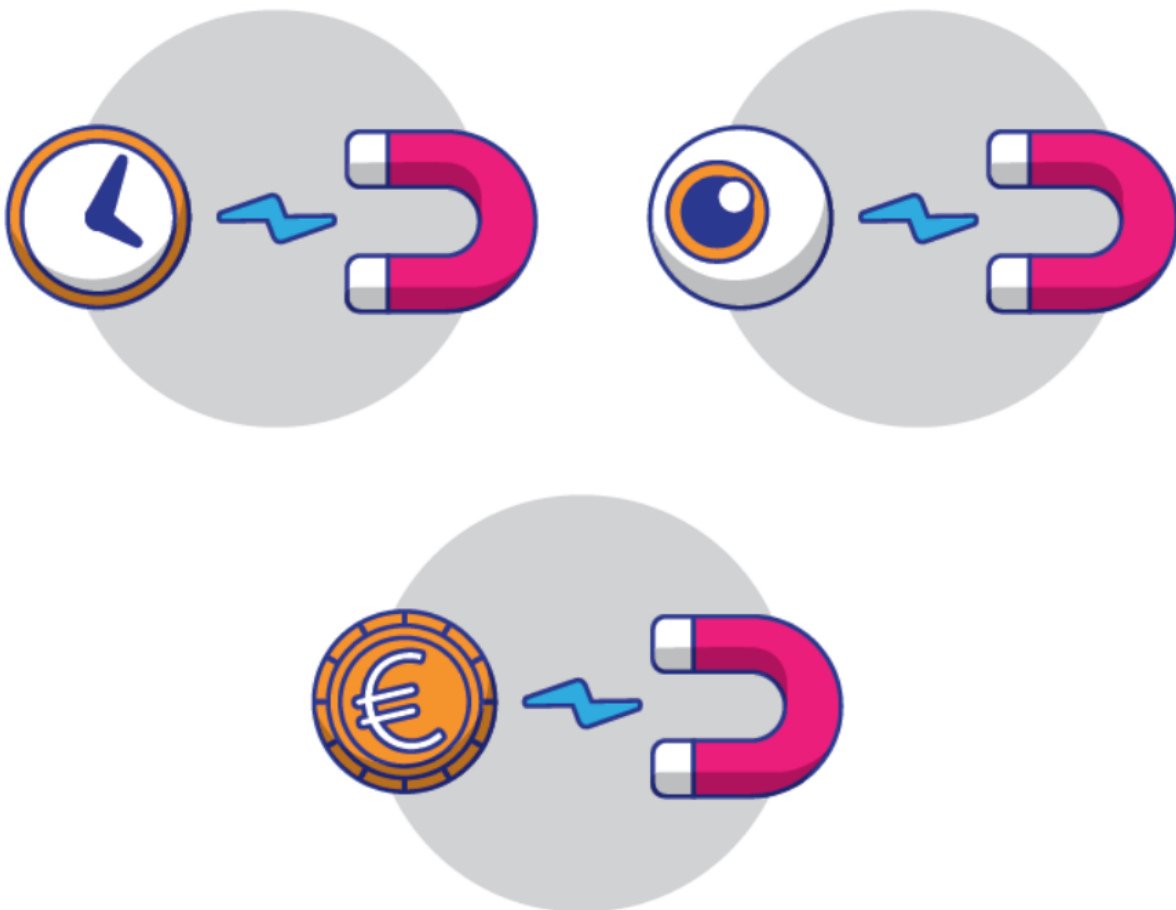


Game-check:

Development, application and visualization of a classification system for behavioral design in games



Colofon

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Ministerie van Binnenlandse Zaken en
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The involved researchers retained and formalized full academic freedom with regards to the work process and retained freedom to publish or teach in educational settings about this project.

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AI tool usage

The main report text was not generated with AI. AI was used to support proofreading efforts in the quality control phase. Usage of AI tools was explored for automatic answering of scoring options on the coding tool, for which it was partially useful. Additionally, usage of AI tools was explored for brainstorming at times during the project.

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Samenvatting (Dutch summary)

Het Gamecheck-project richt zich op **de toenemende invloed van gedragsbeïnvloeding (*behavioral design*) in video- en mobiele games**.

Beïnvloedingstechnieken kunnen zowel positieve als negatieve effecten hebben, zoals het stimuleren van gezonde keuzes, maar ook langdurig spelen of ongeplande aankopen. Omdat deze invloed op subtiele wijze plaatsvindt, beseffen gebruikers van games – in het bijzonder kinderen – vaak niet dat hun gedrag wordt beïnvloed. Ook ouders zijn zich niet altijd bewust van de gebruikte beïnvloedings- en overtuigingstechnieken in de games die hun kinderen spelen.

