choices are poorly understood and hard to discuss due to a lack of terminology and the lack of a coherent framework. The current project aims to provide a taxonomy of behavioral design.

Approach. The report focuses on '**behavioral design**': video game design decisions which elicit, either accidentally or purposefully, self-negative or self-beneficial behavior in the gamer. Expertise from public health, game design, and legal scholarship is leveraged to analyze current game design practices.

Conclusions. The report illustrates the centrality of changing business models in relation to design and the tension this creates within games. In practice, the monetization strategies regularly guide decision making in game design, facilitating risks for gamer welfare and finances. External transparency about design decisions and user manipulation is very limited. Moreover, manipulative design choices are not always fair - especially with regard to vulnerable groups - given the harm they may cause. Vice versa, beneficial, health-supportive game design is somewhat underused and receives limited attention in the current commercial space.

Different design motives now compete within games: legal compliance requirements, commercial and monetization objectives, and providing enjoyment for the gamer. To protect and even strengthen the consumer's physical, social, mental, and financial health, these motives should be expanded with an ethical-responsible motive as well. A visualized taxonomy is provided to illustrate these motives and their impact on the companies, the gamers and vulnerable subgroups of gamers themselves, and the gamer's environment.

Moving forward, a two-pronged approach is suggested: 1) Addressing effective governmental and self-regulatory policy efforts, including actual guidance about responsible design, via best practices and principles. And 2) further investigating the impact of behavioral design through research on the gamer, the game industry, and on the relationship between game mechanics and health outcomes.

Project aim

Do social media products keep us engaged beyond what is healthy with endless scrolling, continuous notifications and temporary 'stories'? Are games addictive by design? Do video games contain 'gambling' mechanisms? Can apps help us get healthy? Which games provide relaxation and not stress to my children? How do I recognize commercial exploitation of my child via a game or app?

The current project was initiated by the Trimbos institute and the Alliance 'Digitaal Samenleven' (ADS) ¹ in 2020 and is funded by the Ministry of the Interior and Kingdom Relations (BZK). The project research team contains an interdisciplinary team of academics covering game design and game research (Eindhoven University & Trimbos Institute), behavioral change expertise (Trimbos-institute & Eindhoven University) and legal expertise (Leiden University).

The project aims to investigate decisions in media design and specifically **video game design**. Media design has an impact on health & wellbeing. Young people are especially sensitive to the negative and positive impact of media design choices, due to their immature development. Herein, we specifically focus on what can broadly be described as '**behavioral design**' - the impact of design on the end user's behavior. We use this term in a **neutral** fashion - it can encompass both *harmful* and *beneficial* design of video games.

In other words, games can be used to achieve health gains (games for health, gamification) or mental-social benefits such as relaxation, leisure or social playtime. But the player behavior that is elicited by the product design can potentially also be detrimental to the user's best interests. Design can be misleading in nature, economically manipulative, or stimulate unhealthy or financially risky behavior.

This raises the question of what constitutes 'ethical' and responsible game design. Outside of the media-production and the video game industry, game design choices are poorly understood and hard to discuss due to a lack of terminology and the lack of a coherent framework. There is no industry wide 'code of conduct' to facilitate **ethical digital game and media design**. Moreover, it is hard for policy makers to respond to this issue due to the rapid development of technology and the lack of a common framework to discuss the components involved in the chain that ranges from product design choice to health and behavior impact.

The current project aims to provide a taxonomy of behavioral design and widen the scope of the game design debate. It provides a perspective that goes beyond a focus on monetization and minimal legal compliance. A broader perspective that includes both the protection of vulnerable consumers and the consideration of consumer's long term social, financial, mental and physical health. In other words: a roadmap towards consideration of ethical and responsible game design as a primary principle, not an afterthought.

¹ The Alliance was initiated by the ministry of Internal Affairs, VodafoneZiggo and Laurentien van Oranje. It's run by the Netherlands Institute for Sound and Vision (<https://www.beeldengeluid.nl>) and Number Five Foundation, in close collaboration with the Ministry of Internal Affairs. The Alliance is aiming for digital inclusion for everyone in the Netherlands. The Alliance is connecting public, private and societal organizations to collaborate on the most urgent societal topics in the context of the digital society. Dialogue is a powerful instrument in achieving this goal.

The project is ambitious. Therefore, it's good to emphasize that it will be impossible to be complete in relaying all the different subjects. Instead, the project aims to demarcate the research area to the extent that the central issues become more easily discussable and researchable. The main target audience are European policy makers: they regularly lack the terminology and concepts to discuss behavioral design in video games. That said, we hope the report will be insightful for broader audiences, e.g. industry professionals, gamers, and researchers.

This approach is reflected in the structure of the report: following a broad introduction we provide practical suggestions for policy makers and we outline required research. To increase accessibility even further, a visualized taxonomy is developed during this project. It is our hope that the current project will support debate about the opportunities and risks of behavioral design and provide focus for future follow-up projects.

Section 1: Growth of gaming & evolving business models

The growth of gaming in the Netherlands reflected in survey studies and marketing research. In 2019, 89% of Dutch primary school students and 75% of secondary school students indicated playing digital games [1]. Social media are used by 96% of secondary school students. Already in 2017, up to 40% of the Dutch population played video games [2] and more use smartphone devices and other digital media products.

For 2012, PWC estimated the size of the Dutch video game market at EUR 481 million, including console gaming, PC gaming, and social/casual gaming via browser and mobile phones. This included an estimated in-game advertising market of EUR 23 million (e.g. product placement, etc.) [3]. In 2016, this was up to EUR 606 million, with advertising revenue almost doubling to EUR 38 million. Surpassing PWC's 2016 earlier estimates by 30%, the video game market was already up to EUR 1000 million in 2018, and higher still in 2019 [4].

By many accounts, the COVID-19 crisis of 2020 has benefited all forms of digital entertainment, including video games. The digital game distribution and online play platform *Steam* reports an increase of 21% more games purchased in 2020, combined with a 50% increase in hours played. *Facebook Gaming* statistics confirm equal developments for the mobile market: they report a 50% growth in the mobile gaming audience for the UK (8.6 million new gamers) and a 25% increase in Germany (6.5 million new gamers) during 2020 [5].

1.1 Game business models impact gamer behavior

Originally games were sold primarily in a single transaction, similarly to books or movies. Users bought a box containing a physical copy of the game, i.e., CD, cartridge, floppy diskette, or blu-ray disc. The changing video games market can be illustrated by a number of key developments, mostly related to changes in monetization.

A first shift was in (the user's) acceptance of new transactions. In 2004, Blizzard Entertainment (now Activision-Blizzard) introduced *World of Warcraft* or *WoW* and exemplified a shift towards a new paradigm. Unlike the majority of earlier games, *WoW* was subscription based, but retained its mass market appeal. User's paid a monthly subscription fee to participate in the game (around EUR 10 - 15). In the persistent multiplayer universe of *Warcraft*, the user can develop their relationships with other players, lead groups, and experience adventures. Even the scientific community took an interest, as the large online gatherings provided avenues for exploring digital economies, gamer culture, leadership, etc. [6].

The excessive amounts of time spent in games like *World of Warcraft*, leading to problems outside of the game for some, was essentially the start of mainstream attention for problematic or 'addictive' video gaming. Eventually, the *American Psychiatric Association* [7,8] and the *World Health Organization* [9] both decided to incorporate 'gaming disorders' into disease classification models, although the

psychiatric/psychological diagnostic manual DSM-5 did so on a tentative basis in the appendix. This decision has not been without controversy [10–13].

But both opponents and critics of the new gaming disorder dominantly agree on the following fact: in the last two decades, treatment professionals in psychological contexts worldwide have seen an increase in children and adolescents that experience problems in daily functioning related to video games.

Until recently, there has been minimal public acknowledgement from gaming publishers and game developers that their product might contribute to unhealthy or unwise behavior [14]. That said, it was clear to players of World of Warcraft that **some design choices elicited extreme behavior**, and they were sometimes removed or adjusted by the game developer over the course of game development after community discussion or feedback. In example, the original WoW player versus player competition system basically rewarded the player with the most time in the game and thus, the most points, in the race to achieve the highest military ranks [15]. This led players to set up work-like shift schedules to keep one shared account fully played to remain competitive.

Behavioral change researchers know that human behavior is often multi-determined [16,17]. This holds true for media products: no single factor determines the gamer's behavior, but product design obviously plays a role in directing this behavior [18]. A media consumer's behavior is always an interplay of the user's biological/psychological/social characteristics, the product design itself, and the physical and virtual environment the user is active in [17–19]. With regards to **game design**, it is thought that the online *interaction* in the game, the essentially infinite amount of new *content*, and the sophistication of the *reward schedules* all contribute to the high 'stickiness' of this type of game - as opposed to earlier single player games with a limited amount of content [20].

Positively interpreted, the scope of the game and the opportunities to achieve and accomplish together provided a unique experience for gamers, which is fondly remembered by many. Marriages and lifelong friendships were formed through this game, a level of depth and human connection that stands in stark contrast with, for example, watching television shows alone.

It can be hypothesized that the increase in problematic gaming and the shift in business model are connected in a self-reinforcing loop. The structural inflow of money helps the company to keep generating high quality content for the game, which is necessary to keep players engaged and keep them paying the monthly subscription fee over time. This works well: while players eventually started leaving World of Warcraft for other games, the game has an unprecedented scope and is still releasing expansions after 15 years. The result is a virtually endless playground for players to get lost in. The monetization model of World of Warcraft and the interplay of design choices and player behaviour is one example of the relationship between business models and gamer behaviour. Since then, monetization approaches and game design have both evolved to create enjoyable experiences, while maximizing profit.

1.2 Monetization models

The chosen monetization model affects game design choices by game developers, the models are described from the perspective of the makers first. The gaming public's perspective and expectations will be discussed later on.

Monetization is not inherently problematic, but monetization can become overly manipulative and misleading when the systems build aim primarily and exclusively at the extraction of money through user-time spent. This can have negative consequences for gamer's fun and broad health, likely more so for vulnerable gamers and minors. When taken to extremes, video games of this type can start resembling digital gambling machines.

For instance, strategic building games require players to build structures and require time to be built. This context provides game designers with various opportunities to create additional 'special' buildings that can be purchased, with paid options to decrease building time, or sell players protection against other players - who might destroy their hard earned buildings (e.g. mobile game Clash of Clans). This introduces a **negative incentive** for game designers. When they increase the frustration and friction in their games - in example, extra long waiting times that can be skipped for money - they might very well make more money. Monetization techniques are game-type specific. Some games do not have waiting times for buildings or other players that might destroy the players' digital village.

To monetize other strategies are required in those cases and a wide variety of examples exist [see example section]. Monetization models are not mutually exclusive and are sometimes combined. Some popular monetization models are now discussed.

Game monetization models [box A]

[Box A]: Common monetization models

- Pay-to-play
- Retail/Box revenue
- Subscription models, games as a service
- Free-to-play
 - Microtransactions
 - Pay-to-win
 - Season passes
 - Data-driven/data-for-access revenue models
 - In-game video advertisements
 - In-game advertisement and product placement
- Out-of-game revenue models (e.g. e-sports, streaming, selling brand)

Pay-to-play. The pay-to-play business model sells attempts to beat a game, e.g., pinball, arcade machines such as Pac-Man, for a small amount. From a customer's perspective, the threshold to partake is low (e.g., 25c per play) and the value is determined by a player's skill. Some games, e.g., pinball, also offer in-game performance incentives (extra balls, extra lives) to keep playing. To beat a game,

substantial experience and training is required, which asks for regular investments and can become expensive quickly. However, the investment is transparent, there are no hidden costs, and there is very little potential for exploiting the business model.

- From a designer's perspective, pay-to-win games need to be easy to learn to assure pick-up and sustained engagement, but hard to master to assure that there is a barrier that is worth paying for to overcome. Pay-to-win games often allow for social comparison to drive spending, either through leaderboards, competitive or cooperative play, and feature a sellable unit that defines "attempts", e.g., lives. Being out of lives through personal mistakes then require spending to refill lives and continue play.
- From a publisher's perspective, the units themselves are sold as retail items. Hence, the quality of the games need to be high enough that the machines are bought for entertainment or that the play experience is interesting enough to be played frequently.

Retail/Box revenue. In the box or retail revenue model publishers sell physical copies of their game, e.g., via floppy disks, CDs, or cartridges. Customers receive a complete game experience without hidden costs. When games were still a fringe entertainment product (before 2006), box models were the predominant form of distribution. This model also allowed players to sell or lend their copy of the game. However, physical copies of games were often replicated, leading to losses for publishers and an increase in copy protection mechanisms.

- From a publisher's perspective, box models were for a long time the only way to distribute games. The model has the advantage that it does not require additional infrastructure, e.g., server support, content creation, or bug fixing, which needs to be maintained. However, a physical product restricts the reach of sales and box sales don't scale well for the mass market. The box production also requires added investment, that in case a game flops is added loss.
- From a designer's perspective, box revenue provides a larger amount of creative freedom, because the product is not judged by the quality of the overall service, novelty of content, or events in the game, but solely by the customers' opinion on the quality of the experience offered by the complete product.

Subscription models, games as a service (e.g., World of Warcraft: WoW, but also cloud gaming). Subscription models sell access to game content for a regular, usually monthly, fee. Subscription models are commonly used in mass-multiplayer role playing games or by gaming platforms that provide added services such as the Playstation Plus Network.

- From a publisher perspective, subscription models provide continued revenue as long the customer-base remains stable. In comparison to box sales, which usually aim for one-time peak revenue, this model allows publishers to build sustainable infrastructure, see for example: Activision-Blizzard via WoW. A newer form of subscription models are cloud gaming platforms (e.g., Shadow) which offer a similar service as subscription-based content platforms such as Netflix. Customers pay for access to a library of products, the subscription fee is then divided among the different content providers.
- From a designer's perspective, games that qualify for subscription models need to provide content that allows customers to invest almost infinite amounts of time into the content or provide enough novel content that subscription remains justified. World of Warcraft has achieved 17 years of subscription-content through a combination of offering different play modes (e.g., raiding, PvP competition, exploring, questing), in-game events (e.g., seasonale events), new expansion that fundamentally change the game world, and progressively added content, e.g., new challenges, group activities (raids) that are consecutively introduced within expansion.

Free-to-play. Free-to-play is a super-category for games that can be accessed and played free of charge, but leverage other monetization strategies, such as microtransactions, data-driven/data-for-access revenue models, in-game advertisement, product placement, or other marketing efforts.

- From a publisher's perspective, Free-to-Play models have in common that they need to find other monetization strategies to monetize player engagement. This comes with disadvantages, e.g., the risk of giving away the game for free, and advantages, e.g., wide distribution, continuous revenue potential, revenue potential that surpasses box models.
- From a designer's perspective, free-to-play models set the requirement to integrate a monetization strategy into game play. This provides added challenges and has potential to create tension between monetization requirements and experience design considerations (such as enjoyment).

Cosmetic content, microtransactions, & loot boxes. Microtransactions refer to a host of monetization strategies that capitalize on user engagement by selling premium currency, virtual items, or extra content. Players can, for example, buy skins in League of Legends, premium currency in Clash of Clans, or hats in Team Fortress 2. The distribution of income for microtransactions is uneven across the player population, because some players invest large amounts, while other players don't invest beyond the base game—the industry coined the term “whales” [21,22] to describe individuals that show substantial spending behaviour. Games featuring microtransactions are often free-to-play, but microtransactions are also used alongside other business models. In some cases, the rewards can also be unlocked through regular game-play, although the time investment required can be heavy.

Loot boxes form a special case of microtransactions, in which the rewards are unknown before purchase. In example, in FIFA (EA games), players are bought via card packs that have unknown content at the moment of purchase. A similar system emerged in Overwatch, a massively popular free-to-play Blizzard Entertainment title, although the items from boxes in Overwatch are **cosmetic** in nature and merely change the player's appearance, not their skills. Nonetheless, Overwatch proved to be a huge financial success for Blizzard over the course of 2016-2017 [23]. These financial successes contributed to widespread adoption of this monetization approach. The audiovisual and sometimes actual overlap with for-money-gambling resulted in gamer and societal resistance to loot box monetization.



Cosmetic Loot box example, source: <https://overwatch.blizzplanet.com/blog/comments/new-feature-loot-box> (2016).

- From a publisher perspective, microtransactions have several advantages: 1) they can result in continues revenue, e.g., skin sales; 2) the potential massive spending of a few individuals allows a game to thrive even without a large paying customer base (e.g. a mix of non-paying younger adolescents and high paying early adults); 3) microtransactions

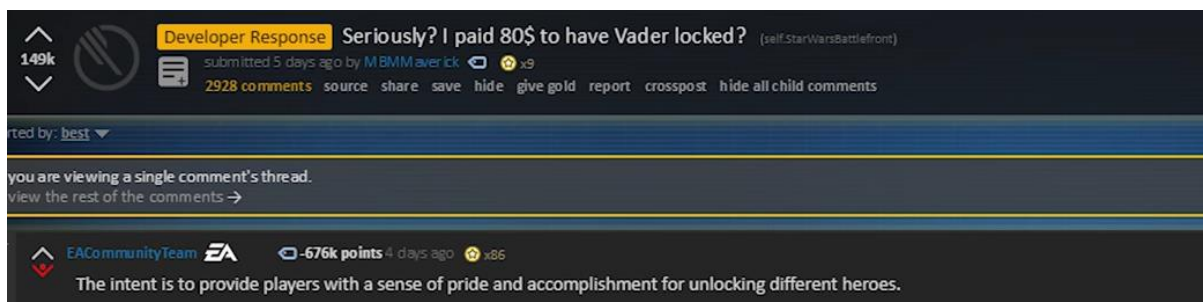
allow publishers to introduce new content frequently and monetize on its actual uptake; 4) microtransactions also allow to measure the uptake of newly introduced content quickly, allowing for data-driven adjustments to game content; 5) microtransactions can be used to exploit cognitive biases (illusion of control, gambling type biases), which has resulted in regulatory and legal discussions before, especially concerning loot boxes.

- From a designer's perspective, microtransactions impact the design process, because they require designers to plan and adapt visual style, underlying game mechanics, or narrative arcs to the requirements revenue model. The implementation requires technical considerations, e.g., building shops or rewards systems, visual design consideration, e.g., choosing art styles that allow for an easy production of virtual clothing items, or a segmentation of the game progression, e.g., sets of levels in Super Mario Run. In another example, Grand Theft Auto 5 online mode's tutorial takes the player through the in-game shop to 'try' the purchase process for free one time. The implications for designers are substantial and in many instances the monetization strategy is decided on first and the game is then designed to fulfill business requirements.

Pay-to-win microtransactions & loot boxes. Pay-to-win monetization enables players to buy items that increase their strength disproportionately to player's who don't pay and hence forcing players who are interested to fully compete in the game to invest money. Pay-to-win strategies are distinct from other microtransactions, because of the direct implication on the enjoyment of a game, i.e., if you don't pay you can not enjoy the game on the same level as others.

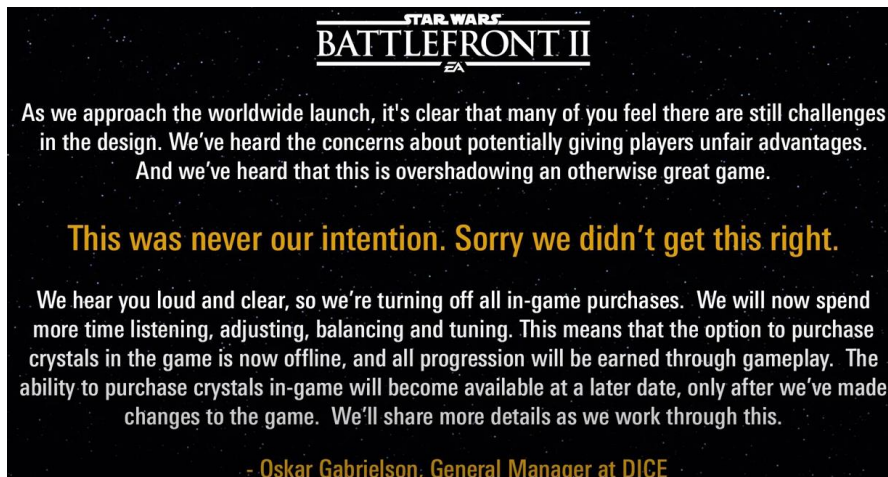
While many mobile games employ this tactic, high profile titles generally avoided it. That said, some highly publicized examples exist. For instance, the release of Battlefront 2 in 2017. Battlefront 2 was a high profile title and was sold to players for a sizable sum of money (well over 60 Euro), often as a Christmas gift. Upon playing the game, players discovered that they couldn't even play with some of the most desired characters, such as Darth Vader, without spending additional money on in-game randomized outcomes - loot boxes, or playing the game for extremely large amounts of time (grinding).

Secondly, many microtransaction items locked in loot boxes were non-cosmetic and essentially a necessary part of the game for players that wanted to become more powerful, leading to allegations that the game used a pay-to-win model. Doing the math, gamers discovered it would take \$2100 or 4528 hours of play to unlock all of the game's content, both equally absurd [24].



Source: A Summary of EA's Star Wars: Battlefront 2 Controversy.
<https://www.youtube.com/watch?v=iP7KFvBXHHs>.

After massive critical feedback in the game related media and on Youtube, the publisher EA and the developer DICE (a fully owned EA subsidiary) backpedaled and removed both the pay-to-win microtransactions and the extreme time requirements to unlock certain heroes from the game.



Source: A Summary of EA's Star Wars: Battlefront 2 Controversy.
<https://www.youtube.com/watch?v=iP7KFvBXHHs>.

The public debate continues to progress with regards to randomized microtransactions, focusing on various issues: players themselves dislike being wrangled into unwanted purchases that add little to the core gameplay experience and dislike pay-to-win elements in some of these games. Regarding loot boxes in general, the discussion is ongoing. Policy makers, parents, and researchers have focused attention on the high degree of audiovisual and sometimes even actual similarity with gambling, as well as the potential manipulation of players in terms of making informed decisions as a consumer. The gambling authority in the Netherlands has indicated that the loot boxes mechanisms employed in several popular games (including: FIFA) are likely legally considered as gambling and therefore in violation of Dutch law (as offering online games of chance / gambling without a license is prohibited) [25].

- From a designer's perspective, pay-to-win requires decisions around balancing the game. If the pay-to-win mechanism is too obvious, players do not purchase the game. Generally, the early game provides a level playing field. However, the game eventually needs to come to a point where progress without paying is almost impossible to achieve, in order to encourage players to pay for the additional content.
- From a publisher's perspective, pay-to-win seems intriguing, because the model promises that players who enjoy the game will eventually pay. Negative responses via gamer critiques and gamer's disillusionment with the games usually lead to high attrition rates, which renders pay-to-win fairly uninteresting for serious publishers in general. Predatory publishers [26], however, might find the model valuable, especially when the game production cost is kept low.