Het project heeft drie hoofddoelstellingen:

1. **Het ontwikkelen van een coderingsinstrument** om gedragsbeïnvloedende technieken in games te identificeren.
2. **Het ontwikkelen van een educatieve aanpak** om bewustwording te vergroten onder jonge gamers en hun ouders.
3. **Het verkennen van implementatiescenario's** om de toepassing van het coderingsinstrument en de educatieve aanpak te faciliteren.

Het **classificatiesysteem** ('coderingsinstrument') categoriseert gedragsmatige invloeden in drie hoofdgebieden: **druk op geld, tijdsdruk en druk op aandacht/engagement**. Het omvat 28 spelmechanismen, zoals dagelijkse beloningen en *pay-to-skip*. Daarnaast biedt het richtlijnen voor positieve ontwerpkeuzes. Hoewel de huidige versie van het instrument zich richt op waarneembare kenmerken, is expertise op het gebied van game-kenmerken – wat deze kenmerken inhouden en hoe ze tot uiting komen – essentieel voor de inzet van het instrument. Aangezien de focus ligt op het identificeren van potentieel schadelijke gedragsbeïnvloedingselementen, biedt het positieve ontwerp nog ruimte voor toekomstige uitbreiding. Ook op het gebied van opkomende technologieën (zoals AI of XR) en verdienmodellen is uitbreiding mogelijk.

De **educatieve aanpak** is ontwikkeld via een **proces in vijf stappen**: (1) het inventariseren van de behoeften van ouders; (2) kennis en bewustwording van het probleem, inclusief het opstellen van een ontwerpbriefing voor de creatieve partner; (3) conceptontwikkeling, waarbij een ontwerp is gemaakt voor testdoeleinden; (4) testen met ouders en gamers; en (5) oplevering van het definitieve ontwerp. Een van de bevindingen is dat ouders niet volledig begrijpen hoe gedragsbeïnvloeding in games wordt toegepast. Zo hebben zij moeite met het onderscheiden van druk op geld, tijd en aandacht, en hoe deze in games worden geoperationaliseerd. Interviews en tests met ouders en gamers droegen bij aan een betere educatieve aanpak.

Tot slot onderzocht het project de **implementatiemogelijkheden** van het Gamecheck-instrument en de educatieve aanpak. Er zijn twee mogelijke scenario's geïdentificeerd: één voor kortetermijnimplementatie en een langetermijnscenario, waarvoor dat beleidsmatige en wettelijke aanpassingen vereist. Beide scenario's maken gebruik van bestaande kennis en bestuursstructuren, met ruimte voor toekomstige Europese uitbreiding. Het project benadrukt het belang van voortdurende samenwerking tussen belanghebbenden, gezien de dynamische aard van de game-industrie en de verschillende uitdagingen van zowel videogames als mobiele freemiumgames.

Summary

The Gamecheck project addresses the **increasing influence of behavioral design elements in video or mobile games**. These elements can have both positive and negative effects, such as encouraging either healthy choices or long-term play or unplanned purchases. Because the influence occurs subtly, users of games - especially children - often do not realize that their behavior is being influenced. Parents are also frequently unaware of the influence and persuasion techniques used in games played by their children.

The project has three main goals:

1. **Developing a coding tool** to identify behavioral design elements in games.
2. **Developing an educational approach** to raise awareness among young gamers and their parents.
3. **Exploring implementation scenarios** to facilitate the implementation of the coding tool and educational approach.

The **classification system** ('coding tool') categorises behavioral influences in three main areas: **pressure on money, time pressure and attention/engagement pressure**. It includes 28 game mechanisms, such as daily rewards pay to skip. It also offers guidelines for positive design choices. Although the current version of the tool focuses on observable features, expertise on gaming features, i.e. what characterizes them and how they are expressed, will be essential to deploy the tool. Since the focus of the tool is directed towards identifying potentially harmful behavioral design elements, the positive side of design leaves space for future development. The tool also leaves room for development in terms of emerging technologies (e.g., AI or XR) and monetization strategies.