Season passes provide players with access to in-game content, available for a limited amount of time. Season passes are not selling the game itself, but rather open up access to a range of items available during a specific season. Users move forward on a track (the 'premium' season track) during play, to unlock exclusive rewards, often cosmetic in nature. This model is regularly employed in free-to-play games, where a 'free' reward track is also available for players to progress on (and see the premium track and what they are missing out on). Season passes are often combined with additional premium content such as cosmetic skin sales (see: microtransactions).

- From a publisher's perspective, season passes provide publishers with revenue proportional to their user base, and are hence a valuable instrument to generate stable revenue. However, season passes don't scale beyond the user base, and are therefore often paired with microtransactions that which enable publishers to further grow revenue,

- From a designer's perspective, season passes have a number of implications. They require the game to feature events that continue over a certain amount of time (a season), i.e., changes in the game world, new content, etc.. They require systems that link seasonal events to game content, e.g., finishing a set of challenges to receive an item. The challenge for designers is to expand or alter the game universe, while at the same time avoid player attrition due to changes in the content.



Source: Season pass example, Fortnite (https://fortnite-archive.fandom.com/wiki/Battle_Pass)

Data-driven/data-for-access revenue models. When selling user data to data brokers, game developers and publishers can generate revenue. User data can be sold by data brokers to digital advertising companies [27]. Data is then used for targeted advertisements. While the access to a service is experienced as free, users give away their personal data, which is inherently valuable. Some companies offer premium services that are not free of charge, but in return promise to not sell the users data. Due to its business-to-business nature, it is fairly untransparent if game publishers and developers sell user data for the end-user, but cases have been established, including for games that are used by children [28].

Gamer data exists in various forms and some of those are unconsciously shared: some **data actively given** (data we mostly consciously provide when signing up to a service (e.g. email address) or posting on social media (pictures, videos etc)). A variant of this are **data that are passively given off** (mostly behavioral data, but also our social networks, devices that we use, or other data that we are usually less aware of spreading). **Inferred data is also possible:** new, potentially very sensitive, information generated through data mining which results in profiling of users; the information generated includes things we would not have shared consciously, like personality traits, medical conditions, sexual identity, political preferences etc, and is derived from data that by itself does not reveal this new information. In short, the first two types of data are the raw materials for the third type.

- From a publisher's perspective, selling user data is a technically simple way to generate extra revenue—some of the data is generated anyways and some of it can be gained through asking for certain phone or system permissions—but the notion that data represents substantial value, plus privacy considerations, lead to several ethical and legal implications for data-driven revenue models that need to be carefully considered. Moreover, it is particularly difficult to lawfully shape these models in relation to children.
- From a designer's perspective, data-based revenue models can have little implications on game-design in some cases. If designers specifically aim to gather data from in-game interactions that are designed to gather a certain data point, e.g., ethical dilemmas, political opinions, or cognitive tasks introduced in a game and then used to categorize players, the impact on game design becomes bigger.

In-game video advertisements. The appeal and sometimes large number of players has been used to sell advertisements. Similar to video advertisements on platforms such as YouTube, video games show advertisements at the beginning of a game (e.g., Angry Birds Star Wars) or sometimes to continue after failing an in-game challenge (e.g., Puzzle & Dragons) or to acquire boosts (e.g., Gardenscapes). This model is much used by mobile games.

- From a publisher's perspective, advertisements are an easy way to monetize already developed games. The strategy is fairly safe, because it is not necessarily intertwined with game mechanics or if the mechanism intertwined, then only by using game events as a trigger to show advertisements. The mechanism is transparent to players.
- From a designer's perspective, integrating in-game video advertisements requires little effort. The primary effect on the player experience are interruptions that break the flow of the game and distract from the game's content. The impact on gameplay and design can potentially be quite large with games that are designed around this approach, and some mobile games fully lean on getting the user to view these video advertisements.

Direct in-game advertisement and product placement. Similar to product placement in movies or TV shows, publishers monetize on the visibility of games by selling in-game advertisements or allow for product placement. Games such as Fortnite use skins to promote certain brands (e.g., Marvel or Star Wars). Other forms of product placement are car brands in racing games, the use of billboards (e.g., Burnout Paradise) or the use of products by in-game characters, e.g., Subway in Uncharted 3.

- From a publisher's perspective, in-game product placement allows publishers to sell in-game real estate without requesting substantial changes to the game-play. In addition, brands working together has the potential to increase both parties' visibility or likability. E.g., by featuring Marvel skins Fortnite benefits from widely appreciated characters such as Deadpool and Marvel benefits from being visible in a game with a 350 million player base.
- From a designer's perspective, in-game advertisements vary in complexity, e.g., displaying a brand on a billboard in a game requires only the use of a different asset, while integrating an entire character or section of a level on an existing character requires careful treatment of the brand. For example, in Fortnite Season 2 players could visit Deadpools yacht, several challenges were focused on Deadpool, and a number of items that were created in reminiscence of Deadpool are featured.

Out-of-game revenue models: Streaming, e-sports, reselling brands. Video games and playing video games attracts a large audience. 2019, the final of the multiplayer online battle arena game DOTA 2 attracted 1.97 million concurrent viewers [29,30]. In comparison, Wimbledon reached about 60 million on BBC and ESPN alone [31] and the 2018 World Cup final reached 517 million live viewers [32]. The streaming platform Twitch attracts 3 million concurrent viewers with 9.5 million unique broadcasters creating content [33]. The high level of audience engagement and time spent on Twitch solicits marketing investments, sponsorships for eSports, and the investment into the development of professional streaming infrastructure. Using the games brand (IP) to make money outside of the game directly is also possible: in example Minecraft or Fortnite merchandise.

- From a publisher's perspective, additional revenue channels that help develop the brand / IP can be very interesting and lucrative.
- From a game designers perspective, designing for audience engagement is a new challenge for game designers. While there have been observer tools implemented in games in the past, actively creating content that's appreciated by a large audience is a challenge in itself and will likely influence future game products. Managing the community of streamers around the game is a task in and by itself and the streamers are vocal about the game, impacting the game's development in some cases.

Finally, there are several other opportunities to generate revenue with games including crowdfunding, e.g., Kickstarter or Patreon, trading or selling digital assets, e.g., non-

fungible tokens (NFTs), and game-external player markets to sell, for example, in-game currency or accounts.

1.3 Trends in monetization

The widespread adoption of microtransactions around 2020 can be traced back to 2006. The Xbox Live Marketplace and the Playstation Store began offering additional content for games [34]. Initially these times were free 'nice to have' bonus items for existing games, but this quickly shifted to low priced items that could be bought, such as the infamous 2 dollar piece of armor that mostly just changed the cosmetic look of your horse in an adventuring game, introduced in 2006 [35]. Various stores started using a token economy, where real money was exchanged for 'points' (e.g. *Microsoft points*), similarly to the exchanging of money for chips in a casino. In 2020, complex token economies are essentially the default payment structure in games.



Source: <https://www.destructoid.com/oblivion-s-horse-armor-dlc-still-selling--196594.phtml>

Two types of aftersales emerged: larger Downloadable-Content or **DLC** transactions, such as expansions for games with entire new segments of the game and microtransactions that provided small 1-3 Euro/Dollar purchases for small pieces of content. To some extent, microtransaction development was most likely inspired by the rise of mobile gaming: from 2008 forward, touchscreen devices started mass adoption with the proliferation of iPhone 3G phones. Mobile games were monetized with small transactions, possibly because mobile users were thought to be hesitant to pay full-game prices (50 Euros) for a small, mobile game. Eventually existing games, such as World of Warcraft, adjusted their models to incorporate these microtransactions as well [36].

An illicit *in-game / out-game economy* also emerged for several popular games, including World of Warcraft. While technically prohibited, players sometimes sold their accounts, signalling the real monetary value of these achievements and possessions. In monetary terms, accounts were sometimes sold for hundreds, up to thousands, of Euros, indicating the value of these in-game assets and avatars [37]. Socially, stopped payment had very real consequences as well, as the gamers peer group would be partially lost within the 'walled garden' of the game.

In the personal computer (PC) gaming arena, the successful game developer Valve became market leader in game distribution via the Steam Platform. The company can also be connected to some of the first large audience experiments with *free-to-play* games: games that are financed by in-game microtransactions. It was found that a price reduction to zero and a switch to microtransactions in Team Fortress 2 actually increased gross revenue substantially:

It's likely that Valve's reputation for providing free updates and ongoing support was even more of a factor than the "free-to-play" label, but Newell admits that Valve are generally stumped by their observations. As an example, Newell commented on the remarkable but confusing success that Valve saw early on with Steam sales, saying "we do a 75 percent price reduction, our Counter-Strike experience tells us that our gross revenue would remain constant. Instead what we saw was our gross revenue increased by a factor of 40. "Not 40 percent, but a factor of 40, Which is completely not predicted by our previous experience with silent price variation."

- Team Fortress 2 free-to-play shift increased player base "by a factor of five" [38].

The microtransaction system was extended to other Valve games, such as the popular *Counter-Strike*, a very competitive game. In this game, the purchased items were cosmetic in nature only, in order not to disrupt the eSports nature of the game [23]. As a side note, even cosmetic items can sometimes have strategic purposes, e.g. wearing a black outfit on a dark map helps you blend in.



- An example of early microtransactions in Team Fortress 2 (source: <https://www.youtube.com/watch?v=6qW5LTbkssI>)

Market agencies were starting to take note of this shift in monetization: by 2012, PWC released a brief report specifically discussing the new options. The title of the report states: "Virtual Goods in Video Games: A Business Model with Prospects." [39].

Figure: Virtual additional content: Segmentation as by PWC: "Types of virtual additional content" [39]

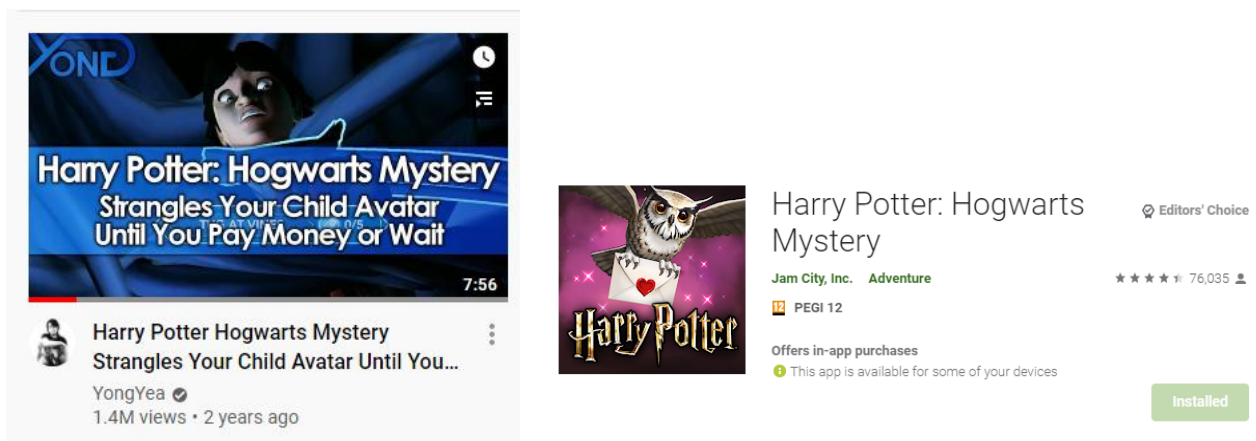


The above visual impression demonstrates the interplay between the business model intentions on the one hand, and the player's experience on the other hand. In other words: the monetization scheme starts to shape the gaming experience via **manipulation** of the player's experience by adding ads, or the need for virtual goods,

in-game items that are outside of the intended game experience, e.g., for example by providing the option to purchase hats irrelevant for game play.

The carrot and the stick: Both reward and punishment are used: non-game relevant frustrations are first introduced for the player (e.g. advertisement) and then taken away if the player engages in small monetary transactions. Game-content, temporary game-advantages, visual/cosmetic goods (skins, clothing) and communicative virtual goods (emotes, dances) are sold as plus-items, even though some of those items would be a natural part of earlier games.

The frustration trend would grow over the course of the years after 2012, resulting in some mobile games that increasingly extremely and continuously frustrate players into buying the ingame currency. Take for example, the aptly named Youtube video: "Harry Potter Hogwarts Mystery Strangles Your Child Avatar Until You Pay Money or Wait". This mobile game, **rated for 12 years and older**, fairly continuously frustrates the player into waiting extreme amounts of time OR purchasing microtransactions.



- Source: YongYea - Harry Potter Hogwarts Mystery Strangles Your Child Avatar Until You Pay Money or Wait. <https://www.youtube.com/watch?v=umUD1rwUaH4>

1.3 A massive shift in game revenue streams

Income streams among large video game publishers are dominantly derived from new business models. Investigating publisher financial statements of the last 10 years we find that the source of revenue has dramatically changed. Taking *Electronic Arts* as an example, the 2010 annual report has minimal mention of add-on content or live services. Income was dominated by box sales and physical shops, with digital sales emerging [40]. In 2012 and onwards, the tone notably shifted, indicating a rapid growth in live-service revenue. For sake of reference, the net revenue for 2012 was 4.143 million.

*For example, we offer our consumers additional services and/or additional content available through online services to further enhance the gaming experience and extend the time that consumers play our games after their initial purchase. Our social and casual games offer free-to-play and micro-transaction models. We also offer subscription-based products, such as our MMO role-playing game Star Wars: The Old Republic. The revenues we derive from these services has become increasingly more significant year-over-year. **Our service revenue represented 13 percent, 8 percent, and 6 percent of total net revenue in fiscal year 2012, 2011, and 2010, respectively.***

- 2012 Annual Report - EA [41]

The 2020 annual report represents an almost complete restructuring of the business model: live services and content sales are now the dominant focus and growth area.

- *Live Services Business. We offer our players high-quality experiences designed to provide value to players and to extend and enhance gameplay. These live services include extra content, subscription offerings and other revenue generated outside of the sale of our base games. Our net revenue attributable to digital live services for console and PC was \$2,813 million, \$2,216 million and \$2,083 million during fiscal years 2020, 2019 and 2018, respectively, and we expect that live services net revenue will continue to be material to our business.*
- *Net revenue attributable to extra content, which includes extra content within **digital live services for console and PC as well as extra content within our mobile business was \$2,763 million, \$2,309 million and \$2,033 million during fiscal years 2020, 2019 and 2018, respectively.** Extra content net revenue has increased as players engage with our games and services over longer periods of time, and purchase additional content designed to provide value to players and extend and enhance gameplay. Our most popular live service is the extra content purchased for the Ultimate Team mode associated with our sports franchises. Ultimate Team allows players to collect current and former professional players in order to build and compete as a personalized team. Net revenue from extra content sales for Ultimate Team was \$1,491 million, \$1,369 million and \$1,180 million during fiscal years 2020, 2019 and 2018, respectively, a substantial portion of which was derived from FIFA Ultimate Team.*

- 2020 Annual Report - EA [42]

Translating this information into percentages, we can derive that in the past ten years, service revenue has increased to over 50% of the total revenue [42], with approximately a quarter of 2020 revenue being derived from a hotly debated loot box microtransaction system in FIFA. The suggested age for FIFA is 3+ (PEGI 3).

In absolute terms, the service revenue increased to ten times its original volume (an increase of \$2593.73 million in service revenue between 2020 and 2010 [41]). In this time, the company revenue has increased by approximately \$1883 million, indicating most, if not all of the growth in revenue is driven by these new services.

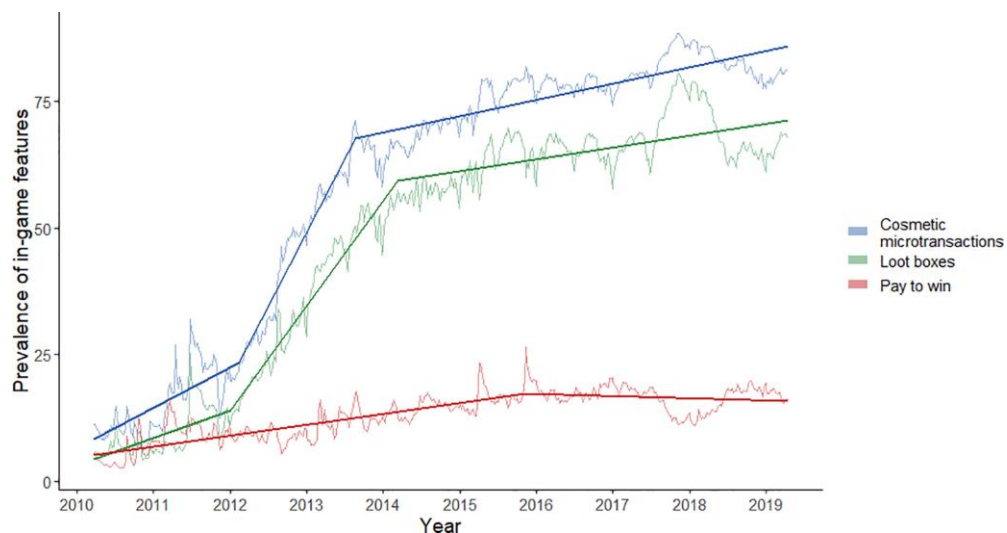
<i>(in millions, \$)</i>	2020	2019	2018	[...]	2012	2011	2010
Service rev. in %	50.80%	44.77%	40.45%		13.00%	8.00%	6.00%
Service revenue	2813	2216	2083		538,59	287,12	219,24
Total net revenue	5537	4950	5150		4143	3589	3654
Fifa Ultimate team revenue	1491	1369	1180				
Ultimate team (%)	26.93%	27.66%	22.91%				

Obviously EA does not represent the entire industry, but it is a major party, and this case clearly illustrates the centrality of evolving monetization practices.

Data from the PC market confirms the widespread nature of the service model as well. Both in small and larger games, **new monetization models, such as microtransactions** are increasingly being employed in recent years. An analysis by Zendle et al. [43] on the open data provided by Steam illustrates the growth of some of these approaches in the PC gaming market:

Results of exploratory joinpoint analyses suggested that cosmetic microtransactions and loot boxes experienced rapid growth during 2012–2014, leading to high levels of exposure by April 2019: 71.2% of the sample played games with loot boxes at this point, and 85.89% played games with cosmetic microtransactions. By contrast, pay to win microtransactions did not appear to experience similar growth in desktop games during the period, rising gradually to an exposure rate of 17.3% by November 2015, at which point growth decelerated significantly ($p < 0.001$) to the point where it was not significantly different from zero ($p = 0.32$)

- Zendle et al. (2020) [43]



Source: Zendle et al. (2020) [43]

Nonetheless, it is still very much possible to be successful using a single initial purchase moment model or a hybrid business model:

For example, the 2016 game *Stardew Valley* achieved global success and was essentially developed by one person. It is sold via a one time single purchase with a fairly low price point. Updates are provided for free [44]. In 2016, it surpassed larger games such as *Call of Duty* in direct sales revenue [45], in spite of a lower price point.

Another small game that suddenly achieved global recognition is the 2018 game *Among Us*. This game combines various monetization models: on mobile phones it is free to play, but supported by advertisements. It also offers microtransaction purchases of cosmetic and funny enhancements for your character, ranging from 1 to 3 Euros per item. On digital distribution channels, advertisements are removed and the game requests a single purchase (low price point), while in-game purchases are also provided for the optional cosmetic microtransaction enhancement. The game is a massive success, with over 100 million downloads on the Google Play store.

1.4 Young people's vulnerability and need for protection

The brain evolves throughout adolescence and into early adult life. The impulsiveness and risk-taking evident in many adolescents, coupled with the relatively late development of critical faculties, has a neurochemical substrate.[...] This makes the young person uniquely vulnerable to the blandishments of marketing in all its forms.

- Babor et al. [46]

Young people are of special interest due to their vulnerable position. They may lack the experience, and resources to adequately assess misleading, persuasive practices correctly. While knowledge and experience grow during adolescence and early adulthood, this is also a period where sensation seeking - actively seeking out exciting new situations and experiences - is high.

For a while, the dominant narrative portrayed adolescents solely as 'impulsive risk takers' with immature brains, resistant to rational information processing. Critical work from the neuroscience field indicates that, while adolescents can be described as sensation seekers [47,48], they are not mindlessly impulsive and in fact do consider information about potential risks associated with behavior [48]. Sensation seeking, also, is a natural part of moving to adulthood and is not inherently negative. Adolescents and children are not a unified and singular group: in this group, more vulnerable individuals exist with additional needs for protection. This holds true for adults as well, of course.

For purposes of this work, it should be noted that humans in general and consumers in particular often do not act rationally in purchase decisions [49]. But even rational sensation seekers require correct and complete information to make calculated choices. This information is absent or partially absent in the context of new digital monetization strategies: what are the exact odds of getting Ronaldo with specific FIFA card packs? Can an adolescent without statistical training adequately evaluate those odds even with this information? While FIFA now provides some information on pack content for some packs, some ambiguity remains in the information. A FIFA oriented website argues that information that is specifically vague for the 1% or lower chance to achieve top players (best of the best, the ultimate prize), and the exact weighing of individual cards. More subtly, it is unclear to what extent customization in loot boxes outcome is employed on the user level [50].



Screenshot source:

<https://www.game.co.uk/en/fifa-17-ultimate-team-fifa-points-750-1638817>

As described above, the last decade has seen widespread and financially successful experimentation with new business models and forms of video gaming. Sometimes these models are very close to being actual or at least simulated gambling. These models might well manipulate, direct or nudge young people into making in-app purchases or spending a lot of time in a game via social pressure or game-incentive pressure, for example. It is unclear to what extent appropriate legal/responsible-business, or ethics frameworks are guiding these developments.

In other words: if not for public outrage or heavy handed policy intervention, where is the line drawn with behavioral design?

Even if not always applied in practice, some guiding principles **are** available and applicable, such as the child's right to have their best interests protected. From this, a game developer/publisher has the duty to at least protect the child or adolescent - as a vulnerable consumer - from harm and provide an inclusive and fair digital playground. Moreover, a digital game should contribute to the well-being of young people [see section 3.1].

In comparable, but not identical, industries, the situation differs per product group. For instance, for alcohol, tobacco and gambling we have minimum ages. These are clearly regulated areas. Food and advertising (and particularly in this combination) is mostly addressed by industry self-regulation: there is doubt about how effective self-regulation is in this area. For children in particular, we tend to societally opt for a precautionary approach - even when there is no conclusive evidence of harm.

1.5 Towards responsible and ethical behavioral design

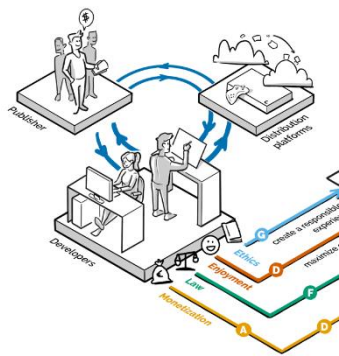
We describe that rapidly developing monetization models result in massive financial gains, while exposing children and vulnerable people to potential harm. We also recognize that some of these monetization methods are increasingly criticized by both gamers themselves and in the wider public debate, as well as in the scientific debate. Meanwhile, the industry as a whole seems fairly reactive in terms of ethical frameworks, self-regulation and responsible business standards.