The **educational approach** was developed through a **process of five steps**: (1) assessment parents' needs; (2) knowledge and awareness of the problem, including the production of a design briefing for the creative partner; (3) concept development, creating a design for testing; (4) testing with parents and gamers; and (5) delivery of the final design. One of the findings is that parents do not fully understand how behavioral design is implemented in games. For example, they struggle with the distinction between pressure on money, time and attention and how these are operationalized in games. Interviews and tests with parents and gamers hence ensure that the tool is effective in raising awareness of behavioral design strategies.

Finally, the project investigates **implementation possibilities** for the Gamecheck tool and educational methodology. Two possible scenarios were identified: one for **short-term** implementation and a **long-term** implementation scenario, which requires legislative changes. Both scenarios make use of existing knowledge and governance structures, with potential for future European expansion. The project emphasizes the importance of continuous cooperation between stakeholders, given the evolving nature of the gaming industry and the different challenges of both video games and mobile freemium games.

Introduction & project aims

0.1 Project aims and background

In the call for proposals that resulted in the current project, the Ministry of the Interior and Kingdom Relations in the Netherlands described the background for the current project as follows:

*In recent years, a trend has emerged where the **behavior** of users playing games is increasingly influenced within the games themselves. [...] This influence is sometimes **positive** (such as encouraging a healthier lifestyle), but often **negative** (such as enticing users to buy online products or play a game for extended periods). [...] In response to these developments, the State Secretary of the Ministry of the Interior and Kingdom Relations (BZK) has included the development of a 'game-check' guide in their "Werkagenda Waardengedreven Digitalisering".*

Project aims:

The current project aims to develop the intended 'game-check' guide. More specifically, the project aims to (1) **develop a system to classify** behavioral design elements in games, and apply this system in an (2) **educational** approach. Finally, realistic scenarios for (3) **implementation** are explored and suggested to facilitate societal usage of the results. Each of the three aims involves different methodological approaches. The three respective chapters describe these approaches and their results.

First, we define central concepts to contextualize our aims, drawing from our previous work on behavioral design in games. To situate the current effort, we will provide insights into existing systems that educate the public about behavioral design in particular and game content more broadly.

0.2 Behavioral design: definition and scope

In our previous report on behavioral design^{1,2}, we investigated decisions in media design - and specifically video game design - that impact the user's health and well-being. We specifically focused on what can broadly be described as 'behavioral design'. In other words: the impact of design on the end user's **behavior**. The report broadly defined behavioral design as follows:

- *'Behavioral design' characterizes the impact of game design on the end user's behavior - and, consequently, their well-being and health.*

The absence of classification and terminology on behavioral design hinders the debate about boundaries in the use of behavioral design choices. Additionally, behavioral design in games is more complex than the presence/absence of certain types of **content** in games. For example, we have to consider some of the following:

- **Firstly, there is a wide range of pressures on behavior.** Many techniques can be used to steer gamers in their purchasing or time-spending behavior. This can include elements such as unfair/manipulative interface design, manipulation of user experience (e.g., through matchmaking), manipulation of currency (e.g.,

converting euros to in-game currency units at complex ratios), and pressure on your time spent (e.g., pre-commitment systems/temporary events, etc.).

- **Some pressure on behavior is invisible.** Some of the manipulations are invisible to the end-user, i.e., unknown and invisible manipulation. For example, think of an algorithm that consistently places you, as a gamer, among those who have already made purchases. This gives you an unconscious skewed perception of who is making purchases in the game. Or, consider the opening of a digital treasure chest (loot box): you don't know if the contents are always identical or if there are 'pity timers' active, that always give you a prize after multiple disappointments.

Behavioral design can be **misrepresenting**³ in nature (e.g., 'rubber banding' in racing games, which slows down non-player racers to retain tension and engagement with the game). Such design can also be **economically** manipulative and misleading (e.g., currency conversion with lack of clarity about real prices, temporary offers that are not actual offers, hidden odds or distorted presentation in loot box 'win' rates). Behavioral design can also stimulate **unhealthy choices** (e.g., notifications at night) or financially risky **'extreme'** behavior (e.g., repeated loot box purchases to chase set completion or rare finds).

In other words, some behavioral design techniques are problematic or "dark patterns," and may even be unfair under consumer law. But there are also techniques that fall into a legally or ethically gray area (e.g., inaccurate health bars, 'rubber banding'), as they relate initially to game experience and enjoyment. Both rubberbanding and non-linear health bars deal with providing one impression while reality is different. This is not inherently negative, and to some degree expected in good game design.⁴

However, the absence of a direct attempt to monetize does not mean that techniques are always harmless in their consequences. For example: if a game is slow and grindy by design, 'speed-up' mechanisms can be directly sold to the player and are more interesting to purchase. Theoretically, this could even be an incentive for commercial actors to slow certain gameplay down, as to sell more 'speed-ups'.