This also holds true for the **positive** side of **behavioral design**: the behavioral impact that games have might also be leveraged to achieve intended or unintended social, mental or physical health gains. For instance, consider the Pokemon Go mobile app, which drove large groups of people to leave the house and start engaging with the environment [51].

Here we define behavioral design as:

behavioral design: video game design decisions which elicit, either accidentally or purposefully, self-negative or self-beneficial behavior in the gamer.

For now, policy makers have a limited set of tools to discuss and visualize the game design process, the intended or accidental game-user behavior, and the personal, the health, and the societal impact of these decisions.



In the following sections we aim to provide clarity on the central concepts and the areas of obvious tension.

We develop the idea that different design motives now compete within games, even after the moment of sale: **legal** compliance, commercial and **monetization** objectives, providing **enjoyment** for the gamer.

This should be expanded with an **ethical-responsible** motive as well, which seeks to protect and even strengthen the consumer's physical, social, mental, and financial health.

Whether it is considered a duty of care towards gamers, or simply responsible business behavior to retain reputation and contribute to society, this motive requires additional attention.

Ultimately, we aim to contribute concrete ways in which stakeholders can move forward with the topic of positive and negative behavioral design in video games.

Section 2. Game, gamer, gaming

Following Björk [52], we divide the topic of behavioral design in video games into three main areas: the **game**, i.e., process of creating a video game, including design considerations and business models and the resulting dynamic artefact; the **gamer**, i.e., individuals who engage in game-play, and **gaming**, i.e., the activity of playing video games with consideration of cognitive, affective, and behavioral implications. This is the middle ground where the designer's intentions and the gamer's actual experiences meet.

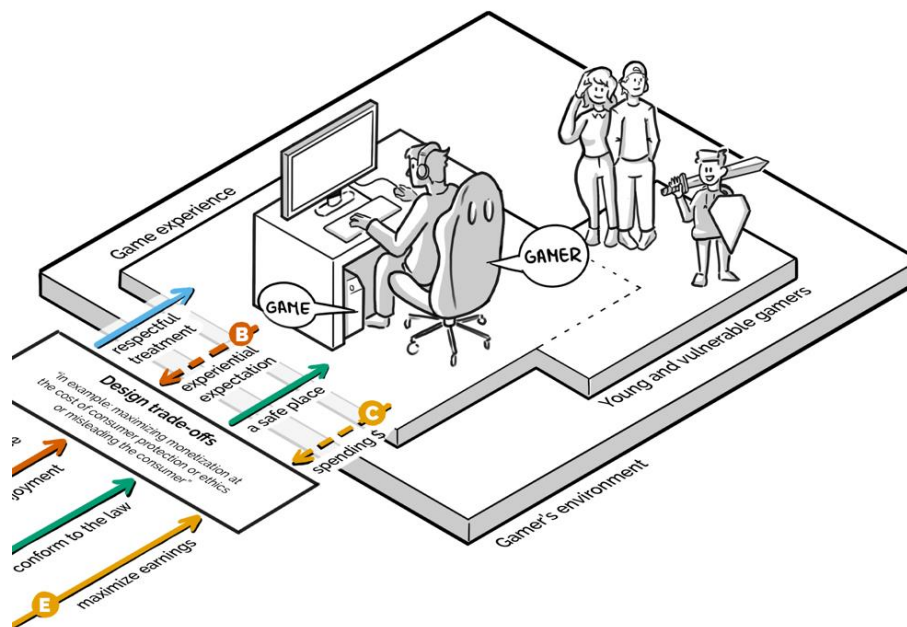


Figure copyright maintained at <https://osf.io/x9vhs/>

2.1 The game: game development

Similar to other entertainment products like music, or movies, videogames are produced by global operating studios, financed by publishers, with large teams that can go up to thousands of people. The company size matters for the likelihood of success—i.e., big studios are mostly dominating the gaming market with large products, such as *Grand Theft Auto 5*, that small developers could never replicate. However, the risks of a large-scale endeavour are also considerable, and some big games are dead on arrival, which means the industry remains risky, even for massive projects.

Games may also be produced by independent developers operating on small budgets with almost no staff (the so-called “indie studios”). While publishers have better access to marketing channels and distribution channels, digital distribution channels allow single developers to have a massive impact on the uptake and usage of video games. Minecraft, for example, was developed and marketed by a single individual from 2009 onwards, before being picked up by Microsoft for \$ 2.5 billion to increase reach even further [53] and to create a long-lasting product and valuable intellectual property (IP).

In early 2021 the game *Valheim*, developed by a five person team, achieved a top 5 position in the charts with almost 500.000 concurrent players active in the game [54].

Thus, the nature of gaming is such that products developed by small teams or even individuals can still be successful, even without the costly investments into audiovisual embellishment of bigger games. Digital distribution surely helps here, as individual developers at least have a chance to participate in markets such as *Steam* and the App stores (*Google/Apple*). This is different than before, when software distribution had larger initial costs, via the pressing of CD's, designing and printing product boxing, marketing the game, et cetera. Of course, even in digital distribution it may take considerable effort to get noticed, so small developers regularly opt to sign with publishers at considerable cost to increase their chances of getting noticed. This might be the rational choice given the increase in the volume of game-releases. On the Steam platform alone, 10.263 games were released in 2020, which averages out to approximately 28 games per day [55].

In most Devolver [the publisher] deals, 60-70 percent of revenue goes to the developer. (This, of course, is after the percentage taken by Steam [ed: @30%] and other storefronts.)
 - Why do indie developers sign with publishers [56]

2.2 The gamer: harms and benefits, motivation, and behaviour

Games are played by toddlers and seniors and everyone in between. A recent review commissioned by NDP for the International Game Developers Association indicates that in the US, 67% of the population plays video games. Depending on their lifestyle and phase in life, gaming behavior adjusts to the context. Some players invest large amounts of time into play, others play in short bursts during commutes. Gamers are almost as diverse as the population and there is not a single style of playing.



- NPD report, as an impression of the diversity of video game players [57]

In this sense, the outdated and stereotypical view of exclusively young-nerdy-male gamers is incorrect, and has been so for a while.

However, studies regularly indicate that (on average) younger, male players tend to play games more intensively than girls do. For example, a factsheet using the 2015 European

ESPAD study data indicated that gaming boys (average age 15) spend approximately 21 hours on gaming, while girls averaged around 10 hours of playing [58]. These findings are replicated in the 2019 data, with the broader and more recent European data also indicating that boys spend as much time on gaming [59].

2.3 Harms and benefits associated with gaming

Harms associated with video games and sedentary media in general

Survey studies in school settings fairly consistently find a small percentage of highly engaged gamers that report **issues** with their gaming behavior. In our own research on nationally representative Dutch datasets [58], we found that approximately 4% of students and 7% of boys reported five or more problems with their gaming behavior (average age: 14). Problems include arguments within the family, obsessively focusing on the gaming or trying to decrease game time, but failing to do so. This group also scores higher on a range of other negative health indicators of mental, social and physical wellbeing. Cause and effect cannot be assigned here due to the nature of the data, but it can be hypothesized that this is a vulnerable sub-group with multiple issues.

In contrast: we find a much larger group of 'hobby-gamers' (36%), who play games regularly but demonstrate no issues with mental, social or physical well-being. In fact, they are more healthy - they smoke and they drink less. This group is about sixteen times larger than the risky group. So, for the majority of gamers, gaming is a normal and healthy part of their routine.

While details vary per study, the finding that a small percentage of children and adolescents are heavily engaged in gaming AND experience issues with functioning is replicated in many studies, including European [59] and worldwide reports [60]. Actual **clinical** gaming disorder or "game addiction" that requires professional treatment is thought to be a fairly rare phenomenon.

Experiencing some problems with gaming behavior (e.g. disruption of sleep, arguments of parents, wanting to reduce gaming but failing to do so, spending too much money on it, etc.) can be viewed as a harmful outcome (**harm**) of gaming behavior, but it does not always escalate into a clinical problem. In fact students who report these issues regularly recover from them later in time [61,62]. That said - these problems are real, escalate for some, and stimulating healthy and balanced game use is important.

Moving beyond addiction, the activity of engaging in **sedentary** gaming behavior has an impact on physical, social and mental health. This is not inherently problematic or even abnormal: reading a book, indoors, in a comfortable chair also has an impact on your health. It can, however, become problematic if the gaming product elicits unhealthy behavior by design.

This ties in with another key point, which is well understood for other entertainment media such as gambling products. A large customer base also involves **vulnerable individuals**. The product audience might involve people with intellectual disabilities, lower cognitive abilities, early adults, people with mental disorders or broadly speaking, people who are simply extremely impulsive or sensitive to reward schemes offered in

games. These vulnerable or younger consumers, who are present in the gamer community, deserve protection from the provider of games: **a duty of care** should be considered in the wide sense of the word.

Benefits of playing video games

Remaining sedentary all day, with limited physical activity, is often considered to be unhealthy [63]. Thus, from a purely physiological standpoint, physical therapists might understandably be opposed to any type of extended sedentary screen based behavior with an eye on physical health. And indeed, purely physiologically speaking, people seem to have a somewhat sedentary lifestyle these days, especially during the COVID pandemic [64].

But, reality is complicated and people engage in digital activities for good reasons and for non-physiological benefits: for instance, it might be their job to work behind a desk and a computer screen. Or they might simply enjoy 'unwinding' after a stressful day with some shooting action in *Call of Duty*. Or they might be connecting to their friends in a Fortnite match. Or they might be creating beautiful buildings in *Minecraft*, expressing themselves creatively. The take-home message here is that mental health and social health might well benefit from screen time behavior and it should be weighed against any potential negative effects on physical health. In short: benefits are associated with gaming.

Besides potentially negative consequences, playing games has also been argued [65] and demonstrated to have positive effects for cognitive [66,67], social behaviour [68], motor skills [69], and physical activity [70]. Next to demonstrable positive effects, video games have positive social implications and facilitate beneficial social learning.

Nintendo Wii and Switch, Microsoft's Kinect, and Sony's Move, all brought physically active gameplay into the living room. So called "exergames" have shown positive effects on physical activity [71,72], cognitive benefits of physical activity [73], are used for deliberate High Intensity Interval Training [74], and have shown positive effects when used by the elderly [75].



Video games have shown to teach 21st century skills, as communication (e.g., team-based coordination in League of Legends), collaboration (e.g., working together to beat a boss in World of Warcraft), creativity and innovation (e.g., when building worlds in Minecraft), critical thinking and problem-solving (e.g., puzzle solving in The Witness or moral decision-making in the Walking Dead). Games are also an entry point to learn about Information and Communication Technology (ICT) [76] by requiring players to learn to connect their devices, about hardware differences, and signal processing characteristics such as latency.

Video games are played across societies, for example in multinational eSports teams. They also create awareness for other cultures, e.g., through the celebration of Chinese New Year in League of Legends. While racism and sexism are issues within the games industry, and gaming community, publishers engage in actions towards societal change by using their large developer and player base to address topics such as racism and sexism (e.g., IGDA Advocacy [77] or Riot's Social Impact Fund [78]).

Multiplayer games require players to play together, which often leads to the formation of teams or clans. In League of Legends, for example, casual teams and professional teams of 3-5 people who regularly play together are very common. In World of Warcraft, larger groups come together to play, forming entire clans with sometimes hundreds of players and strict leadership roles. These social structures teach players a number of skills relevant for team work [79], such as accountability towards other team mates, taking leadership roles, e.g., setting times, selecting players for certain tasks, and taking on responsibilities such as collecting certain items or taking on the design of a clan website.

For some players, video games have shown to contribute to their emotional resilience [80,81] or play a positive role in their well-being [82,83]. The data extracted from video games has also been argued to provide added benefits for monitoring health relevant markers [84] and shown to be a predictor for mild cognitive impairment [85]. Like books or movies, video games can also tell impactful narratives and engage individuals in meaningful interactions around emotional themes such as cancer [86].

2.4 Motivations from play and gamer expectations

Why do gamers play games? [Box B]

[Box B]. Why do gamers play games?

- **Affiliation:** contact
- **Achievement:** challenge
- **Power:** leading
- **Autonomy:** freedom

At first glance, we might assume that gamers play games simply 'to have fun' or to 'enjoy themselves'. Research into gaming motivations, however, indicate more subtle motives for play that explain intrinsic drivers to engage in gaming. In this more detailed approach to the question of 'why' gamers play games, two main approaches are distinguished.

Reason to play video games

De Grove, among others, presents reasons to play fairly concrete and descriptive: people play to experience a **narrative**, people play to 'escape' daily life, for social reasons, people play to pass the time, etc. The authors distinguish eight motivations in total (*habit, moral self-reaction, agency, narrative, escapism, pastime, performance, and social*) [87].

Underlying psychological drivers for play

Recent work in psychology provides a more basic and summarizing approach to player motives as well. Gamer engagement in play behavior has been tied to explicit (cognitive, defined by reasoning) and implicit (affective, defined by mood or attitude) preferences [88]. Applied to games, this approach, *Motive Disposition Theory*, suggests that **affiliation** — connecting to other players; **power** — influencing others; **performance** — mastering challenges; and **autonomy** — having control over one's actions, are central to our engagement with play. For example, we play games because we seek contact, or because we seek challenges. In this, of course, we assume that gaming is not the person's job, in which case **extrinsic** motivators such as money also come into play.

Motive Disposition Theory highlights that we seek out play to either approach a positive experience or to avoid a negative one, e.g., playing to experience influence or to avoid feeling powerless. Both orientations—approach of positive experiences and avoidance of negative experiences—result in different considerations for business models and business models might purposefully frustrate these aims to obtain player behavior.

Social subscription-based models, for example, leverage that players seek social contact (**affiliation**), but might prevent players from engaging with other people in the game unless they buy the subscription. Here the business model makes use of the player's social needs and prevents access to force a purchase decision.

Pay-to-win models are not always effective as business models, because even if players experience engagement in **achievement** related behaviour (e.g., slaying a difficult boss) as positive, they are experiencing need-frustration when achievements are invalidated by giving players easy access to the same achievement through payment. In this case, business would likely be lost, because players experience the business model as unfair.

Free-to-play models provide access to the game, so they are not frustrating affiliation motives. However, the skin, dance, and emote ecosphere of Fortnite, for example, leverages the fear of feeling alone and feelings of insecurity (insecure about the self, ashamed), by providing easy access to shared items (being part of the same experience) via the battle pass and individual items to visually empower and distinguish an avatar through the shop (compensating for insecurities).

Both the positive and negative approaches to the main motives are described below, and the main motives are summarized in box B.

Table X: Motives for play

	Sourcing: Motive disposition theory (gaming motivation) [88]. Text is literally used from the original paper.
Affiliation: seeking contact	The affiliation motive is the desire to form meaningful and satisfying relationships or not be rejected and alone. <i>Both approach and avoidance can serve as strong motivators for behaviour. For the affiliation motive, hope for closeness (approach) entails liking and enjoying intimacy or spending time with others, [...]</i>
Affiliation: don't want to be alone	<i>[...] whereas fear of rejection (avoidance) is the wish to be not alone.</i>
Achievement: seeking challenge	The achievement motive is a preference for activities that increase an individual's performance. <i>For the achievement motive, hope for success (approach) entails the enjoyment of a challenge,</i>
Achievement: fear of failure	<i>whereas fear of failure (avoidance) focuses on not doing badly.</i>
Power: leading and helping	The power motive is the need to impress, control and influence others, and to receive recognition for doing so. <i>For the power motive, hope of power (approach) entails finding pleasure in helping, leading, or influencing others, [...]</i>
Power: fear of being powerless	<i>[...] whereas fear of weakness (avoidance) focuses on having a higher status than others or having power over them in order to avoid being dominated or powerless.</i>
Autonomy: pride and self-worth	A fourth motive – the autonomy motive – was recently identified and described as the need for self-preservation by establishing and protecting boundaries between the self and others through self-integration, self-expansion, and self-protection. It describes the need to have control over oneself rather than allowing others to do so. For the autonomy motive, hope of self-integration (approach) is associated with feelings of pride, self-worth, and enjoyment of self-experiences, [...].
Autonomy: avoid feeling insecurity (fear of self-devaluation)	<i>[...] whereas fear of self-devaluation (avoidance) is the wish to avoid feeling insecure about the self, ashamed, and unworthy.</i>

Purchase motivations within games? [Box C]

[Box C]. Why do gamers carry out in-game purchases?

- Unobstructed play
- Social interaction reasons
- Competition
- Economical rationale
- Indulging the children
- Purchasing content

Hamari and his colleagues have written extensively about the actual motivations that gamers have for purchasing premium content in otherwise free-to-play or 'freemium' games [89], as well as motives to purchase virtual goods in general [90,91].

*The findings of the present study highlight the peculiarity of the freemium business model: increasing perceived value of the freemium service (i.e. enjoyment) may both add to and retract from future profitability via **increased retention** on one hand, **reduced monetization** on the other.*

- Hamari (2020) [89]

Their findings illustrate the trade-offs between different designer motives that are now being made within gaming products, and how they translate into consumer behavior. A freemium product (such as Fortnite) wishes to provide enjoyment to all players, otherwise they will leave the game. But the better the free experience is, the less likely people are to engage in in-game purchasing. On the other hand, a larger volume of players, even with low conversion to payment, might still provide a net income for the designer. Players might well start playing and paying because their friends are also playing the game, and liking it.

In another study, the concrete purchase motivations for purchasing online content were gathered from Finnish gamers [91]. The authors group the motivations into five main categories for purchasing via: *Unobstructed play, Social interaction, Competition, Economical rationale, Indulging the children*. We illustrate those categories below using the authors original, literal descriptions, derived from their Table 1 (p. 540).

Unobstructed play: motivations for purchase:

- **Speeding timers.** "Many games set artificial timers as to how long it takes to, for example, build a building into the player's village. Many players wish to make this process quicker."
- **Avoiding repetition.** "Many games have been criticized for repetitive content. Since designing repetitive content is less costly and requires less innovation it is commonly used. "Grinding" repetitive content can, however, be boring for the players, and therefore, players may be enticed to use real money in order to take a shortcut."
- **Reaching completion.** "Completing different tasks and levels etc. in a game can be too difficult or time consuming. Therefore, some players might be willing to pay for skipping parts of the game."
- **Continuing play.** "Many free-to-play game designs prevent players from continuing the game sessions unless they use real money."

- **Protecting achievements.** "Item/achievement degradation is a prominent game design pattern in free-to-play games where players' earned achievement or items may degrade or be threatened if they are not protected."

Social interaction: motivations for purchase

- **Playing with friends.** "Some free-to-play games require players to use real money in order to add more friends in-game, or employ highly desired features that must be purchased if one wants to play with their friends."
- **Personalization.** "One prominent value proposition of a lot of in-game content is that it affords players to differentiate themselves from other players by personalizing their avatar or other belonging in-game."
- **Giving gifts.** "Free-to-play games sell gifts that can be given to other players."
- **Avoiding spam.** "Many free-to-play games have provided the possibility for players to earn in-game currency or goods by sending messages to friends. Spamming friends in this manner, however, is generally frowned upon. Therefore, some players [would] rather pay up than spam their friends."
- **Participating in a special event.** "Game companies attempt to come up with novel events and content in the game to keep it fresh. This has also been one way for game companies to introduce new purchasable content. Moreover, special events are often perceived as unique one off events, which may induce perceived rarity and, therefore, fear of missing out."

Competition: motivations for purchase

- **Becoming the best.** "Many in-game items boost the performance of players thus giving them an advantage over other players."
- **Showing off achievements.** "Players unlock, earn and win many notable signifiers of achievements in games (such as trophies, badges and other virtual goods). However, being able to display all this gaming capital has been also harnessed as a revenue source."
- **Showing off to friends.** "Social representativeness and showing off have been observed to be a major reason for in-game content purchases."

Economical rationale: motivations for purchase

- **Reasonable pricing.** "Players may be enticed to purchase in-game content if they perceive the deals to be cheap."
- **Supporting a good game.** "Players might be enticed to spend money on in-game content to support the company running the game and thus ensuring the game's continuance."
- **Special offer.** "Players may be enticed to purchase in-game content if they perceive the deals to be cheap. This may especially be the case if there are special offers of limited quantity or for a limited amount of time."
- **Investing in a hobby.** "The gaming activity can be considered as a hobby similar to any other free-time activity. Players may be motivated to invest financially in their hobby in addition to investing time."

Two motivations are not specifically categorized, namely:

- **Unlocking content.** "One major form of in-game content is simply more content to play such as maps and levels"
- **Indulging the children.** "Games are played with young children, or given to older children to be played, both in order to entertain them and to buy free time for the parents. To support those goals, parents may sometimes need to make purchases. The children have their own motivations for gaining the content, but the parents control the money."

In summary: these motivations for purchase illustrate the economic reality that is unfolding via new approaches to game monetization and their success: players are inclined to purchase within games for both **positive** reasons (supporting a good game, helping out their friends, etc.), and **negative** ones (avoiding time wasters, avoiding spam, etc.).

The gamers originally seek out the game to be with friends, to feel powerful or in control, but end up being confronted with a series of frustrations/manipulations - or a very positive experience.

Game designers are at the steering wheel of this incentive mixing process. The next section will describe some of the techniques that are used to influence players from the design side and their inherent risks to be abusive, 'dark' or predatory in nature.

2.5 The design of games to influence gamer behavior

Behavioral design patterns in games [Box D]

[Box D]: Behavioral design patterns

- Positive behavioral design patterns
- Temporal dark patterns
- Monetary dark patterns
- Social capital-based dark patterns
- Psychological dark patterns

People interact with many digital products, not just video games. Digital interfaces on websites and mobile apps are designed to guide users, direct their attention, and enable overall a good user experience when using a product. While the majority of interfaces are designed to support users in achieving their activities, e.g., shopping online, engaging with social media, or playing games—user interfaces can be manipulated to coerce, steer, and deceive users.

Investigating shopping websites, Mathur et al. [92], identified asymmetric, covert, deceptive, and restrictive interface design, and interfaces that intentionally hide information. For example:

- **Asymmetric interfaces** create friction to interact with one element, e.g., leaving the store, while creating other elements to be easy to use, e.g., buying a product.
- **Covert interfaces** using decoy options, e.g., an overly expensive item, to make other options more appealing.
- **Deceptive interfaces** use misleading or false statements to guide user decisions, e.g., apparently limited stock of widely available items.
- **Restrictive interfaces** force users to make choices beneficial for the webshop provider, e.g., limit sign-ups to social media accounts for additional information about the user.
- **Hidden information** refers, for example, to hidden charges on products (that might only show up in the last phase before paying).

These types of “*Dark patterns*” commonly exploit cognitive biases and the user’s inherent trust in presented information to increase the likelihood of customer behaviour advantages for the webshop owner.

Historically, the box-sales model of gaming allowed game designers to primarily focus on game enjoyment: they sold the game once, followed by the user having fun and enjoying the game. Ultimately, the game ended, and the user bought another game.

Current business models (see **Box A**) require that designers pursue multiple goals simultaneously in their live product environments (online games). These games act as live service that juggle multiple goals: they **monetize** via microtransactions, subscriptions, or temporary pre-commitment, they should be **enjoyable** to attract and **retain customers**, even those ‘free-to-play’ customers that provide volume for the game’s community, and **regular new content** or regular events are required to keep the game fresh and interesting. Tensions can arise between these goals.

Advertisement and/or user-data driven business models require additional direct triggers to increase ad views and clicks (e.g. *obtain x coins for watching this advertisement, skip this or that timer for watching an ad*), or opportunities for product placement.

This juggling of motives by the game designer is connected to the fact that the entertainment product, the game, has started to exert pressure on the users behavior, and even attempts to design this behavior. The game might become frustratingly slow for a while, in order to elicit a purchase. Or showcase the ‘awesome’ new things that can be bought for only ‘x’ dollars. This increase in pressure from the entertainment product, at least in its interactive sophistication and subtlety, is somewhat new games and interactive media.

Even without financial pressure from the developer’s monetization intention, social multiplayer games have been known to exert **behavioral pressure on the gamer**, e.g. because your regularly playing group depends on your presence, or your competitive team is counting on you.

When behavioral design becomes hidden or predatory, the term *dark pattern* comes into play. Similar to dark patterns in webshops, video games can utilize **manipulative interface design** to increase the spending likelihood of players. Video games add new dimensions to designing dark patterns, because of their interactive, social, and dynamic nature of gameplay.

Zagal et al. [93] highlight that creator and player interests might be misaligned in some cases, for example, when focusing on financial gain vs. enjoyment. They [93] define dark patterns as design patterns “*intentionally used by a game creator to cause negative experiences for players and against their best interest.*”. The website <https://www.darkpattern.games/> contains examples of dark patterns for different games and adds psychological dark patterns as the fourth category.

Design approaches implementing dark patterns are often built around friction in game play and resulting frustration of the player to increase the likelihood of spending money on the game, e.g., pay to skip a difficult section of the game.

- **Temporal dark patterns** focus on luring the player into extensive time investments, for example, by requiring time investment for success, by manipulating expectation about required investments, or by creating scenarios where invested time is not adequately compensated for in experience. Examples of temporal dark patterns are the performance of a repetitive and tedious task (*grinding*) or predefining times where players need to engage with a game to be successful (*playing by appointment*), e.g. 'temporary events'.
- **Monetary dark patterns** use deception or covert options, but also friction created in game-play, e.g. to overcome an intentionally very difficult designed section. Examples of monetary dark patterns is the steady reduction of players abilities until payment is received (*pay to skip*), the sale of incomplete content, and charging extra for existing content that should normally have been included in the sale, while the actual content is actually already available and even exists on the disc or download that is already purchased (*pre-delivered content*), or the enabling to win competition through financial investments (*monetized rivalries, pay to win*).
- **Social capital-based dark patterns** evolve around the assumption that players want to protect their social standing and relations in a game. Threatening social relationships by design will then force players to pay. Examples of social capital-based dark patterns are games that require players to invite friends to the game to advance (*social pyramid scheme*), or use information about a player's social circle to impersonate a friend simulating in-game social interactions (*impersonation*).
- **Psychological dark patterns** are psychological 'tricks' that get you to make decisions against your own best interest. They are not inherently bad, but are considered 'dark' when used to elicit unhealthy behavior. Examples mentioned are: getting the gamer to 'complete a collection' of something to keep them engaged, set up achievements/badges that are unhealthy in their requirements (excessive grinding or waiting), or use your existing time or money investment to keep you in the game (don't quit or you will lose all of this) - or vice versa, pay if you want to keep this. While not fully 'dark', paid character customization in World of Warcraft might be an example here.
- **Positive behavioral design patterns**. Finally, positive behavioral design is also possible. This can include 'neutral design', such as the absence of pushy marketing notifications, build in frustration and calls to action in a game that is otherwise financed by 'microtransactions' (e.g. the mobile game Polytopia, which has a store but does not push for its use). It can also be that the game is reasonably playable and somewhat sympathetic in its business model without extreme grinds and purchasing, but if you want to indulge yourself with cosmetic purchases and 'nice to haves', you can (e.g. League of Legends). Expanding this, we can consider a truly positive design that helps the user with their mental-social-physical or financial health in the long run. This can include, for instance: forcing healthy breaks in play via game design, or encouraging positive player-to-player interactions and positive behavior via game design.

These descriptions indicate the main delivery methods of behavioral design that encourage the player to either consider their own health (consciously or unconsciously), or push the player towards a state in which purchasing content becomes the natural option. The designers play with **time, money, social relationships**, or even basic **psychological** urges. Of course, some of the same principles could and can be used for **positive** outcomes and a positive contribution to the players health and wellbeing.

Behavioral change techniques [Box E]

Box E: Basic behavioral change methods

- Reinforcement and punishment
- Nudging and facilitating
- Social techniques & modeling
- Complex feedback systems
- Guided practice
- Early/public commitment & goals
- Tailoring and individualization
- Forced 'snap' decisions
- Using imagery to relay value
- Anticipated regret
- Conditioning and cue altering

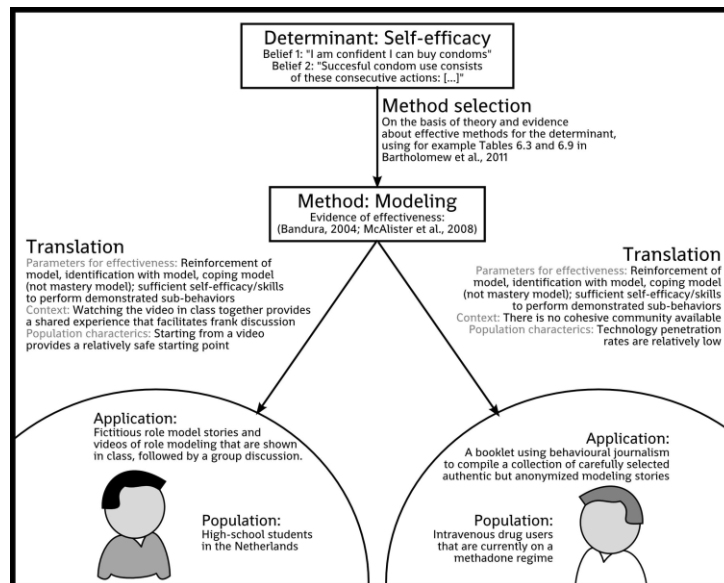
Both dark patterns and attempts to positively impact the player's wellbeing design the gamer's behavior. In order to do so, *behavioral change techniques* are used.

While predicting and manipulating human behavior is not an exact science, there is an academic field that specializes in structured attempts to change human behavior. This is situated in the context of formalized attempts to develop health promotion programs in such a way that they actually elicit demonstrable behavioral outcomes. One such example is the '*intervention mapping*' approach [16].

When first considered, behavioral outcomes usually are broad conceptualizations: Stop smoking. Don't drink and drive. Exercise aerobically thirty minutes per day. Eat less than 30 percent of calories from fat. These injunctions do not have sufficient detail on which to base an intervention. Therefore, we use performance objectives to clarify the exact performance expected from someone affected by the intervention.

- **Subdividing the expected outcomes** [16]

This approach emphasizes that our intuitive understanding of behavioral change is often incorrect when you analyse the actual determinants of and precursors to behavioral change. A structured approach is necessary to achieve results. For example, we might assume that informing adolescents that AIDS is scary and therefore condom use is logical, but a more detailed analysis of the situation might reveal that the actual bottleneck is physical availability of condoms, or their free availability in a private location. Or the fact that these adolescents have no functional understanding of proper usage. When any of these issues are unrecognized and not addressed by the program, results would suffer.



Source of figure: *A Practical Guide to Effective Behavior Change: How to Identify What to Change in the First Place* [94].

Behavior change techniques operate under certain conditions and are not universally effective. It goes beyond the scope of the current work to fully analyse each behavioral change instance employed in games and the marketing surrounding games and assess their effectiveness. That said, it can be illustrative to summarize the main, popular behavioral change methods and consider how they are relevant in the gaming context. To summarize these methods, we condense the excellent overview provided by Kok et al. [95]. The paper provides 15 tables with methods, of which at least 8 seem relevant for the gaming context, so some reduction is warranted for use in the current context. The most relevant techniques are now illustrated, with gaming illustrations added²:

A. Reinforcement and punishment

- **Reinforcement** ties in with feedback to some extent, but has a more specific aim: to encourage the target behavior to repeat. It's centrally relevant in games, e.g. through quest design, level design, etc. It becomes relevant but more complicated in preferred player behavior (e.g. rewarding non-toxic behavior in certain online game cultures).
- **Punishment:** The reverse of reward. Very relevant in games, and very relevant in design choices. E.g. crops that wither if you don't return to the game in time, etc. Requirement: Punishment needs to be tailored to the individual, group, or organization, to follow the behavior in time, and to be seen as a consequence of the behavior. Punishment should be avoided because of negative side effects. If used, emphasis should be on positive reinforcement.

B. Nudging and facilitating

- **Nudging** is the manipulation of the context of the decision to make certain choices easier than others. Nudging is very relevant within games, but especially relevant in purchase decisions, and stimulating purchasing behavior. **Facilitation** of the required behavior via the environment is crucial for any intended behavior, within games as well. The digital and non-digital environment should stimulate the intended behavior. E.g. if the game does not have a pause function or breaks, the user will not be able to take breaks. Examples: Battle Pass - visualisation of missed alternatives. One click purchase, automated facilitation of

² **Note** that the input for the following techniques is derived literally from Kok et al, they were reduced by the current authors, and supplemented with gaming examples.

healthy or unhealthy choice [introduced breaks, auto queue]. Positively used: make the default choice the healthy choice.

C. Social techniques: Modeling, Provide opportunities for social comparison and information about others' approval

- **Modeling** is very relevant within games and ties in with the social layer within games and in the meta-game (e.g. fora, Youtube). Ideally realistic (coping) model is used, e.g. a perceived peer is more effective than a celebrity. Think about influencers that open loot boxes to show how cool results can be (example behavior) here, but also the use of role models within the game, or highlighting e-sport champions and their lifestyle / gear choice.
- **Provide opportunities for social comparison:** Facilitating observation of non-expert others in order to evaluate one's own opinions and performance abilities. **Other approval:** Providing information about what others think about the person's behavior and whether others will approve or disapprove of any proposed behavior change. Examples: Fortnite showing people with purchased gear before embarking on the mission, Influencers on Youtube opening packs, etc., Stimulation of the streamer ecosystem, Game review systems, streamers pushing certain products/choices/purchases

D. Complex feedback systems: Set graded tasks, Self-monitoring of behavior, Enactive mastery experiences, Contingent rewards

- **Set graded tasks:** Setting easy tasks and increasing difficulty until target behavior is performed. Self monitoring of behavior: Prompting the person to keep a record of specified behavior(s).
- **Enactive mastery experiences:** Providing increasingly challenging tasks with feedback to serve as indicators of capability.
- **Provide contingent rewards:** Additional rewards on the way to and besides the primary reward. Praising, encouraging, or providing material rewards that are explicitly linked to the achievement of specified behaviors. Gamer example: progressing in the battle pass will provide rewards before reaching the ultimate reward (final 'unlocked' price).

E. Guided practice

- Prompting individuals to rehearse and repeat the behavior various times, discuss the experience, and provide feedback. Gaming example: Grand Theft Auto online introduction takes the player to the game store and allows for an initial free purchase of clothing to learn how the shop works.

F. Early commitment, public commitment, and goal setting

- Early commitment. Having people choose a (larger) delayed reward far in advance. Public commitment. Stimulating pledging, promising or engaging oneself to perform the healthful behavior, and announcing that decision to others. Goal setting. Prompting planning what the person will do, including a definition of goal-directed behaviors that result in the target behavior. *Example: purchasing a battle pass commits the player to continuous play to achieve the end goal.*

G. Tailoring and individualization

- **Tailoring** the message / intervention to available characteristics of the gamer. This can be done via behavior, or the determinants of behavior. Better and more tailored measures are expected to create behavioral change more easily. **Individualization** is very relevant in the context of game design. In a more simple setting, e.g. a teaching environment, this would be equivalent to a single tutor being more effective as opposed to a larger lecture. In games, the feedback is often inherent, especially in single-player games. Sub-mechanisms and design choices can be evaluated for individualization. Examples: Personal offers in in-game stores, personalization of loot box content (possible), personal outcomes for randomized purchases, etc.

H. Active learning - elaborate thinking, arguments or the exact opposite: lack of elaboration, quick and automated decision making (snap decisions)

- **Attentive, active learning (with full and deep attention)**, as opposed to **peripheral, quick decision / learning responses**. People actively evaluate arguments in this approach and are less easily misled. Arguments in favor of the change are more convincing when the intended behavior leads to a desirable, likely outcome, when the outcome is causally logical, when the arguments match their current worldview, when they perceive the arguments as important, and when the arguments are surprising or new.
- **Elaboration**. Stimulating the learner to add meaning to the information that is processed. This requires individuals with high motivation and high cognitive ability; messages that are personally relevant, surprising, repeated, self-pacing, not distracting, easily understandable, and include direct instructions; messages that are not too discrepant and cause anticipation of interaction. The opposite of active learning is snap decision making, where existing bias and automated habits play a role.

I. Using imagery to relay new concepts and value to established concepts

- Using familiar **artifacts or concepts** that have a similar appearance to some new subject. Familiar physical or verbal images as analogies to a less familiar process. Application to games: e.g. visualisations of gold or mountains of cash when introducing a digital currency indicates its value

J. Anticipated regret

- Stimulating people to focus on their feelings of **regret** after behavior, before any losses actually materialize. *In example: Timed content, you don't want to miss this offer, seasonal content, limited time offers.*

K. Conditioning and providing cues for behavior, Classical conditioning, Repeated exposure, Cue altering [using cues/triggers]

- **Providing cues**. Assuring that the same cues are present at the time of learning and the time of retrieval. Within the gaming context, this might mean: using the same imagery and audiovisual signal within the game in the reminder to play (mobile game).
- **Conditioning**. Stimulating the learning of an association between an unconditioned stimulus (UCS) and a conditioned stimulus (CS). Playing the game skillfully might result in an earned reward.

The previous list indicates the wide variety of concrete options that exist to influence gamer behavior on the designer side (techniques), as well as the potential abuse of those techniques in 'dark' patterns or the use in positive patterns that contribute to the gamer's long term wellbeing.

2.6 Gaming: Gamer meets game design

Summarizing the previous descriptions, table x indicates the two main parties in the gaming experience and some of their main considerations, specifically with regards to the monetization of games. Some case examples will be presented to illustrate some of the tensions that are created by these choices.

While not intended as a purely linear experience, the framework can be used to illustrate the journey from player expectations to design.

Table x: Gamer motivations, purchase intentions and design choices in games

Gamer motives	Gamer purchase intent	Design patterns	Behavioral change techniques
<ul style="list-style-type: none"> • Affiliation: contact • Achievement: challenge • Power: leading • Autonomy: freedom 	<ul style="list-style-type: none"> • Unobstructed play • Social interaction reasons • Competition • Economical rationale • Indulging the children • Purchasing content 	<ul style="list-style-type: none"> • Positive behavioral design patterns • Temporal dark patterns • Monetary dark patterns • Social capital-based dark patterns • Psychological dark patterns 	<ul style="list-style-type: none"> • Reinforcement and punishment • Nudging and facilitating • Social techniques & modeling • Complex feedback systems • Guided practice • Early/public commitment & goals • Tailoring and individualization • Forced 'snap' decisions • Using imagery to relay value • Anticipated regret • Conditioning and cue altering

Some popular games are now evaluated via this framework. The analysis is not intended to be a comprehensive analysis of chosen games and their full design, but it serves to illustrate the actual presence and relevance of their main behavioral design patterns and the elicited player behavior.

Case examples: Fortnite, Clash of Clans and League of Legends

Case example 1: Fortnite (Battle Royale)

Fortnite, the popular free-to-play battle royale shooter game that players against up to 99 hostile players, allows players to purchase a **battle pass** every season, e.g., new iteration of the game. The battle pass costs about \$9.50 and is paid through Fortnite's in-game currency "V-Bucks". The battle pass is the only way to get access to only temporarily available equipment and characters, some of them, like the Christmas Tree skin (Chapter 2).

In terms of gaming motives, Fortnite allows players to feel **powerful** and presents **achievement** opportunities (either winning the game, or achieving smaller milestones in play). Players might also play for **social** reasons: their friends play. The wide open map gives a large degree of **freedom** in play.

Once committed to this "FREE TO PLAY!" game, Fortnite attempts to lock in the players interest and generate a regular playing habit via a structured ladder of incentives, both temporary goals (quests) and commitment to the battle pass system.

Temporal patterns in Fortnite

Included in the battle pass are a total of 1500 "FREE!" V-bucks, which players can earn when playing the game—effectively providing players with the chances to earn back the costs of the battle pass and additional V-bucks to purchase a small item, e.g., a dance emote or gear such as a glider or a harvest weapon. In essence, **'grind'** the entire battle-pass to regain their investment of V-bucks. If they do not do so within the limited time of the season, they lose out on their investment. This creates pressure to keep playing, even if other priorities appear in life (an exam period, or social commitments). Some of the techniques visible here are: *commitment, anticipated regret, punishment*.

Psychological patterns in Fortnite:

Even if you play for free, you claim rewards from the free tier of the battle pass system. This free tier serves to showcase to players what they lose out on without the premium battle pass. It also serves to allow players to practice the process of using the premium reward system. Both experience gain incentives and the unlocking of additional gaming goal incentives both stimulate buying the premium battle pass as soon as possible. But if you don't - you can always catch up later and get all of the accumulated goods all at once. Players can see the items available for premium customers and decide to purchase all items left on the table at any time. The interface language "PURCHASE" directly elicits the players to engage in a financial transaction. If you don't purchase before the season ends, you might lose the accumulated rewards permanently. Cool items are also showcased by other players in-game (in the pre-game staging area) or outside of the game (in the hands of popular streamers), *modeling* the intended behavior. In order to remedy this, 'battle pass tiers' can be directly purchased to catch up, capitalizing on the fear of missing out after 'almost' getting there via regular play. Some of the techniques that are visible here are: *nudging, guided practice, commitment & goal setting, anticipated regret*.



Source: Fortnite, Epic Games, in-game shop via <https://assets.primagames.com/media/files/fortnite-s5-drift-tier-1.png/PRIMA/resize/618x0>

Imagery to relay value with casino-like token systems in Fortnite:

V-bucks are illustrated using 'coins' and use the 'bucks' terminology to signal value. In addition, currency conversion from regular currency (e.g., Euro) to in-game currency (e.g., V-bucks) is commonly performed for a fixed amount, e.g., 1000 V-bucks can be purchased for 7.99EUR. Item pricing and the amount of in-game currency that players can purchase is rarely aligned, leaving players with extra currency that either stays unspent or can be used to save up for the next purchase. Techniques used: Using *imagery to relay value*, and encouraging *snap decisions* as opposed to deeper thinking (due to intentionally cognitively taxing currency conversion rates).



Monetary patterns in Fortnite

The majority of items that are directly purchasable in the Fortnite shop are only available in a rotating pattern—they are available for one day, disappear and then reappear after a while. This strategy highlights specific items, while creating purchase pressure and taps into the players fear-of-missing out. The shop indicates how long the items will be available. The shop states clearly that there are no competitive advantages through items, but players still sometimes see advantage in certain items, e.g., skins that make you less visible or distract, like the regularly appearing toy trooper who blends in better into green landscapes and appears on average every 38 days [96]. Here, artificial scarcity is combined with *anticipated regret*.



Source: Fortnite, Epic Games, in-game shop via <https://blogs-images.forbes.com/erikkain/files/2019/01/marsh-1.jpg>

Positive design patterns in Fortnite

Fortnite is a session based game, in which natural breaks in play occur after play. With the exception of group play (when the group leader can select 'ready'), players should not automatically join a new game. This technique *facilitates* a break-in-play in which the user can decide to either quit playing, go outside for a bit, et cetera. This does not seem to be a conscious choice on the designers part to elicit healthy outcomes in this particular case, but more negative implementations (automatically joining new matches with a countdown system unless the user manually aborts - such as Netflix does) can be imagined.

Case example 2: Clash of Clans

Clash of Clans is a mobile strategy game that asks players to create their own village, compete against the computer and other players, and join groups of people, i.e., clans. Units and structures in the game are paid with different virtual currencies, i.e., gold, elixir, and dark elixir. Building units takes varying degrees of time—building a soldier takes only a couple of minutes, while upgrading town hall, the central structure of a village, can take multiple days (18 days on the highest level).



Source: Clash of Clans, gameplay via https://media.pocketgamer.com/artwork/nabg/clash_of_clans1.png

Monetary and temporal patterns in Clash of Clans

Currency to train troops can be produced through dedicated structures, e.g., a gold mine to produce gold, or directly bought in the in-game store. Building time can be shortened using the premium currency "dark elixir", which is available for purchase or is sometimes gifted to the player when they achieve certain milestones in the game, e.g., building their town hall to a new level. Troops used in battle are produced in camps and limited by the level of the camp. Depending on their level and infrastructure, players can produce a variety of units that have different properties in battle. But the number of building operations, e.g., building a new camp for troops or upgrading the town hall, depends on the number of available builders. Builders are units with the special ability to create buildings. Builders can only be bought using the premium currency "dark elixir".

While Clash of Clans can be played without paying for in-game currency, the process substantially slows down over time. At the beginning progress is fast, e.g., 20s to build the first town hall, but requires patience, deliberate savings, and planned investments on higher levels, e.g., 18 days building time for the town hall on level 13. Players can speed up development substantially and simply buy their way out by paying for the remaining development time with the premium currency. In short, direct payment can be used to short circuit the waiting times and gain in-game power 'here and now'. Either way, the player pays: via 'grinding' or via payment.

Following Zagal et al., Clash of Clans thus implements a temporal pattern which can be overcome through payment. Some of the specific techniques that are visible are: slowly *nudging* the player into payment with increasing frustration and even *punishment*. *Early on, the player experiences the joy of building completion and in-game advancement with a series of easy goals (conditioning, guided practice)*. The goalpost is then moved further and further into the direction of either payment or enormous waiting times. In a sense, Clash of Clans is not *pay-to win* (which would create angry customers and potentially

blow up the fan base), but *soft* pay-to-win: it is possible to compete as a non-paying customer, but it would require extreme dedication to do so.

Temporal patterns & reinforcement-punishment in Clash of Clans.