However, **behavioral design can also be positive for well-being**. Behavioral design techniques do not have to be negative: games also have clear benefits.⁵ Games can be designed to facilitate disengagement, meaningful experiences, or supporting the well-being of the gamer. A concrete example is the use of *resting* rewards, where gamers get rewarded for absence from the game with a temporary bonus or reward when they eventually start playing again. In short, design in games can support **well-being** in a variety of ways. Properly designed games can support restorative experiences, help with relaxation, support behavioral activation to guide (health) positive choices, or stimulate physical activity.

Given the previous, the term 'behavioral design' is intentionally **neutral**; it can encompass both the harmful and beneficial design of video games.

0.3 Business meets consumer: Design trade-offs and competing motives

We acknowledge that games are a commercial product and selling the product or adjacent content to consumers in some way is both reasonable and expected. That said, we observe that financial constructions and behavioral pressures on the consumer are rapidly becoming more complex and less transparent to the gamers themselves and their environment, facilitating new risks and confusion. Factors that might contribute to this trend are technological advancement, professionalization of the industry, increased competition, and higher stakeholder demands.

Our previous report provided a categorization of motives to better understand the tensions between various commercial motives and the experience and expectations that gamers and their environment have (see: figure 1).

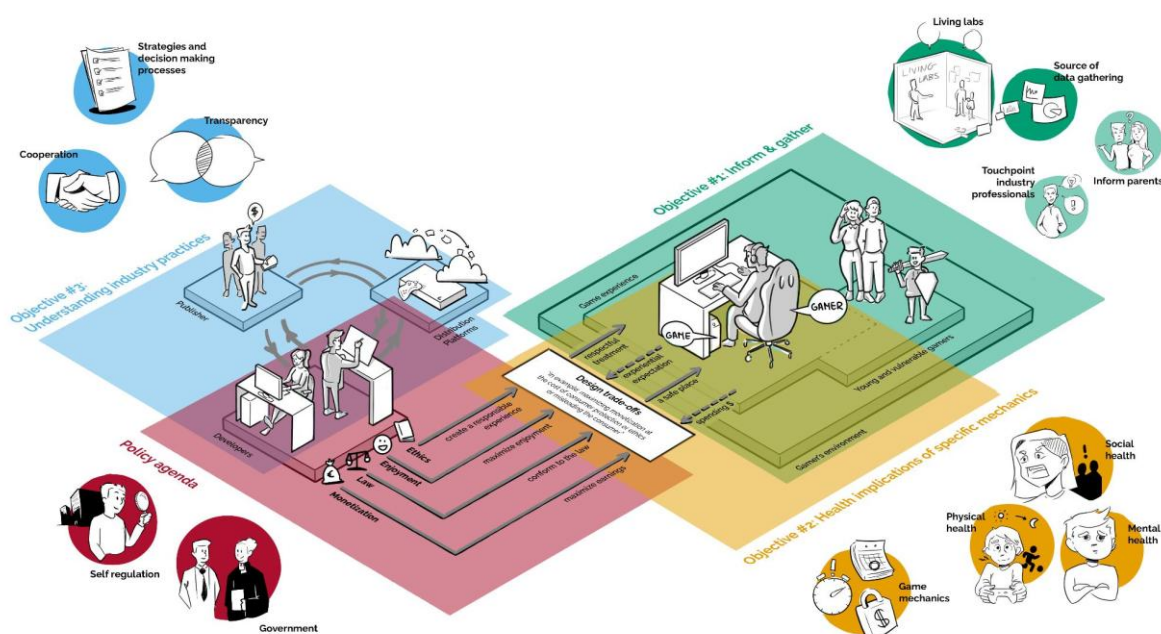


Figure 1: An overview of a two-pronged approach to responsible and ethical behavioral design: both governmental, game industry internal and research efforts (project maintained at <https://osf.io/x9vhs/>, republished from first report ²

On the **industry side** we highlighted the idea that different design motives now compete within games, after the moment of sale: **legal** compliance requirements, **commercial** and **monetization** objectives, and 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.

On the **gamer side**, we highlighted that each of these motives has a counterpart. Where a game might seek to maximize earnings, the gamer is **spending** money - and ideally in a well-informed and honest transaction that does not trigger regrets. Where a game is legally compliant, the gamer (and their parent/caregiver), is experiencing a **safe place to play**. Where a game is seeking to maximize retention of customers by optimizing the game for enjoyment, the gamer might be experiencing a '**good game**'. And finally, when

a game is going the extra mile, with ethically responsible choices, gamers might experience **respectful treatment** and support the company with good-will and additional loyalty in the future.