The game is persistent, in the sense that your village can still be attacked by other players when you are not present. While you will not lose everything, you will lose resources. This can be negated with buying or earning 'shields', which guard your base for a period of time (e.g. 4 hours, 8 hours, etc.). This creates a win-win situation for the game designer: the player has to keep coming back to play the game at regular intervals, to either refresh their shield or check their defensive situation in-game - this creates a playing habit (*avoid punishment*). They even get rewards by playing daily as well (*reinforcement*), via daily assignments. And gamers that opt out of this habit or wish to reduce it have to start paying for longer shields, and become paying customers. If the player takes a one week vacation from the game they need the most expensive shield. Either way, the game has created a gamer behavioral commitment that directly impacts their day to day choices.



Mixed offerings in the Clash of Games in-game store, with direct purchase incentive for the most expensive packages (3x value!)

- Via <https://i.imgur.com/kodTO23.jpg>

Temporal patterns in Clash of Clans: Notifications

Another less obvious implication of the temporal pattern implemented in Clash of Clans are the notifications used to inform players about their progress. Notifications can be switched off, but to play effectively players need to utilize their builders, which requires them to assign builders ideally the moment they are done. Hence, switching off notifications has a direct impact on play performance.

Notifications are sent out frequently: everytime a building is completed players are notified that the building is available, or when an army is complete players are notified that their troops are ready for battle. Notifications to engage with the game are sent out depending on the speed of building buildings, but especially when starting out to play the frequency is very low with a couple of minutes for building simple structures. Completing troops is always fairly fast, resulting in at least one notification per hour.

Constant notifications can distract the gamer from other activities and break their concentration. They serve as a *cue* to restart the gaming, and are regularly accompanied by recognizable sounds and images from the game, as well as a direct call to action (earn this *reward* - or act quickly to avoid getting this *punishment*). While they serve the game designer quite well, in developing the players gaming habit, they take away the spontaneity of playing that existed before and still exists for some games - you played whenever you felt like it, and if you skipped a year, no harm was done to your gaming progress.



Clash of Clans notifications screenshot
Via: <https://i.redd.it/wqggc45fo6621.jpg>

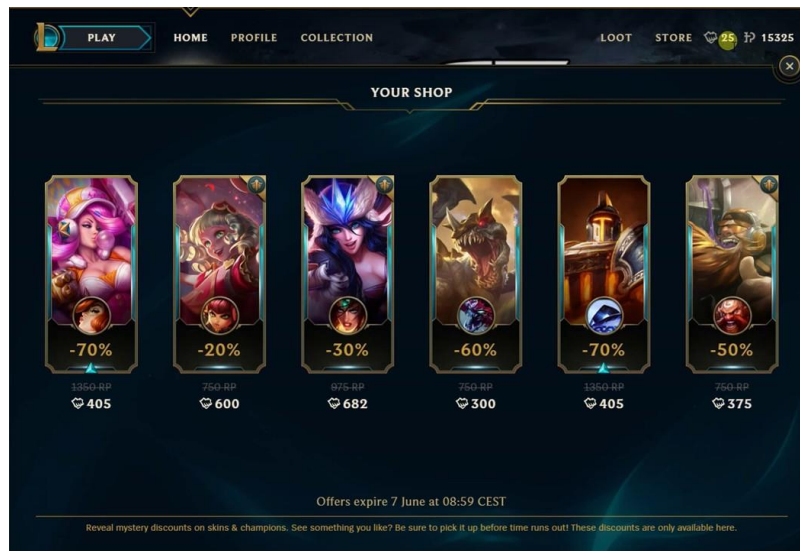
Case example 3: League of Legends

League of Legends is a free-to-play Mass Online Battle Arena (MOBA) game that is on the forefront of current eSports. While League of Legends features several modes, the core game pits two teams of 5 players each against each other to destroy the base of the other players. The game environment is always the same, but players can choose champions with different abilities. Different champion matchups and varying abilities of players lead to ever changing game dynamics that lead to uncertain outcomes even on the highest performance levels.

Monetary patterns: Skin Sales and temporary availability

League of Legends monetizes on microtransactions, primarily on champion and skin sales. Players can earn the game's internal currency through play or pay for "Riot Points" (RP). 1380 RP cost 10 EUR. Skins cost between 520 RP (~4 EUR) up to 1820 RP (~14 EUR), with a special tier of skins for 3250 RP (~25 EUR). Users have various other ways to (slowly and much more randomly) collect skins and champions over time, via *essences* and conversion of shards that can be transformed into the actual item.

Besides the full price direct sales and this *grinding* mechanism, a temporary shop (see also: *Fortnite*) offers sales on certain skins, which are only purchasable using the premium currency. This creates urgency, leveraging *quick decisions* and *anticipated regret*. A good deal also provides an incentive to purchase the premium currency (Riot Points or RP).



League of legends: shop with temporary offers.

Via: <https://www.youtube.com/watch?v=aZz0N4VidSE> (user: the punisher)

Monetary patterns: loot boxes and mystery packages

League of Legends features loot boxes, although the prices (skins, champions) are account bound and cannot be traded outside of the game, unlike some other games out there (e.g. Fifa).

For instance, the game featured "Mystery Skins" for premium currency (RP) for a while, which are slightly cheaper than the cheapest skin. Players always receive a skin, but the tier of the skin varies and can be drawn from all cost points described above. While the item is luck based, it's neither the only mechanism to get hands on an item nor has it particularly high risk/reward trade-offs. All skins are also available for a higher price in the shop [97].

"According to Riot's post, the relative value of a skin does not determine the rate of drop, meaning a legendary-tier skin (the most expensive) is just as likely to drop as a common skin. There are around 800 skins available that can drop from the crates, meaning that there's roughly a one in eight (0.125%) chance of getting any given skin in any given chest. Skins that are exclusive to the system, such as Hextech Annie, are an exception, with a one in 2,500 chance to drop."

Secondly, users can either play extensively or purchase 'chests' and 'keys' directly that unlock champions and other rewards [98]. To some degree, the odds are public information, with cases of extreme rarity existing (e.g. opening 2500 boxes to get a specific skin). The whole system is fairly complicated, with users exchanging tokens for other tokens and again for other tokens. This leaves users fairly confused about the actual value of their tokens. This results in a fairly complete disconnecting between the game tokens and any euro/dollar value spent on it.

The game is not pay-to-win, but pay for convenience (and an early access boost to new content / new champions). It could likely also not become pay to win, as this would disrupt the player ecosystem and competitive nature of the game (it's an esports).

Positive behavioral design in League of Legends

League of Legends has ongoing issues with player to player bullying and toxicity and various attempts have been made to address this, fairly publically, via game design. The game League of Legends, for example, openly experimented with nudging and persuasive messaging to reduce toxic behaviour, for instance, allowing players to 'honor' another player with good behavior, and providing in-game incentives for multiple matches with sportsmanship and lack of bullying (honor system) [99].

Riot Games has also publicly engaged with external stakeholders to provide help with (acute) mental health issues and abuse for gamers playing League of Legends. A collaboration exists with a 24x7 crisis chatline [100] and a mental health outreach organisation [101].

2.7 Digital balance: mental, social, physical and financial health

"Health is a state of complete physical, mental and social well-being"

– World Health Organisation

It is clear from the preceding chapters that game designers are eliciting user behavior with their game design. This is not inherently problematic in all cases, but recent years have indicated that the quest for monetization by increasingly larger and shareholder driven organisations has resulted in some excesses in which existing laws and regulations are pushed to their breaking point, or at least, responsible game design is not always reasonably present. Meanwhile, parents, caregivers, and gamers themselves are somewhat unaware of the real-time experiments that are being run on their behavior.

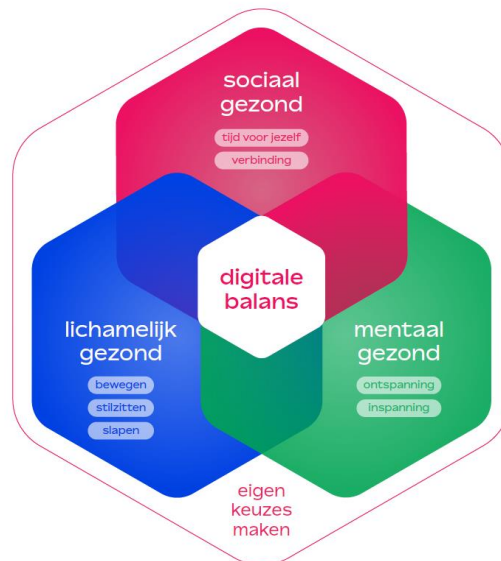
On the positive side, some designers **DO** opt for responsible and ethical design spontaneously and out of concern for their customers wellbeing - such as *Warframe* removing a monetization tactic that elicited extreme spending [102]. The question presents itself if this decision should be left fully up to the personal choice of parties with a vested financial interest in doing the opposite.

Some ways forward, in terms of both policy and research, are discussed in the closing chapter, but it can be helpful to illustrate what we would consider to be the components of a good '**digital**' balance. Recent work by Trimbos-institute and Netwerk Mediawijsheid provides a model [64,103] to discuss the health context of media behavior more holistically by describing the implicit trade-offs that are made when selecting activities.

This **digital balance model** departs from a time-use perspective: the activities we spend our time on are the activities that ultimately impact health. It covers three domains: physical health, mental health and social health.

- Regarding *physical health*, a person is either **sleeping, sedentary** or **physically active**. WHO supported standards describe the recommended minimum levels of both sleep [104] and physical activity [63,105]. Sedentary behavior is considered to be detrimental to health, especially in excess and for children.

- Regarding *social health*, it is thought that people need time for **connection** and relationships, but also need **time to reflect** and time for themselves.
- Regarding *mental health*, the model describes the value of both **relaxation** (doing nothing at all), experiencing a narrative, but also the value of **performance** and focus: creating something, performing well and being competent.



The digital balance model, Trimbos-institute & Netwerk Mediawijsheid [64].

The consequences of time-disruption and activity displacement

For purposes of the current work, the model is relevant to broadly illustrate the consequences of leisure time displacement.

High quality survey population studies find minimal or small effects of moderate game use on the overall mental health, while extreme patterns of game use (3-4 hours a day) are indicated with diminished mental well-being [106]. The model indicates one potential reason for this finding: mental well-being is not just narrowly connected to gaming or mobile phone use but related to the entire pattern of time use and the selection of activities.

For instance, if schools have a sedentary, screen based program and the child's dominant leisure time activity is sedentary gaming, the 24 hours per day might not be enough to also incorporate recommended physical outdoor activity. Even though the sedentary gaming behavior might very well be contributing to **mental health** (relaxation, achievement) and social health (connection) with others, negative **physical consequences** will likely flow from this pattern of behavior.

In other words: if a certain video game requires large amounts of time to remain competitive, or requests continuous presence not to drop out of the battle-pass system or not to miss temporary content, this has consequences. From this, it follows that those manipulating the gamer's time should reasonably have some responsibility with regards to preventing extreme outcomes. This is especially relevant in relation to the presence of vulnerable consumers and children within the game.

3. Game design and children's rights

Legal principles in game design [box F]

[Box F]: Guiding legal principles in behavioral design

- Design in the child's best interests
- Ensure child-friendly data protection
- Avoid profiling of children for commercial purposes
- Avoid exploitative game design
- Avoid negative effects on children's development and health
- Ensure due regard for the child's right to play

Gaming is enormously popular among children and young people and can contribute to their well-being and development. At the same time, game design can also have a negative impact on the well-being or development of children. From a children's rights perspective, both sides of the coin - the positive and negative aspects - are relevant. This chapter addresses relevant children's rights in relation to gaming and game design given that children besides avid gamers are also seen as more vulnerable because of their lack of experience or capacity to adequately assess misleading, persuasive practices correctly (see also section 1.4.). We discuss successively designing games in the child's best interests, the impact of game design on children's health and game design in relation to the child's right to play, protecting children from exploitative game design, game design and data protection.

3.1. Designing games in the child's best interests

In all activities with an impact on children, the best interests of the child must be a primary consideration (Article 3 CRC). The principle aims to contribute to the full and effective guarantee of children's fundamental rights. It is a threefold concept with as its elements a substantive right (i.e., an enforceable right), an interpretative principle and a procedural principle [107]. The best interests of the child do not stand alone but must be considered in the light of all the relevant rights of the child in a concrete situation.

When gaming companies create a game that is also played by children, the best interest of the child principle should be considered. In relation to gaming, particularly, children's rights to leisure and play (Article 31 CRC), association (Article 15 CRC), privacy (Article 16 CRC) and health (Article 24 CRC) may be implicated. These rights must be interpreted in accordance with the best interests of the child principle. In the broadest sense, the best interests of the child means that activities that have an impact on children must ensure the child's well-being and development [107]. It is therefore not enough merely to prevent harm or negative consequences to children, although in gaming, the focus is often on the potentially harmful effects. The best interests of the child also include providing children with a meaningful and fun online experience that can make an important contribution to their development. Here, games can also contribute in a positive way. Children should also not be excluded or deprived of a gaming

experience just because their interests and rights require special attention in the design and development of games.

Moreover, a balance must be struck between childrens' protection rights and their participation rights, such as their rights to development, freedom of expression and freedom of information. Ideally, games contribute to the child's well-being, participation and development, while preventing harm. An example where that does not go entirely well is Pokemon Go, which encourages players to exercise more but also brings players to physical locations at, for example, late hours, where they are a potential target for theft and assault. Additionally, what is good for the wellbeing of some age groups is not necessarily good for other age groups. This is related to the evolving capacities of children (Article 5 CRC); the impact that games can have on children depends, among other things, on the development of children. For this reason, tools such as content classification (e.g. PEGI), privacy-friendly age verification and, in the case of young children, safety tools to be used by parents are also worth considering. In any case, it is important to keep in mind that, whenever a game is played by children, game design is inextricably linked to the best interests of the child through the content and contacts they may encounter, the functionalities of the game that direct their behaviour, and the terms and conditions that impact their rights. Moreover, these factors can be interlinked by the underlying and evolving business models of games as addressed in previous chapters.

The best interest of the child must therefore be a constant consideration during the design of games, from the moment the idea is first conceived and throughout the life cycle of a game when it is further developed by engineers and used by the players. That way e.g. unintended or even undesirable uses or consequences with respect to children can be dealt with when games are further developed. In this context, it is also relevant that research into the impact of gaming and game design is in development and may provide new insights that can lead to the adaptation of game design if it is not in the best interest of children or even harmful to them. In addition, with respect to children it is advised to apply the better safe than sorry approach (precautionary principle), which means that even if there is insufficient hard evidence, it is better not to choose a particular design if it may have a negative impact.

Design can be understood broadly and includes terms of use, community guidelines etc. Age and maturity of children (or, in other words, their evolving capacities) need to be taken into account in making choices in the design of games. The best interests principle is also inextricably linked to the right of children to be heard (Article 12 CRC) [107] because in order to find out what their interests, expectations and wishes are you have to know their views on gaming and game design. Therefore, game designers should involve children in the design of games and learn from both their positive and negative gaming experiences. As far as we know, game studios engage in experience testing after development but with a few exceptions, there is no direct participation of children in the design of games. One reason may be that game studios are concerned about their IP rights, and obviously it also requires special expertise to co-design with children making it a challenge that would rather be avoided or simply forgotten.

In connection with the best interests of the child, it is relevant that children are considered vulnerable consumers because of their age, evolving capacities (Article 5 CRC), or credulity can make them particularly susceptible to particular commercial

practices. Their capacities in, e.g., recognizing and understanding online advertising and commercial content, will vary greatly from one child to the next depending on age and maturity [108]. Due to emerging business models and especially the enormous economic importance of in-game monetisation, the significance of protecting gaming children as (vulnerable) consumers has become much more relevant. When assessing the (un)fairness of commercial practices the impact on children will, pursuant to unfair commercial practices law, be assessed from the perspective of the average member of the group of children in question. In the case of a game developed for children or teenagers, the average child of the relevant age group will be the benchmark. Extra protection for children is needed when games are specifically aimed at children. This is certainly the case when it is reasonably foreseeable that a game is likely to appeal to children, e.g. through its content, style and/or presentation [109]. A significant determinative factor is whether children are known to play the game, or if the game is marketed to children. The use of cartoon-like graphics, bright colours, simplistic gameplay and/or language could be an indication that a game is likely to appeal to children [110].

Similarly, children are seen as vulnerable data subjects when it comes to the processing of their personal data. It is generally accepted that children are less able to assess the risks and consequences of data processing and less aware of safeguards and rights that can help protect their personal data [111], where children deserve more protection. This extra protection always applies when a game is not restricted to players aged 18 and over and there is no evidence that children are not playing it anyway.

3.2. Game design and the right to play

Children have not only protection rights but also participation and provision rights. One of their rights that falls into the latter categories and is directly related to gaming is their right to play. It is a participation right to give children the freedom and, above all, free time to play and develop. It is a provision right because there must be sufficient facilities that contribute to optimal development through play. In the offline world, we think mainly of the availability of playgrounds and other public spaces or nature where children can play undisturbed. In a world mediated by digital technologies, play has obviously taken on new forms, including gaming. At the same time, hybrid forms are emerging where children use, for example, stories or characters from games in their offline play.

Besides play, this right provides children with a right to leisure appropriate to their age and the right to participate in cultural activities and the arts (article 31 CRC). The right contributes to the optimal mental, social, cognitive and physical development of children, another children's right (Article 6 CRC), and is thus inextricably linked also with the best interest of the child principle discussed in the previous section.

The importance of play cannot be underestimated as the following quote from the Children's Rights Committee illustrates:

"Play and recreation are essential to the health and well-being of children and promote the development of creativity, imagination, self-confidence, self-efficacy, as well as physical, social, cognitive and emotional strength and skills. They contribute to all

aspects of learning; they are a form of participation in everyday life and are of intrinsic value to the child, purely in terms of the enjoyment and pleasure they afford. Research evidence highlights that playing is also central to children's spontaneous drive for development, and that it performs a significant role in the development of the brain, particularly in the early years. Play and recreation facilitate children's capacities to negotiate, regain emotional balance, resolve conflicts and make decisions. Through their involvement in play and recreation, children learn by doing; they explore and experience the world around them; experiment with new ideas, roles and experiences and in so doing, learn to understand and construct their social position within the world." (at p. 4) [107]].

Play and recreation have a number of characteristics: it is free, self-determined time in which the child has control over the course of the activities and is driven by intrinsic motivation [107]. In other words, play is generally understood to be non-scripted play. In the case of gaming, one can think of Minecraft or Terraria where (unless, for example, private servers with timed events are involved) creativity can be given free rein while playing. It is also recognised that getting enough rest from activities and adequate sleep are an important part of the right to play and leisure. This is in contrast to design features that constantly disturb players with notifications or push them to keep playing in order to be competitive.

Moreover, gaming can also be seen as an adult-organised form of recreation that can contribute to the development of children as long as participation is voluntary [107]. Games qualify as such if there is little or no freedom to shape the gaming experience (so-called scripted play). The question is to what extent there can be voluntary play if the design of games contributes to (or at least does not protect against) obsessive gaming or at the least has sticky features that make it difficult to get away from the game. Here, in addition to the design, the personality and vulnerability of children or young people play a role. In any case, game design that causes negative experiences against the gamer's best interest through e.g. manipulation defies the autonomy of the gamer to play (and stop playing) freely.

Furthermore, the right also presupposes inclusivity, which means, among other things, that gaming should also be accessible to children with disabilities and that games should steer clear of stereotyping, prejudice and discrimination, and be respectful of gender, ethnicity and, in general, the vulnerability of children [112]. However, the gaming environment is not always inclusive and this is therefore a point of attention and can even be seen as an opportunity when designing games (responsible and inclusive design) [113].

Age-appropriate gaming can contribute to children's development in many ways [107]. Depending on the game, they can learn to cooperate, meet new people, socialize with friends, develop their identities, develop or improve certain skills or practise a foreign language (usually English) [113]. Developing skills include for example improving one's reflexes in fast paced shooters such as CS GO. One study found, e.g., that "Playing action video games—contemporary examples include God of War, Halo, Unreal Tournament, Grand Theft Auto, and Call of Duty—requires rapid processing of sensory information and prompt action, forcing players to make decisions and execute responses at a far greater pace than is typical in everyday life" [114]. Games can also be instructive because they are developed from a cultural, artistic or historical perspective.

Games such as Oregon Trail, We. The Revolution, and Europa Universalis are historically accurate, to a certain degree, and can contribute to a deeper understanding of history. There are also political simulation games such as Democracy 3, which can contribute to a better understanding of real-world political struggles and perspectives. Other games such as Shenzhen I/O and Screeps contribute to learning programming by effectively teaching and requiring knowledge in the programming languages assembly and javascript respectively. A plethora of games also increase a child's artistic capabilities by enabling them to build certain structures, Gaming may therefore support a child's right to education (article 28/29 CRC).

Although the right to play perspective focuses on the ways in which gaming can contribute to children's well-being and development, it also implies that harmful play should be avoided or at least warned against (think of age rating such as PEGI) so that informed decisions can be made. These two sides are also relevant when it comes to the child's right to health.

3.3. Game design and the effects on children's health

The child's right to health (Article 24 CRC) includes many aspects including the importance for the development of children to engage in healthy behaviours [115]. Gaming can contribute to children's development as we have seen previously (see section 2.7). Gaming can train their reflexes and coordination, improve their learning skills, increase their socialisation and teamwork skills. However, game design can also have a detrimental effect on the health and well-being of children. Children and young people may even be more susceptible to the negative effects of some forms of game design because they are still developing. Therefore, from the perspective of the child's best interests, it is essential that these effects are properly assessed and that their specific vulnerabilities are taken into account by avoiding negative effects of game design. More specifically, the right to health includes the prevention of health-related harm. Tools such as the digital balance model from Netwerk Mediawijsheid and Trimbos Institute can, for example, help gamers reflect on their game use in relation to their mental, social and physical health [64,116].

The gaming environment should meet certain conditions that must be applied in line with the evolving capacities of children in order to ensure a healthy development of children. There must be no stress, demands, social exclusion, social harm (e.g. invasion of privacy, hate speech or cyberbullying, all of which may also result in mental harm), mental harm (e.g. sexual abuse or aggression from playing violent games, although, if any exist at all, effects are small, [117]), physical harm (lack of exercise, obesity, poor sleep) or harmful content (e.g. violence) [107]. Again, the game providers will therefore have to take into account the avoidance of harm in any way through design, terms of use and community policing instruments. For adolescents, this may have a different outcome than for younger children. What is harmful for the latter group may not be so for adolescents. The evolving capacities will also have to be taken into account in order to avoid unjustified restrictions of participation rights (including their right to play and their rights to expression (article 13 CRC) and to association (article 15 CRC)).

Specific concerns include the prevention of game design that leads to excessive gaming or even game addiction. Although a direct link cannot be proven, it is noteworthy that

subscription-based gaming was associated with a growth in problematic gaming behaviour and gaming addiction [61]. Spending an inordinate amount of time in a game has a damaging impact on the non-game environment. In any event, it is clear that with the emergence of games with an infinite game duration, the problems of children and young people in their daily functioning have increased. The World Health Organization added gaming disorder to its disease classification models in 2018 although this only applies to a small percentage of gamers (see section 2.3.). Moreover, with respect to some of the issues with gaming, such as excessive use, there are often other underlying social or emotional problems as well [113].

The incorporation of gambling elements into the design of games can also pose health effects. Children and young people are particularly susceptible to gambling because of their still evolving capacities and online gambling may therefore not be offered to children in the Netherlands if licences will be granted to online providers in the course of 2021. Moreover, no advertising activities may be aimed specifically at children, and a clear distinction must be made between games and gambling. Furthermore, licence holders may not offer or advertise gaming when offering gambling services. They are also not allowed to advertise games of chance in services where games are offered. In addition, loot boxes with which prizes with an economic value can be won in games are banned in the Netherlands.

Although we have not focused on marketing as a persuasive strategy to steer behaviour through design specifically, marketing in games can have an impact on children's development and health. This is particularly the case in so-called advergames (games in which the commercial message is completely interwoven with game play and is often no longer recognisable to the gamer) [108,118]. Advergames are particularly notorious for promoting unhealthy food brands [118]. It is generally accepted that advertising can have negative side effects on children in terms of encouraging materialistic values, unhealthy lifestyles and parent-child conflicts [119].

However, the commercial nature of games has an impact on children's rights in a broader sense than advertising and marketing. In the following two sections, we focus on the right to protection against economic exploitation and the right to data protection.

3.4. Protecting children from exploitative game design

Children have the right to be protected from economic exploitation (Article 32 CRC). This right aims to, among others, protect children from being abused by unfair methods of gaining commercial advantage [120]. Such unfair methods may include deception and subliminal manipulation of children [121], as well as other forms of potentially harmful design, i.e. design primarily or exclusively for an economic purpose. Such methods are considered to violate the "human dignity of the child or the harmonious development of the child's personality" [122]. The Committee on the Rights of the Child acknowledges that particularly "[r]eaching adolescence can mean exposure to a range of risks reinforced or exacerbated by the digital environment, including [...] economic exploitation" [123]. While companies can certainly pursue economic goals with their games, children's vulnerabilities should not be exploited for profit.

Economic exploitation of children does not contribute to the child's well-being and healthy development and can even be harmful, economically, socially and emotionally. Given the shift towards in-game monetization models and the huge commercial interests that go with it, economic exploitation of children is increasingly becoming a focus of attention [120,124]. Exploitation of children can take three, intertwined forms: (1) economic exploitation of children's personal data (see also section 3.3.), (2) economic exploitation of children's cognitive development (e.g., manipulating economic choices through marketing and with respect to in-app purchases), and (3) economic exploitation by having children engage in economic activities (think eSports and child influencers) [120,125]. All these forms of economic exploitation are relevant in relation to game design. Economic exploitation in gaming more specifically includes so-called 'dark patterns' which are intentionally misleading interfaces that unwittingly trick users into, for example, spending money or sharing more personal data than they would have done if it had been a conscious choice. Specific examples are hiding the actual economic value in (constantly changing) in-game currencies, online profiling users for optimizing profitable in-game behaviour, and forcing users into in-app purchases to boost their gaming performance. Such behavioral design patterns have more specifically been elaborated in section 2.5. of the report. Esports, as a new form of work which also allows children to earn money, is another development that is starting to receive more notice [125]. Another way for children to make money is Twitch streamer where viewers can make donations while the gamer is playing. Children may also be faced with special requests, for example, to display tempting behaviour [126]. In the latter case, economic exploitation may coincide with sexual exploitation of the child.

The protection against economic exploitation of children is to a certain extent regulated in consumer law and data protection law. Some forms of manipulation are considered unfair commercial practices, when they push consumers, i.e. gamers in our case, to make decisions they would not have taken otherwise. Such practices include business activities, in this case those of a gaming company, that violate the requirements of professional diligence and noticeably impair or are likely to impair the ability of the average consumer to make an informed decision. A distinction is made between misleading commercial practices and aggressive commercial practices. Gameplay and commercial messages that are intertwined and indistinguishable from each other and intended to encourage gamers to pay for access to premium content or features are regarded as misleading commercial practices. Games that suggest that a particular feature is scarcer than it actually is, or that suggest that gamers are somehow inferior if they don't do something that requires a purchase, are examples of aggressive business practices [110].

While some unfair commercial practices are easier to recognise from the outside, design practices to enhance monetization that are "inside" or coded in the game are more complicated to address. Activision's patent, filed in 2015, on a type of monetized matchmaking is a good example [127]. It describes a system that "may match a more expert/marquee player with a junior player to encourage the junior player to make game-related purchases of items possessed/used by the marquee player". This is not a matchmaking system designed to make a game more fun, instead its purpose is solely to increase monetization. A further development of this type of monetized matchmaking is Activision's more recently filed patent. In 2019, a patent was filed for what Activision calls 'skill-based matchmaking' or SBMM [128]. A gamer's personal data, such as their skill level, items used regularly, their frequent locations in game, and their previous in-

game purchases are all used to match players in such a way that they will more easily purchase in-game items. Such a type of matchmaking, designed to encourage microtransactions, might be fair for adult players with disposable income. However, for children that are both more easily influenced by these tactics and have less disposable income, such a type of system might fundamentally alter their gameplay experience and be unfair. It is therefore necessary to take all parties involved into account when determining whether or not a certain practice is fair, as there is no universal standard. In any case, such practices may be considered unfair both under data protection law and unfair commercial practices law and might even be seen as exploitative design in terms of article 32 CRC.

Different business models raise particular legal challenges in relation to economic exploitation and unfair commercial practices more specifically. We will give some legal considerations on the business models mentioned earlier in the report (see section 1.2).

Subscription models, games as a service

The objective of a subscription based business model is to retain customers in order to secure a recurring revenue. Since customer relationships are important to the success of a subscription-based business model, game developers are encouraged to ensure that the game remains attractive for the gamer to continue subscribing. However, the game design should not make it difficult for gamers to end the subscription to the game. Any design that makes it noticeably more difficult for gamers to withdraw from the game may amount to an aggressive business practice [49]. This could be the case when characters or equipment are lost upon termination of the subscription. Also, the loss of access to friend groups and the online social life in the game environment could have a huge impact on gamers, especially teenagers, and deter them from canceling a subscription.

Free-to-play games

Offering an app or game for free while incurring additional costs (e.g., in-app purchases not clearly identified) is considered a misleading commercial practice. Essential information for a consumer's decision to play, download or subscribe to a game (such as the cost) must be provided clearly, transparently and accurately [110]. Before consumers buy or download a game, a provider must inform them about in-game purchases and must clearly indicate which parts of the game are free or not [129]. Misleading claims may not be immediately obvious, but are still unmistakably there when taking a closer look. In Super Mario Run, for example, the first world is "Free-to-play", but to unlock the other worlds you pay € 10,99. It is claimed that when you buy the game, there are no other in-app purchases. However, this only applies to the "World Tour" mode and not to the "Rally Mode". Furthermore, the vanity content is still up for purchase and can only be accessed through "? bonus blocks", buying or gaining coins and through rally tickets (which you must purchase). In addition, while the "number of playable characters" will increase, not all characters are unlocked.

Moreover, "free-to-play" games, in which no monetary payment is required, may be a misleading commercial practice when there is no transparency regarding the actual "cost" of accessing the game. The ban on calling something "free" when it is not, is based on the idea that consumers expect a 'free' claim to be just that, i.e. they get

something without giving money in exchange [109]. However, there is a growing acceptance that personal data has economic value and is the price of entry for digital content and indeed personal data, including consumer preference, are being sold to third parties [109]. When the collection and use of the gamer's data are part of the main monetization strategy of the game, the insufficient provision of information regarding this practice (and basically hiding the commercial intent) is problematic as it does not allow the gamer to take an informed decision on whether to play the game or not. In addition, there is the question of whether the processing of personal data is done lawfully at all. If the provision of a service, i.e. playing a game, is conditional upon consent for the processing of personal data that is not necessary for said provision then consent is not considered to be freely, and therefore lawfully, given (Article 7(3) GDPR). A violation of EU data protection law must be considered when assessing the overall (un)fairness of commercial practices [109]. In the case of children the conditions are in any case stricter both under consumer and data protection law.

Microtransactions

Freemium business models have strong incentives to design a game in a manner which maximises microtransactions. Various techniques are used to increase gamers' engagement and encourage the gamer to spend money on the game. Some examples of techniques used to stimulate purchases and trigger impulse purchases include the use of offers that are valid for a limited time, price personalization, and algorithms that determine the best sales strategy [129]. Techniques used to encourage microtransactions sales that pressure gamers to the point where they are unable to make a well-considered decision are considered to be the exercise of unacceptable pressure (and therefore an aggressive commercial practice) [129]. The use of algorithms to exploit psychological vulnerabilities in groups of players, such as children, to determine whether and when an offer can be made is considered to be an aggressive commercial practice [129]. In addition, it seems problematic to use nudge techniques to exploit subliminal processes, such as cognitive biases (e.g. loss aversion) or associations between certain colours of imagery ("trigger our preference for shiny buttons over grey ones"). Moreover, games that target or appeal to children should not directly encourage children to purchase items in a game. This includes pressuring a child to buy the game directly or asking them to persuade an adult to buy items for them. Examples include "buy now" or "upgrade now". When assessing marketing directed at children, due consideration should be given to the way messages are presented and of the context of those messages [44].

Game design patterns in which gamers are tricked into spending more money than they expected or anticipated occur in various forms [130]. For example, gamers are deliberately and continuously confronted with frustrations and frictions (e.g., extremely long waits) that can be eliminated by small transactions. "Pay to skip" is a pattern where you can progress in a game or take a shortcut in exchange for a payment. A particularly aggressive version of the "pay to skip" pattern occurs when the gamer's ability to play effectively steadily declines until payment is required to progress in a meaningful way [130]. An Android game, *Replica Island*, tracked players' frustration levels. This tracking can be used to make the game more enjoyable, but it can also be used to balance frustration such that the player is more inclined to make a purchase [131]. Not only is the fairness of the commercial practice questionable, but the tracking must also comply with data protection law.

Monetized rivalries or “pay to win” patterns take advantage of the gamers’ competitiveness, encouraging them to spend money they would not otherwise have spent in order to achieve in-game status such as a high place on the leaderboard [130].

In-game currencies

Many games use their own virtual currency. This currency can be earned in some games (usually at a slow pace, by grinding) or purchased with real money. Examples of these currencies include Vbucks in Fortnite, Robux in Roblox and FIFA (FUT) coins in FIFA. Gamers tend to spend virtual money more easily, as the association with real money disappears and players become unaware of the true cost of certain in-game items. For example, in Fortnite, premium currency can be purchased with real money, but the exchange rate must be calculated manually and can only be calculated with the information on the screen where you buy it. This kind of designed ambiguity intended to make it easier for consumers to spend their premium currency, as they might not become aware of its true value. Therefore, since the price of the product is one of the most important features of a product, it should be included in any invitation to purchase. It is not enough to state the price in the currency of the game. Games must also state the cost of the product in euros with each offer [129]. Deliberately hiding the actual price of currency, either by not stating it, or by a design that causes gamers to forget that they are actually using real money, is an omission of essential pre-contractual (price) information and is considered a misleading commercial practice.

Loot boxes

Loot boxes contain one or more virtual items that vary in value or rarity and that gamers can buy or win. Players do not know what is in the loot box until they open it, and usually the rewards are awarded randomly. A player can unlock loot boxes without additional payment by, for example, completing certain in-game tasks. Alternatively, players can purchase loot boxes with real money, or in-game currency. The invitation to purchase a loot box must include not only the cost of the loot box in euros, but also the chance of obtaining a rare item. If players can sell the contents of the loot boxes, gambling law applies. But because the gambling element of loot boxes plays into the player’s vulnerability, games may violate unfair commercial practices law even if the content cannot be traded [129].

In-game advertisements and product placement

Gameplay and commercial messages that are intertwined and indistinguishable from each other, encouraging gamers to make transactions, can be misleading and result in unfair commercial practices. This could be the case when a game uses similar language to describe the exchange of in-game currency for game features and the purchase of in-game currency for real money. Another example is when there is an indistinguishable transition between gameplay and the store and the purchase process is initiated without making it clear that an actual purchase must be made in order to continue with the game [110].

Games in which the commercial message is immersed in the digital game content via brand or product placement, however, are more complex. Unlike traditional forms of advertising, new forms of marketing are becoming increasingly integrated into the game

experience and more personalized [108]. If an advergame is targeted at children without providing information about the commercial nature of the game, this could be considered an omission and thus an unfair commercial practice [108].

Out-of-game revenue models

Economic exploitation of children can also occur both in-game and out-of-game by having children engage in economic activities such as streaming (child influencers) and eSports. However, there are currently no laws that protect children from this form of economic exploitation. The UCPD and the revised Audiovisual Media Services Directive (AVMSD) contain several protections for child-viewers of the video streams or eSports tournaments, “usually focused on identifying the commercial nature of videos or prohibiting direct exhortations to children”, but do not consider the position of the child-influencer [125]. Both influencers and eSports participants invest a lot of time to be successful and can be under a lot of pressure to perform. However, the protection of children from harmful or emotionally demanding work may be limited to employment relations, which is not the case in this new form of work. Despite the potential harmful effects of influencer work and other digital work (like eSports), this form of child work remains unregulated and leaving children largely unprotected but for their parents setting restrictions [125].

The right to protection against economic exploitation is closely intertwined with data protection issues because personal data is an important raw material for data-driven commercial practices, such as targeted advertising, which are also used in games.

3.5. Game design and data protection

Specific protection of children’s personal data

Data protection law does not regulate game design directly but imposes requirements on the underlying data processing operations and the implementation of these requirements may impact game design. In principle, any processing of personal data of citizens in the EU must comply with the General Data Protection Regulation (GDPR). The move towards data-driven revenue models that track gamers' behaviour and use it to identify profitably interesting gamers and for targeted marketing raises data protection issues. In the case of children, EU data protection law is even stricter and it is certainly more difficult to comply with in the case of data-driven business models. Data protection law requires specific safeguards for children because they are considered particularly vulnerable when it comes to the processing of their personal data [132]. In 2021, the UN Children's Rights Committee recognised that the right to privacy of children also includes a right to data protection [133].

To take into account children and the specific protection of their personal data, it is important that game providers know which gamers are children. Self-declaration is the most common method used in games to verify gamers' left time, and it can be circumvented quite easily. For children under a certain age (usually 13 or the applicable age of digital consent), there is an incentive to declare a different, higher age, otherwise they will be excluded from the game [134]. Moreover, high risk data processing, e.g. the processing of personal data for the purpose of profiling and the processing of children’s

personal data, requires high assurance age verification which means that more is required than self-declaration of age [134].

A number of initiatives have been developed to support technology designers and developers in implementing data protection law in an age appropriate way: i.e. the age appropriate design code in the UK [135], Fundamentals for child-oriented approach to data processing (draft) in Ireland [136], and the Code voor kinderrechten in the Netherlands [137].

Lawful grounds

The lawful grounds for personal data processing, i.e. legitimate interest (Artikel 6 (1) (f) GDPR), necessity for the performance of a contract, (Artikel 6 (1) (b) GDPR) and consent (Artikel 6 (1) (a) GDPR) require that a game provider knows with sufficient certainty that they are dealing with children, i.e. persons under 18 and again self-declaration of age may not (always) be the most adequate form of age verification [134]. This is not only relevant from a data protection point of view, but also because in the case of children, stricter rules may exist from other points of view (welfare, health, harmful content and exploitative design etc). Under the GDPR, it is assumed that if a game is not restricted to 18+ and there is no evidence to the contrary that children play the game, the special protection awarded to children must be taken into account [132].

With respect to the lawful ground of legitimate interest in particular the interests and rights of children should be taken into account and, as we saw in section 3.1., the best interest principle states that the interest of the child should be a primary consideration. Note that this is not just about the data protection and privacy rights of gamers but also about other rights and interests. Game companies have the right to make a profit, also in the case of children, but not at the expense of their health or resulting in economic exploitation in which case there are overriding rights and interests to the legitimate interest of the game company. It is generally assumed for example that in the case of children, data-driven marketing (e.g. personalised advertising) cannot be based on this lawful ground [132], and this may be no different in the case of matchmaking for the purposes of game enhancement for profit.

In the case of the lawful ground 'necessary for the execution of a contract', children will have to be capable legally to conclude a contract [132]. The rules for this are laid down in the national law of countries and in the Netherlands children, i.e. persons under 18, cannot conclude a contract without the consent of their parents. If there is no such consent, the contract is voidable, which means that the contract may be annulled. This rule is also relevant outside the realm of data protection law, for example in relation to in-app purchases and micro transactions.

Insofar as data processing takes place on the basis of consent (Artikel 6 (1) (a) GDPR), which comes into play mainly when the other lawful grounds are not appropriate, this processing is only lawful when given by a person that has reached the age of digital consent and depending on their age, this is not the case for most children (Article 8 GDPR) [132]. Children can consent to the processing of personal data from a certain age (16 in the Netherlands, but other EU member states sometimes apply different ages). Therefore data processing is potentially unlawful if the consent is given by children who are too young to do so by law because they can easily circumvent age verification

mechanisms [134]. Moreover, consent is subject to strict conditions that apply regardless of the age of gamers (Article 7 GDPR). Consent must e.g. be informed, which means that gamers must know what data processing they are consenting to. Designed obscurity immediately makes the choice less informed, i.e. the more complex the data processing, the harder it is to explain to the gamer, especially when a child, and the less likely it is that consent is actually informed. Besides the sheer complexity of data processing practices, the data subject is often unable to make an informed decision due to consent overload and information overload [138]. A recent study shows this ineffectiveness of privacy policies and terms of services even further. In an experiment, 74% of participants did not even read or skim privacy policies and 98% of participants were unaware that the data of their first-born child was being monetized [139]. In the case of children, the GDPR explicitly requires that it must be understandable to them (Article 12 GDPR). Also, the consent process itself should not be designed as a dark pattern where the gamer is tricked into giving consent for invasive data processing when creating a game account while the privacy-friendly options are hidden in the settings of the account. All in all, consent is not a lawful basis that can easily apply to data-driven activities of game companies, certainly not with respect to children [134].

Example: Clash of Clans

The terms of service of Clash of Clans, a game by Supercell, are a good example of some of the problems that arise when not observing these conditions. Upon first installing the app, there is only one option: accept the terms of service or don't play the game. Clicking anywhere except on the button that says 'terms of service' automatically and permanently accepts their terms of service and Supercell's privacy policy is incorporated in their terms of service as well. However, there is no way to quickly and simply check what they use your data for, how it is used, or why they use it. Consent is context specific too, Clash of Clans serves a wide variety of gamers. Children, autistic people, and even the elderly might not always fully understand how the game works or what the game does. Moreover, there is no way to easily limit personal advertisements, instead Supercell works with an opt-out system that most users aren't even aware of, which is intentionally hidden from the easy-to-access sections of their menu. All the consent is bundled together in one single button, that does not even require a button press. The opt-out function for personalization is hidden and users cannot opt-out of personalization more generally. Consent is also especially tricky as it may be a requirement in different legal frameworks. Consent to a contract which also includes data processing activities differs from consent to the data processing activities themselves. Supercell, by hiding their privacy policy in their terms of service, is effectively combining two different types of consent into one action. The permission given to their privacy policy cannot be called consent, as it is neither informed, specific nor freely given. Therefore the lawful ground of consent cannot be the basis for the processing taking place so Supercell must be able to demonstrate that they are lawfully processing personal data on the basis of one of the other grounds, such as that of pursuing their legitimate interest or for the performance of the contract between the user and Supercell. However, with respect to these other grounds this raises the questions of whether data processing is necessary or whether the balancing of interests and rights does provide Clash of Clans with a legitimate interest in processing personal data.

Data minimisation and privacy by design

The game company must implement the principles of data minimization, privacy by design and privacy by default. The principle of data minimisation particularly means that no more data must be processed than is necessary for a specific purpose. Necessity is an inherently slippery concept [140]. Whereas there is an easy way to check whether or not a data point is unnecessary, e.g. if it is not used, it may be more difficult to check its necessity. It is a tricky question to answer as to how much data targeted advertisements truly need in order to generate profit. Is it truly necessary to track a player's every move in order to improve a player's experience? A point could be made that it is certainly helpful and insightful, but its necessity is difficult to pin down. Given the nature of exploitative design, design that extracts more data than necessary for an economic incentive, such as inciting players to make more purchases or nudging them to continue on playing or on certain times, it is difficult to tell whether exploitative designs and dark patterns can even meet a necessity requirement. Again, here the best interest of the child will play a role as well to determine to what extent data processing practices in game design contribute to the welfare of children. Furthermore, as previously stated, it is assumed that data-driven marketing activities aimed at children are not lawful, or at least should be avoided as much as possible.

By the way, game design that is truly privacy-friendly can also contribute to an adequate protection of children's right to data protection. We can even speak of a positive behavioral design if games refrain from a push to collect data unnecessarily and make necessary data collection processes accessible and transparent, with clear opt-in and deletion or correction options. Especially for children, this offers opportunities to take into account their vulnerable positions and abilities [138].

Transparency and fairness

The principle of transparency not only ensures that consent must be informed but that full transparency of data practices and rights is ensured to gamers. In the case of children, this means that information relating to data processing must be comprehensible, recognisable and accessible to them (Article 12 GDPR) [141]. The principle goes beyond providing said information in a formal way and also dictates that game companies cannot take unjust advantage of their position by essentially keeping gamers in the dark of data practices with incomprehensible legal jargon or complex game design. This inextricably links transparency to the principle of fairness.

The principle of fairness dictates a rebalancing of asymmetric power relationships [142] and permeates the implementation of each and every data protection principle, right and obligation. A good example of an asymmetric power relationship could be the interpretative capabilities of a child and a privacy policy written by a team of lawyers. It can quite easily be seen how it is not fair to expect from a child to fully understand a complex privacy policy. This rebalancing is effect-based; of less relevance are the formal procedures of transparency, lawfulness, or accountability; only the substantial mitigation of unfair imbalances can be called 'fair' [142]. In cases where the power imbalance or knowledge gap is greater, due to for example the monopolistic position of a company or the particular vulnerability of the gamer, the fairness principle could be said to apply more strictly as there is more to rebalance. With companies such as Electronic Arts, Activision Blizzard, and Ubisoft, the bargaining position of an individual is almost

negligible. An individual would not be able to renegotiate the terms of its privacy policy with Ubisoft. The fairness principle is intended to ensure that the position of an individual and a company is such that there is no need to try and renegotiate, as the situation is already fair. This principle is context-dependent; what is fair in effect differs in every situation and must be individually assessed. Given the focus on power imbalances, it can also make a difference who the gamer is: an adult or a child; what is still fair with respect to adult gamers may not be fair with respect to children, or others that are vulnerable for that matter. For example, adults can consent to data processing for personalised marketing, whereas this is increasingly seen as undesirable in relation to children. There is no universal standard, some data processing practices can be fair in certain situations and unfair in others. Moreover, what is considered unfair under data protection law can also be unfair under unfair commercial practices law (see section 3.2.).