We described the interplay of choices in behavioral design as 'design trade-offs': a company might aggressively monetize a game, even misleading customers, but this will negatively impact other design motives: ethical, legal, or even enjoyment. Our report identified studies that highlight that gamers are perfectly fine with supporting a game via an honest transaction.^{6,7} But highly visible cases such as the Starwars: Battlefront controversy also show that gamers can feel misled by even the most high profile games^{2(p12)}. The situation can escalate to the point that companies involved feel the need to reverse earlier decisions.

0.4 Behavioral design: Guidance from other organizations

Our team is not unique in identifying the tensions associated with behavioral design and changing design practices. A wide range of actors, ranging from NGO's to market regulators, academics and lawyers have all been vocal about the risks and opportunities associated with trends in behavioral design.

We provide some non-exhaustive examples to highlight this trend.

0.4.1 UNICEF

UNICEF has developed recommendations for the online gaming industry on assessing the impact of game elements on children.⁸ UNICEF states that online gaming is a growing business sector that captures the attention of children around the world. Online gaming can have positive and negative impacts on children. The online gaming industry should recognize this and optimize the positive effects and minimize the negative effects on children. Various behavioral design techniques are mentioned in this report, including pressure on time, simulated gambling and nudging towards purchases.

"For games that offer in-game microtransactions, can players earn the same or comparable items from gameplay without making purchases? If yes, are your games designed to encourage players to purchase virtual items to save time"

- Online gaming and children's rights: Recommendations for The Online Gaming Industry [...] (p. 21)

According to Unicef, children are often unable to recognize these elements and are more prone to techniques seeking to influence behavior. Also, children might not understand they are spending real money when making in-game purchases. Like our work, this report also suggests opportunities for stimulation of healthy play via game design:

Does your game design encourage players to take breaks (e.g. with alerts or rewards)?

- Online gaming and children's rights: Recommendations for The Online Gaming Industry [...] (p. 9)

0.4.2 Netherlands Authority for Consumers and Markets (ACM)

The Netherlands Authority for Consumers and Markets (ACM) highlighted various elements associated with behavioral design in written input for the Fitness Check of EU consumer law (2022).⁹ The topics discussed are based on the ACM's experiences as an agency responsible for enforcement of consumer law and consumer outreach. The ACM has been actively promoting the level of consumer protection in the digital economy in the Netherlands and abroad. In this report, the ACM is particularly vocal about currency conversion in games (emphasis added) and so-called loot boxes (randomized reward containers):

In-game and in-app currencies; the use of in-game and in-app currencies obscures the fact that consumers, particularly children, spend real money. Therefore, it should be considered whether in-game and in-app currencies actually serve consumers in any way whatsoever and should therefore be prohibited. If these currencies are allowed, it should be explicitly required that the 'price' expressed in in-game or in-app currencies is always accompanied by the corresponding monetary price. Additionally, consumers should have the same or similar rights in relation to in-game and in-app transactions as in relation to monetary transactions.

Loot boxes; the widespread use of loot boxes in online games is the cause for various concerns from a consumer-protection perspective. Loot boxes have addictive effects, are marketed aggressively, contain skewed winning probabilities, and may increase consumer spending as a result of the use of their micro-transaction characteristics. It is unlikely that transparency requirements will sufficiently mitigate these risks. Therefore, a prohibition of loot boxes should be considered.

- ACM EU Fitness check report ^{9(p2)}

Interestingly, the ACM also describes fair design, taking a broad perspective. Attention for harms goes beyond **financial** loss, but also includes the lost **time** associated with some design choices:

Fair design; commercial digital environments should be fair to consumers. They should not contain design choices or techniques that harm consumers, whether that is financially, emotionally, in terms of time lost, privacy lost or by creating addiction. Whether a digital environment is fair to consumers should be tested.