Profiling

Gaming companies can make use of data-driven revenue models in which the behaviour of gamers is observed. The goal is to develop models of who drives revenue and make decisions around those groups. Moreover, targeted ads are used in games financed through ads. Publishers like Zynga advertise a lot for their own customers, e.g., by identifying which game types they like. Essentially, all of them profile, even the smallest studios, because they want to know who buys their products. Profiling of children by capitalizing on their personal data, and particularly on their inferred personality traits, preferences, gaming behaviour or vulnerabilities, can amount to a form of exploitative design (see section 3.2.) [120]. The GDPR prohibits automated profiling that has a legal effect or similarly significant effect on gamers. A legal effect can be present when automated profiling pushes children towards in-game purchases they would not have otherwise made. Similarly significant effects may include detrimental consequences for a gamer's physical or mental health or wellbeing, e.g. when automated profiling discloses a person's vulnerabilities in terms of obsessive gaming behaviour. Being economically exploited through AI optimisation could also be considered another significant effect and children can be more vulnerable in this respect.

The prohibition of profiling can be lifted in a number of situations although a game company would still need to make sure safeguards for gamers and their personal data are in place. Gamers can explicitly consent to automated profiling or automated profiling may be allowed when it is necessary for the conclusion or performance of a contract. In the first situation, not only do the conditions for consent (see section Lawful grounds) apply but in addition the gamer must have demonstrably explicitly agreed to automated profiling. In the second situation, 'necessary' entails that the exception must be interpreted restrictively. In the case of children it is recognized that the exceptions should not apply as a norm and game companies must therefore avoid profiling children unless it is in their best interest [120,132].

When a game company uses automated profiling, especially if it includes profiling of underage gamers on their platform, it will be obliged to perform a data protection impact assessment (Article 35 GDPR) [138]. In the case children are involved they will also need to assess the impact of their data and profiling practices on relevant child rights, particularly those elaborated in this chapter.

AI in game design

Artificial intelligence is more and more frequently used in game design for a variety of purposes. E.g. Sony recently filed a new patent for matchmaking based on AI, while Activision has been using a quasi-AI for their games' matchmaking for years. AI can also be used for procedural level generation, where the game generates a new map or level on e.g. every playthrough or restart, in order to keep the game fresh and new. Depending on the way AI is implemented and used in games it can potentially affect any of the rights of children as discussed in the previous sections of this chapter.

From a data protection perspective, AI in game design raises questions of transparency and fairness for gamers more generally because of the black box problem. The black-box problem occurs when an AI is sufficiently complex and self-learning that even the designers and computer scientists cannot fully trace every step in its decision-making [143]. This problem can lead to it being unclear for gamers how the AI involved is altering their game-play experience and behavior through data processing and profiling. If it is already unclear for AI designers, it will be almost impossible to have effective transparency for gamers. When a black-box problem occurs, only the data that enters and exits the AI can easily be seen, how and why an AI makes decisions becomes almost impossible to track in certain models. In Activision's skill-based matchmaking, we might know that the AI uses previous in-game purchases and frequently visited locations on the map to match, but how these two data points correlate and affect the AI's decision is a mystery. This can have a detrimental impact on the transparency that is required by data protection law in case of automated decision-making and profiling with a significant impact on gamers' legal or economic situation, or personal health and wellbeing. The use of AI can also become more problematic when its sole purpose becomes monetization rather than game optimization.

The black-box problem affects the retrospective element of the principle of transparency, which is often called the right to explanation. The right to explanation does not explicitly exist in the GDPR, but a right to 'meaningful information about the logic involved' in automated decisions does exist [144]. It is a right to an explanation for how the system works, before any particular decision is made [145]. Whenever a black box-problem in AI occurs, it becomes impossible to supply meaningful information about its internal logic and operations. In a recent study sponsored by the European Parliament, it was also found that: "the complexity of AI-based processing, and the fact that such processing cannot be completely anticipated, especially when based on machine learning, makes it particularly difficult to ensure transparency" [146]. It is increasingly difficult to put into words how your data will be used, even complex privacy policies might not be adequate for this purpose in the future, let alone child-friendly ones. Simply put, the more complex AI's grow, the more reason there could be for a prohibition based on the inability to provide adequate transparency and information of data processing by the system. Both the so-called right to explanation and effective transparency become impossible to fulfill.

There are various examples of the use of AI in games. Computational algorithms influencing player experiences based on in-the-moment play data or long-term player data has a long standing history in game play. Super Mario Kart (1992), for example, changed the speed of non-player characters (NPC) based on the player's performance to increase tension in play. Other games (e.g., FarCry) adjust the strategy of NPC teams-

based on the player's skill level. Algorithms are also used to support aiming in controller-based games to compensate for the lack of accuracy in controller input. An AI would be a certain algorithm that also has a self-learning factor, which makes the algorithm more efficient or better. These techniques are generally quite safe, given that they do not influence the player themselves, they only help the player slightly to make the game more fun.

The usage of AI becomes problematic when AI or computational algorithms are solely used for increasing profitability, not for increasing the actual quality or playability of the game. When the sole goal of the AI is profitability, the rights to protection against economic exploitation (see section 3.2) and health (see section 3.4), especially for children, can easily be impacted. It should be noted that when the goal is mostly increasing playability or making the game more fun can have the unintended consequence of affecting health too. However, in this case, it is more difficult to tell if this is attributable to the designers or not and safeguards can more easily be implemented. AI can grow even more problematic when player data is being used, as this allows for more efficient manipulation.

Using player data, such as player performance data is not new. Games such as Chess have been using player performance data to calculate ELO points, a type of Chess rating to indicate skill level, even before computers were involved. Newer techniques to calculate player performance, such as TrueSkill™ [147], infer individual skills within a team to predict skill and improve matchmaking accuracy. Video games also adjust difficulty dynamically-based on player performance, e.g., the number and frequency of zombie waves in Left 4 Dead. The rationale behind these types of algorithms is simple, if the difficulty is always being adjusted - not too difficult, not too hard - players are more incentivized to continue playing. However, a continuously adjusted difficulty in pay-to-win games might mean that frustration-levels are also continuously at the optimal point to encourage in-game purchases. Again, the technology becomes problematic once it is solely used for a profitability objective. It should, however, be noted that even if the only goal is making a game more fun or enjoyable, as an unintended side effect, the game could become very addictive.

Video gameplay and the context of video games are also used to train AI and learn about how to improve AI algorithms. Microsoft's project Malmö [148], for example, investigates opportunities for human-AI collaboration and the software AlphaStar uses deep learning to compete with the best players in, for example, StarCraft. Other examples of the use of AI in games is impersonating other players—with currently a fair potential to increase, due to better natural language and image processing capabilities. And the use of personal information for personalized marketing in-game or out-of-game.

Many techniques of AI for game design are fairly safe, e.g., generate levels, path algorithms for NPC, daily scheduling in everyday life simulations. However, unsupervised algorithms are heavily dependent on the data they are trained on, which might result in training mistakes that exclude individuals, for example when training with able bodied people, but exclude disabled players. Bias in data or incomplete data, can lead to an incomplete or biased AI. Another risk is the unethical extraction of information from player behaviour, e.g., stealth assessment of cognitive function or even identity theft.

Section 4. Dealing with behavioral design in games

In the old days, everything was better.

Or, in the case of video games, it was a more simple time at least.

Historically, video games followed two business models: People either played games like Pac-Man or Street Fighter in the arcades, using coins. Or they could purchase entire games on CD's, Cartridges, or Floppy disks in boxes that included the entire game. These boxes did not come with any additional hidden costs, in-game aftersales, and complicated attempts to manipulate our daily schedule for maximum customer retention. They also generally did not come with positive online communities, a potential job in e-sports and life-long new friendships.

Developments over the last decade, in particular the introduction of microtransaction models, have changed video game monetization strategies fundamentally and has led to a shift in design values for many studios. The appeal of developing an end-to-end experienceable story or creating game-play that inherently resulted in enjoyable experiences is now often combined with monetization strategies.

Sometimes, these monetization strategies push design choices toward negative, *dark* design patterns. As the majority of microtransaction approaches show a linear relationship between time spent and money spent, developers aim to engage people regularly and for extended periods of time [149,150]. Design for user engagement is sometimes effective to such a high degree that some players unwillingly neglect other aspects of life, harm themselves physically, experience unintended financial expenses, or create emotional distress for themselves or others.

Iterating on earlier successful design, games are also increasingly adept in keeping the user's engaged in the product over extended time periods. Friction is increasingly removed from popular digital products, visible in elements such as the endless scroll in Facebook, the endlessly playing videos in TikTok and Youtube, and the easy transitions from match to new match in games such as Fortnite.

There is a strong consensus that the structural characteristics of gambling products play a significant role in facilitating risky gambling behaviour and harm to individuals [151]

Design matters, and even more importantly, it directly affects behavior and time of engagement of consumers. Strangely, this is a given fact in the parallel domain of gambling domain and somewhat underappreciated in video game research.

Meanwhile, video games are increasingly enjoyed by a wider variety of individuals, including children, adolescents and young adults. With a large audience, games are now also played by a variety of vulnerable adult individuals, who suffer from conditions that might impair their ability to resist heavy encouragement to play, to spend or to stay engaged with the game.

In general societies tend to advocate for the protection of vulnerable individuals and children in particular. These principles are regularly codified in legal frameworks that indicate, for example, that the *best interest of the child* should be a primary consideration when designing products for children. This means, in particular, that when games are played by children, the impact on their welfare and rights must be assessed and prevented if it is negative. In relation to gaming, particularly children's rights to leisure, play, association, health, privacy and protection against economic exploitation are implicated.

Given the strong potential for negative outcomes, both industry and government responses to the issue of behavioral design seem somewhat fragmented and incident driven. Following the formalization of a *Gaming Disorder* by the World Health Organisation, extreme playing behavior got some attention, but actual substantial empirically grounded prevention, identification, and treatment efforts are not in place yet. Responses are regularly PR focused. Similarly, a debate erupted over loot boxes and their similarity to gambling. The debate landed in the gambling policy area, and is still ongoing. While relevant, *loot boxes* are only one type of experimental business model, and certainly not the last that will appear in the next decade. Both topics are connected to game design choices and the protection of vulnerable consumers.

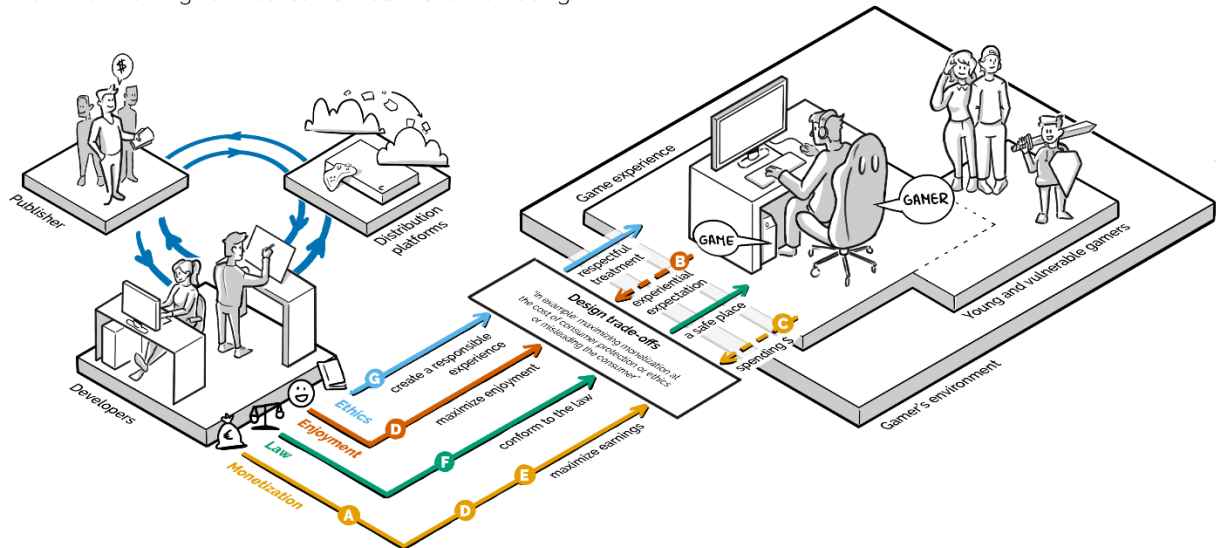
Behavioral design: video game design decisions which elicit, either accidentally or purposefully, self-negative or self-beneficial behavior in the gamer.

We think a more fundamental discussion needs to be held on both the governmental policy side and within the games industry itself about behavioral design in games in general: it has potential for positive contributions, but can also be used in ways that cause harm. Even where that harm is not yet fully supported by conclusive evidence, a precautionary better-safe-than-sorry approach may be necessary to protect vulnerable gamers. In either case, the limits of experimentation with behavioral design should probably not be up to individual companies doing 'what feels like the right thing to do'. In the current situation, accountability and transparency are often lacking or unclear. In order to have this discussion, a common framework of understanding, and a common departure point is required to avoid miscommunication.

4.1 A taxonomy of behavioral design in video games

Behavioral design in video games

A roadmap for ethical and responsible games that contribute to long-term consumer health and well-being



A: Common monetization models

- Pay to play
- Retail/Box revenue
- Subscription models, games as a service
- Free-to-play
- Out-of-game revenue models

B: Why do gamers play games?

- Affiliation: contact
- Achievement: challenge
- Power: leading
- Autonomy: freedom

C: Why do gamers carry out in-game purchases?

- Unobstructed play
- Social interaction reasons
- Competition
- Economical rationale
- Indulging the children
- Purchasing content

D: Behavioral design patterns

- Positive behavioral design patterns
- Temporal dark patterns
- Monetary dark patterns
- Social capital-based dark patterns
- Psychological dark patterns

E: Basic behavioral change methods

- Reinforcement and punishment
- Nudging and facilitating
- Social techniques & modeling
- Complex feedback systems
- Guided practice
- Early/public commitment & goals
- Tailoring and individualization
- Forced 'snap' decisions
- Using imagery to relay value
- Anticipated regret
- Conditioning and cue altering

F: Guiding legal principles in behavioral design

- Best interest of the child
- Avoid exploitative design
- Child-appropriate data protection
- Right to health(y gaming)
- Right to leisure and play
- Inclusive gaming

G: Principles for ethical and responsible behavioral design

- Leverage behavioral design for positives
- Prevent negative outcomes of design
- Actively avoid harmful and deceptive design in games
- Design is transparent and auditable
- Responsibility for design is attributed
- Automated decisions processes are incorruptible

Figure: A taxonomy of behavioral design (project maintained at <https://osf.io/x9vhs/>)

The current report developed a taxonomy to illustrate behavioral design in video games: both the perspectives of the maker and the gamer are explored and included: the tension between competing financial, protection, legal, and enjoyment motives is illustrated.

This report has illustrated the centrality of changing monetization models in relation to design and the tension this creates within games. The massive shifts in video game financing, from upfront purchasing towards in-game monetization techniques was illustrated.

We developed the idea that different design motives now compete within games, after the moment of sale: **legal** compliance requirements, commercial and **monetization** objectives, providing **enjoyment** for the gamer. Ideally, these motives are expanded with an **ethical-responsible** motive as well, which seeks to protect and even strengthen the consumer's physical, social, mental, and financial health.

The design trade-offs

The motives impact both the designer of games and the consumer of games. Both perspectives were explored and are described in a structured manner. From the gamer's perspective, it is indicated why players engage with video games and which purchase motivations they have when purchasing within games.

On the design side it was highlighted how business incentives drive design choices that constitute either negative design (manipulation of player's time, psychology, money or social capital) or positive design, by contributing to the gamer's health and wellbeing. It is also highlighted how established behavioral change techniques are recognized in game design.

Game companies like *Electronic Arts*, *Tencent Games*, or *Ubisoft*, maintain a number of studios (e.g., BioWare, Riot Games, or Massive Entertainment) and have an influence on the decision process within different studios. This might for example affect the implementation of monetization structures that would not be the primary choice of the developing game studio. Regardless of the publisher's influence, the product is expected to generate revenue; shareholders and investors expect a return on their investment.

Designers of video games can thus include a conflict between focusing on the most enjoyable game and implementing game mechanics to support monetization strategies. While game designers might aim for the best player experience, business requirements lead to design decisions that might interrupt game play (e.g., Clash of Clans), add unnecessary behaviour to game play (e.g., Fortnite dances), or adds social layers to game play to drive sales strategies (e.g., skin sales during times events).

While the data are not published, game companies are not blind to the behavior that their games elicit: this should be clearly visible in behavioral user data. From annual reports, it is also abundantly obvious that new monetization approaches are massively successful in shifting consumer behavior. Moreover, designers have the data and behavioral information to infer information about the user's health [84]. That said, they do not always have incentives to engage constructively with these data, or might even have incentives to avoid noticing harms.

The designer's intentions and gamer's expectations meet in the middle, where the actual gaming happens. Here, we illustrate the intended and unintended consequences of behavioral design in some popular games, and highlight the pressure that games can exert on the gamer's behavior.

Ethical and responsible design principles [Box G]

Box G: Principles for ethical and responsible behavioral design

- Leverage behavioral design for positives
- Prevent negative outcomes of design
- Actively avoid harmful and deceptive design in games
- Design is transparent and auditable
- Responsibility for design is attributed
- Automated decisions processes are incorruptible

Based on our research on industrial practices, games as a product, and the health implications for consumers, we formulate principles about responsible behavioral design in games, in order to protect and advocate for mental health, physical health, and the financial health of gamers themselves:

1. **Behavioral design in games can support positives and healthy balance:** Pro-actively stimulating healthy behavior in the audience group. Initially, this might not seem like the economical way forward, but a healthy customer that appreciates your product might well stick around longer and add more value during their entire lifetime.
2. **Behavioral design in games can prevent negatives:** This deals with subgroups of vulnerable consumers and children. To what extent can vulnerable product users and product users in general be protected from potentially harmful outcomes? How can product design and the meta-game or community management contribute to the prevention of some mental/social/physical/financial issues?
3. **Behavioral design in games can elicit harm:** Design choices matter. Behavioral design can cause psychological, social, physical or financial harm and this should be avoided. Regular duty of care should be extended to consider the impact of behavioral elicitation via design choices and boundaries should be developed within or around industry. A better-safe-than-sorry approach must be taken with vulnerable gamers. Anything goes unless it 'doesn't subjectively feel right' approach should not be the baseline in a commercial sector.

These three principles deal with industry internal decisions and design implications.

For external parties, such as gamers, governments, parents or health and research professionals, it is now borderline impossible to understand the impacts that behavioral design in games has on gamer behavior. Moreover, some critical information about monetization information is lacking or withheld (total amount of money spent on a game,

detailed exact odds in loot boxes, time required to realistically achieve goals in a battle-pass system, etc.). Algorithmic decision making in games adds to this confusion. So, how can this understanding be improved?

Covering the ethics of artificial intelligence, Bostrom and Yudkowsky produce some core principles that can be applied to video games as well, as discussed here by Mikkelsen et al. [152]. The principles are reinterpreted and slightly rewritten to cover video games:

- **Transparency** within product-decision making describes the fact that decisions made within video game systems should be open to inspection or at least explainable to the largest extent possible. For consumers to have informed choice, they should be able to access and, ideally, understand the information about how their behavior is being stimulated.
- **Auditability**, within-product systems, refers to the fact that mechanisms for ensuring that game systems act as intended are available. At minimum they should avoid harm and protect vulnerable gamers. Ideally they would contribute a healthy balance. Even if systems cannot be made open to public inspection, it should be possible for trusted professionals to inspect and audit them.
- **Responsibility** in game design refers to the idea that the decisions made by automated decision making tools (AI, machine learning) within game / gaming systems should be attributable to responsible individuals or organizations. Any harm that originates from the use of these tools should have a clear responsible party.
- **Incunctibility** refers to systems and models being robust against willful manipulation from external parties, by being robust against attack with e.g. malicious input data.
- **Predictability** refers to the outputs of systems being predictable for users so that similar actions or conditions yield similar outputs over time. If gamers are exposed to these systems, and the systems manipulate behavior to some extent, they should be safe from unintended outcomes and drift in the manipulation targets.

In the current situation, transparency is notably lacking beyond industry insiders. While some researchers set up personal collaborations with industry [83] to access product data, this also makes them reliant on industry goodwill over time. This potentially creates soft-power pressure to stay friendly, as not to kill the goose with the golden eggs.

Truly independent auditing of behavioral design and the resulting gamer behavior is currently not done anywhere (to our knowledge). In this type of landscape, checks and balances originate from published incidents with either gamer pushback or strong societal pushback (see: loot box debate and gaming disorder debate). This situation has some major downsides: first of all, this means that harm has already occurred (and potentially at scale). Secondly, it contributes to increasing polarization between the discourse on the regulatory, health research side and the gaming industry side, complicating future prevention and intervention actions.

The aforementioned principles are already supported by existing legislation that could be enforced more rigorously, with a stronger focus on vulnerable groups of gamers.

How to move forward

To address the issues with harmful behavioral design outlined in our report and illustrated in the taxonomy, we suggest a two-pronged approach by 1) addressing effective governmental and self-regulatory policy efforts, while 2) further investigating the issue through research on the gamer, the game industry, and on the relationship between game mechanics and health outcomes.

The following figure contextualizes suggested research and policy approaches in the taxonomy: efforts are proposed in the context of the gamer and their environment (green), the impact of behavioral design in games (yellow), and within industry practice (blue) and government regulation of industry practices (red).

The next sections discuss these suggested policy and research efforts in detail.

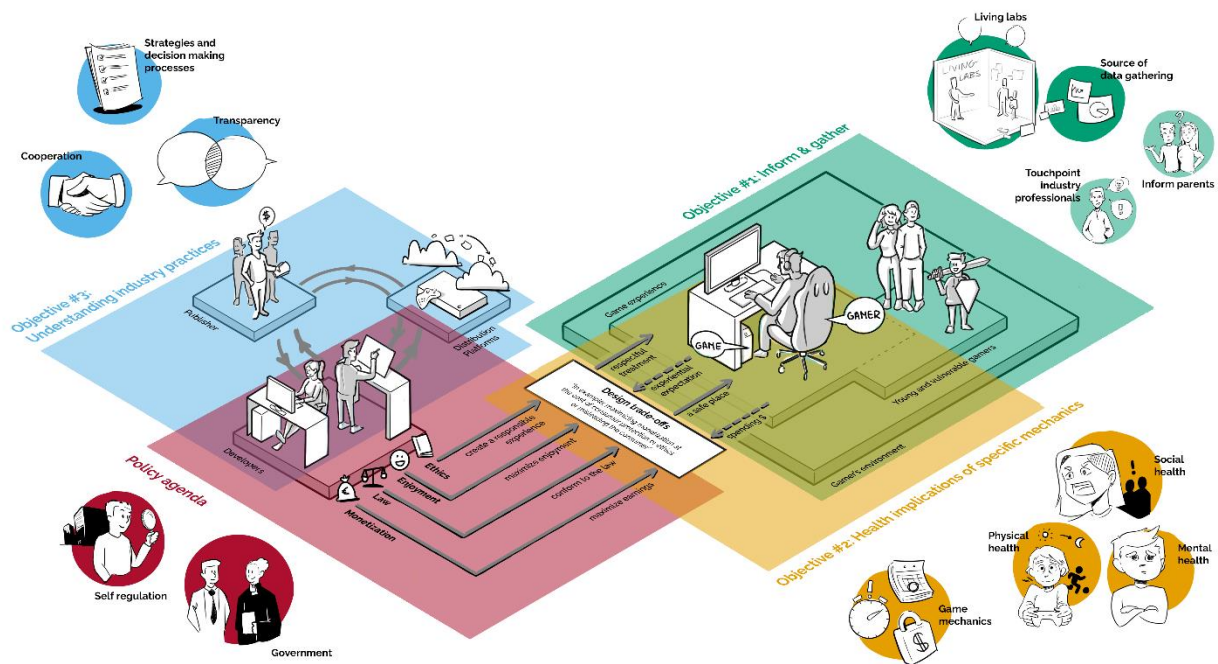
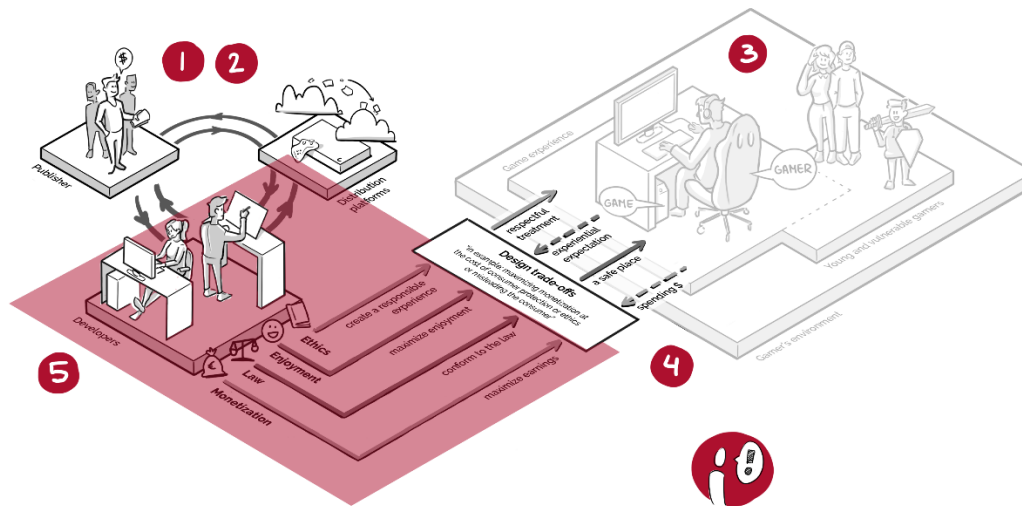


Figure: An overview of a two-pronged approach to responsible and ethical behavioral design: both governmental, game industry internal and research efforts (project maintained at <https://osf.io/x9vhs/>).

4.2 Policy agenda

Summary policy options



1. Contact and communication platforms

- 1.1. Broad protection of children against online harms through international collaboration between governments and NGOs
- 1.2. National industry encouragement. e.g., behavioral codes, violation radar, encouragement of industry to act ethically
- 1.3. Bilateral contact between industry and government

2. Information and control cycle

- 2.1. Government: evaluate the effectiveness of the industries self-regulation, e.g.:
 - a) oversight company-internal measures,
 - b) monitor within game activities
- 2.2. Governmental self-evaluation of game and digital policy, e.g. platforms that have room to critique industry, free from economic incentives and government internal pressure.
- 2.3. Finance and facilitate research, e.g., access to data streams, basic funding, applied research

3. Prevention and treatment

- 3.1. Treatment and preventative intervention of gaming related harms, e.g.:
 - a) fund and stimulate better treatment for gaming problems (e.g. gaming disorder),
 - b) fund preventative interventions and effect evaluations.

4. Intervention options on government side

- 4.1. Legal measures that cover games and oversight, e.g., laws and enforcement, taxation, restrictions etc.
- 4.2. Other measures, targeting the individual, e.g., facilitation of choice, improve alternatives for behavior, provide information lines, educate and inform the public, etc.

5. Influencing game industry internal processes

- 5.1. Potential actions for game publishers, developers, and distribution platforms:
 - a) Signal and monitor harms
 - b) Have processes to deal with incidents / excesses
 - c) Provide transfer to external (mental) help services
 - d) Provide coaching and advice
 - e) Encourage positive behavior (nudging), combat toxicity
 - f) Provide honest and complete information about product at point of sale (labels)
 - g) Provide information about user manipulation (behavioral design / monetization technique)
 - h) Share data with researchers, free of involvement and without limiting questions
 - i) Have and evaluate parental control tools
 - j) Place voluntary restrictions on play time (limits / play times)
 - k) Place voluntary restrictions on money (spending limits)

Figure: Policy Agenda. An overview of policy options to address the risks of behavioral design in games and to stimulate ethical/responsible design of games (project maintained at <https://osf.io/x9vhs/>).

We provide five main avenues for policy efforts that can guide governmental action on behavioral design in video games: to reduce negative design and to encourage responsible-ethical design.

1. Contact and communication platforms

An initial option when attempting to change industry practices is communication with the relevant stakeholders, encouraging them to conform to behavioral codes. The first policy avenue covers this approach, including international collaboration with non-industry stakeholders (NGOs). Three concrete avenues for communicative action are suggested:

Firstly, the **broad online protection of children** against harms and the oversight on this topic is generally viewed as a governmental responsibility, both internationally and in the Netherlands. The actual execution of the protective measures is sometimes situated within the industry (e.g. data protection and privacy). International collaboration between the Dutch government and experienced NGO's, such as UNICEF, could be expanded to strengthen local online protection of children.

For instance, in a 2019 report on online gaming and children's rights, UNICEF recommends six focus areas for the gaming industry [153]: "Healthy game play / healthy time spent gaming"; "Inclusion and representation"; "Toxic environments"; "Age limits and verification"; "Protection from grooming and sexual abuse" and finally "Commercial models and influence". The last issue deals with the potential manipulation of emotion and behavior via monetization techniques. Via the first issue, the report also highlights healthy game play by design.

The UNICEF report includes specific recommendations for companies and addresses specific stakeholders for each area of recommendation. Some concrete examples are ways they suggest to encourage healthy play [153] in games:

1. Consideration of interface techniques that support time management and healthy habits.
2. Investigating designed for play periods and intervals, and assuring transparency of the techniques used for children.
3. Consideration of session length.
4. Refraining from techniques that punish time-off playing.
5. Game-design to facilitate and support break, e.g., rewards or alerts.
6. Designing for idle time.
7. The impact of Virtual Reality and children and their development should be considered as well.

Secondly, a specific **point of contact for industry** representatives within the Dutch government could be helpful to stimulate dialogue - with a somewhat fragmented Dutch policy landscape, the game industry does not have a clear and single entry point to discuss industry internal efforts to address risks and discuss challenges.

Finally, more **direct forms of industry encouragement** can be used by the government to signal expected behavior. This can include publicly identifying, and discussing problematic practices (a violation radar), or drafting and governmentally expected company behavior codes, such as the Dutch Children's rights code. To the degree that practices are publicly visible, such codes can be used to evaluate industry practices and their conformity in the future.

2. Information and control cycle

Due to the interactive nature of video games, inaccessible production methods, and a global audience, game content is inherently difficult to regulate. Moreover, the product keeps changing after release. This requires a high level of expertise amongst policy makers dealing with the subject matter, to avoid heavy handed action that misses the target. While these complexities exist, the governmental information and control cycle can be improvised in relation to behavioral design in various ways.

Governmental action should evaluate industry self-regulation **empirically**. To the extent that changes are made, they should result in demonstrable player protection, demonstrable changes in the product (risks). This type of data-driven evaluation is currently available to governments, or very limited at best. While parental control tools are sometimes suggested as a partial solution to excesses, their actual use and effectiveness on changing child behavior is unknown. While this effort should greatly help with the maturity of oversight, it is a challenging task, which requires substantial expertise within government.

Funding and facilitating access of financially **independent research** and independent researchers into the behavioral design practices within the industry, and supporting applied research in this area, could strengthen governmental efforts in this area. Interfacing with industry will be necessary, of course, but strict protocols should be used to maintain research independence.

Finally, governments sometimes have competing internal motives with regards to video game policy, specifically the economic and protection aims. The game industry is also an employer and generates economic activity. **Fully independent government-internal platforms** would be helpful to critique industry practices, free from economic pressure.

3. Prevention and treatment

Prevention and treatment efforts that address gaming related harms to financial and social/mental/physical health should most likely focus on vulnerable gamers in particular.

Research shows no strong impact of digital media on adolescent health if the entire population is considered as a whole [154–156]. In specific individual cases and for vulnerable gamers in particular, health support should be provided. Ideally, these efforts are early and focus on **prevention**. If not, they can be curative and **treatment** oriented. Examples include subsidies for prevention initiatives, treatments centres or interventions that promote healthy gaming with the involvement of players, parents, partners of players, schools, and industry. Ideally, efforts are empirically evaluated for impact and effectiveness.

4. Intervention options on the government side

Extending the softer measures proposed before, the government can establish more strict interventions on both the industry side and the consumer side. This includes hard **legal measures** that discourage unhealthy design: for instance, taxing unhealthy design choices or outright banning certain design patterns (e.g. loot boxes). Unfair or harmful design patterns are already covered by existing legislation that can be more strictly

enforced. In addition, implementation of the best interest of the child principle requires games played by children to undergo a child impact assessment before offering them. Such an obligation would have more force if enshrined in law. On the consumer side, interventions can be done that restrict unwise or unhealthy individual choices: providing better information on game design to allow consumers to make an informed decision, forcing transparency about manipulations or establishing spending limits.

5. Influencing game industry internal processes

The broader gaming industry has many opportunities to constructively address harms and promote responsible and ethical design, and is in a central position to take effective action. Concrete suggestions cover the increase of transparency, supporting (vulnerable) consumers, and supporting external stakeholders with information and efforts. The figure above describes concrete examples of how to do so, ranging from the monitoring of harms within game environments (a) to voluntary spending limits within games (k).

4.3 Research agenda

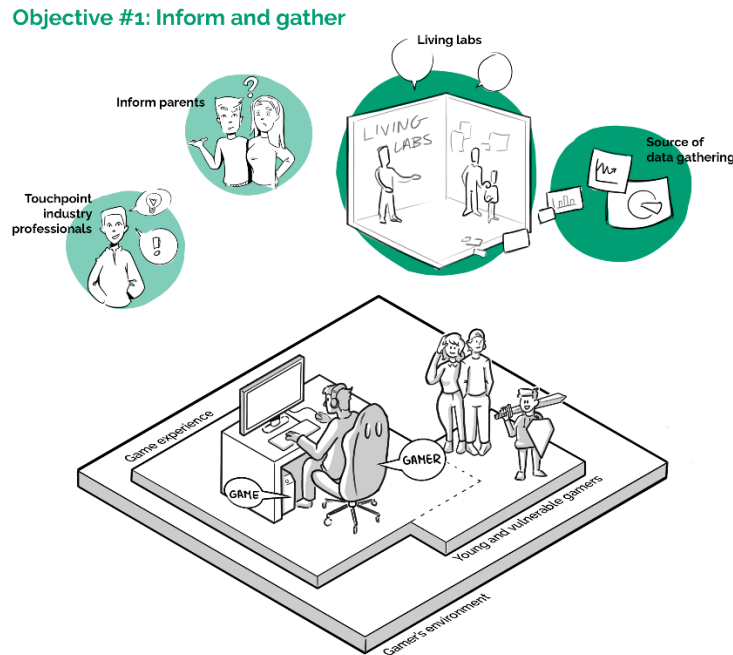
Research aims: behavioral design in games [Box H]

Box H: Future research aims on behavioral design in games

- Game: Understanding industry practices
- Gaming: Assess impact of behavioral design on mental, social, physical, and financial health
- Gamer: Gather information on (vulnerable) gamers and their environment

Follow up research needs to establish a reliable data source of the effects of game mechanics on society. The past has shown how quickly monetization models change. However, to understand societal implications of game mechanics it is important to establish a continuous touch point between end-users, researchers, and industry. Further, individual game mechanics and their actual implications on social, physical, and social well-being need to be established. And finally, the game development context where publisher needs, design decisions, legal requirements, and end user needs is not well-understood and requires further investigation, e.g., through ethnographic studies, stakeholder discussions, or co-creation sessions.

Objective #1: Inform and gather



Project maintained at <https://osf.io/x9vhs/>

The societal need to better understand game mechanics and their implications on health solicits work on better informing parents and children. This requires research into the primarily played games in Dutch society, a detailed analysis of the dominant mechanics, and strategies to educate about known risks of applied behavioral change strategies.

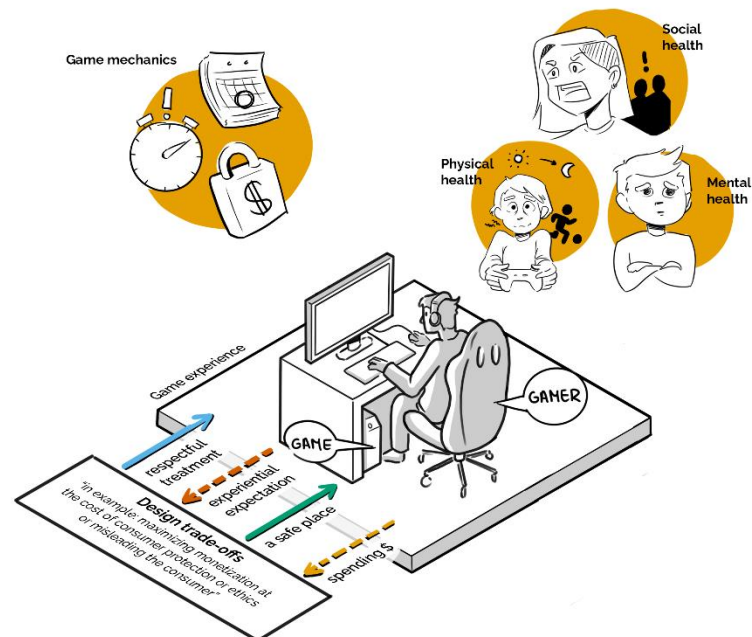
Leveraging the need for awareness raising and education by creating living labs that inform parents, children and young adults, would provide a forum for discussion, a touch point for industry professionals, and a source to gather data and identify potential for Objective #2.

By creating information based touch points, parents will receive information and guidance to support their children and guide engagement with video games by better understanding videogame culture and mechanics. Furthermore, children themselves must be involved and empowered by becoming more aware of game mechanics and how they affect their behaviour and well-being.

The living lab is envisioned as either an online touch point or offline touch point, e.g., a local office, where people interested in learning about the impact of gaming on social, physical, and mental well-being can gather information. The touch point could then be leveraged to gather data about individual cases, e.g., gaming addiction, family conflict, financial exposure, primary information interest, e.g., about gaming and AI, about business models, and physical health and development; and comprehension of different information models, e.g., written information, guided exposure, workshops, or sharing circles.

Objective #2: Health implications of specific mechanics

Objective #2: Health implications of specific mechanics



Project maintained at <https://osf.io/x9vhs/>

We broadly outline that specific game-design patterns have a potential effect on physical, mental, and social well-being. Considering insights gained in Objective #1, research should focus on the most prevalent game-mechanics and their effect on well-being in Dutch society; what are the concrete effects of temporal patterns such as time-events, financial pressure, e.g., pay-to-win, or frictionless interfaces, e.g., easily starting the next match?

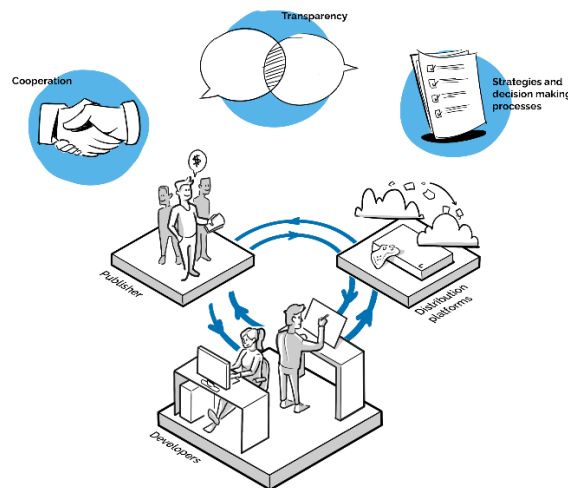
The research should investigate the implications of game-design elements of social well-being, in particular within families—is gaming a source of conflict? How realistic are expectations of different stakeholders, e.g., parents, children, media advisors? How informed are parents and children about different game mechanics and their implications, leveraging Objective #1 as a data source?

We are interested in a balanced approach, evaluating positive effects, e.g., contributions of game-dependent social well-being, and negative effects, e.g., physical implications due to sedentary behavior or negative social well-being due to playing by appointment.

The research approach taken, would leverage methods from behavioral science, e.g., experimental studies, interviews, and observations, social science approaches, e.g., survey studies, and special network analysis, and approaches drawn from data science and HCI, e.g., ecological momentary assessment, user modelling, and interface design instrumentation.

Objective #3: Understanding industry practices

Objective #3: Understanding industry practices



Project maintained at <https://osf.io/x9vhs/>

Highlighting that design is never neutral, the former games user research lead on Fortnite, Celia Hodent, provides a reflection on socially responsible design practices on videogame blog post aggregator "Gamasutra" [157]. Hodent puts emphasis on industrial responsibility and a scientific approach towards the negative and positive effects of design decisions. As a rule of thumb, Hodent recommends to never punish disengagement, e.g., when players need to stop playing and focus on something else they should not suffer any negative consequences.

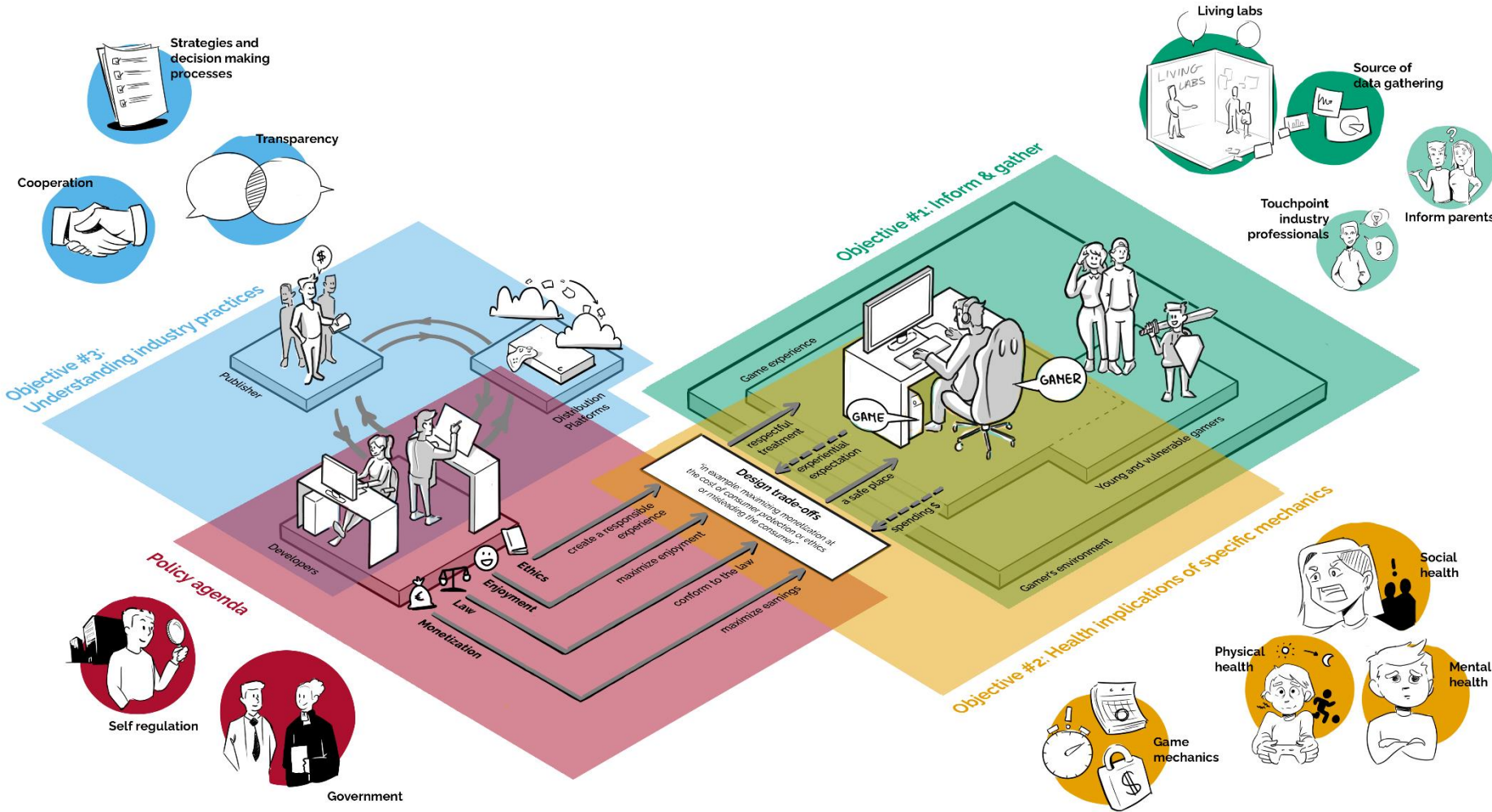
"When companies place their business and revenues first without considering all users' well being, then they are going to lean more towards dark pattern practices. Companies who think about users first, in a win-win mindset (beneficial to both users and the business), then they are leaning towards a UX strategy and culture." - Hodent [157]

Work conducted in cooperation between industrial and academic researchers [83] shows how important cooperation and shared goals are. This requires strong research relationships with the local industry and evaluation strategies to identify where there is mutual benefit in addressing gamers' health. However, it is important that these relationships are constructed with the goal in mind to prevent self-censorship, foster transparency, and facilitate a healthy discussion about ethical limitations and solutions that keep the user in mind.

Research into understanding industrial practices should aim to understand decision processes within the Dutch game industry, the influence of publishers on the game-development and design process, the implications of alternative business strategies, and how responsible design strategies with the user in mind could be implemented considering current industry practices. This strategy also provides opportunities to evaluate benefits of stimulating public-private research opportunities and future research through national funding (e.g., NWO, CLICK.NL).

Industry practices could be investigated through ethnographic work, e.g., by being embedded in the development process, through interviews with multiple stakeholders, or through role playing sessions with industry experts.

Visual summary: Research and policy agenda



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