- ACM EU Fitness check report ^{9(p7)}

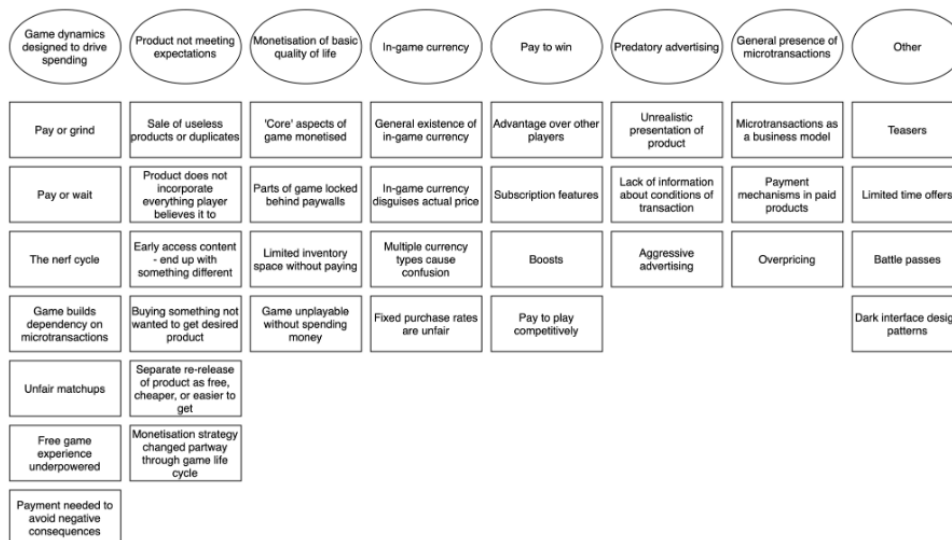
In 2024, ACM has fined EPIC games for using fake countdown timers and direct exhortations to buy to children in Fortnite.¹⁰ These design elements put pressure on children to make purchases in the game and, according to the ACM, constitute unfair commercial practices because they are contrary to the professional diligence that companies must demonstrate under consumer law. The countdown timer was set to a (too) short period of 24 hours to purchase an item, and part of the offer was still available after the timer had expired, making it a so-called 'dark pattern'. Direct exhortations took the form of statements such as 'Get it now' or 'Buy now' to urge players to make a purchase, a practice that is not permitted in relation to children.

0.4.3 Academic game-specialists covering the gamer perspective

Petrovskaya and Zendle gathered information from 1100 video gamers about their negative experiences with transactions in games.¹¹ The authors categorize 35 techniques into eight domains based on their findings. This involves categories such as:

"game dynamics designed to drive spending, product not meeting expectations, monetisation of basic quality of life, predatory advertising, in-game currency, pay to win, general presence of microtransactions and other (involving dark design patterns, battle passes, limited time offers, and teasers [eds: free initial parts of in-game items, which are ultimately not usable without spending])"

- *Predatory Monetisation? A Categorisation of Unfair, Misleading and Aggressive Monetisation Techniques*¹¹



- *Figure 2: Predatory Monetisation? A Categorisation of Unfair, Misleading and Aggressive Monetisation Techniques (Figure 1 in paper)*¹¹

The categorization is derived from the perspective of gamers themselves and their subjective frustration with game design, but the resulting elements are relevant for the current project. They demarcate a large portion of the relevant topical space, at least for behavioral design elements which are visible to the gamers (see: Figure 2).

Types of pressures on **time**, **money** and **attention** (e.g., aggressive advertising) are identified in multiple complaints. Note that the study was designed to focus on negative techniques, positive design choices were not an aim.

0.4.4 Lawsuits against game companies

We highlight an example of legal action against a video game company, with specific attention for the complaints. The specific case covers Fortnite, with the parties of A.B. (anonymous) and Epic Games.¹² The complaint indicates which elements in game design cause concern with parents/children - and ultimately move teams of lawyers to proceed to action. The lawsuit outcome is less relevant within our current methodology, as we are seeking to identify behavioral design techniques, rather than follow-up on their impact.

A.B. is the mother and legal guardian of the minor, C.D. A.B. and C.D. are both residents of Vancouver (Canada). They are proceeding against Epic Games, the video game developer of Fortnite. As C.D. has been playing Fortnite, using A.B.'s credit card without her authorization.

It is claimed Epic Games designed Fornite to be as addictive as possible. Resulting in 'C.D. developing an adverse dependence on the game, which has materially and negatively impacted his mental and physical health, well-being, and relationships with

friends and family. It caused him to spend thousands of dollars on in-game purchases.'

The allegations also cover various concrete examples of behavioral design decisions that raise concern with the legal team. The designed dependence or addiction accusations are of secondary concern in the current report, but a disordered pattern of play could conceivably be interpreted as the negative end result of a number of highly stimulating design choices that encourage play at the expense of (financial) health.

*"Using the Collected User Information and other tools at its disposal, Epic Games continuously adapts and updates Fortnite with a view to (a) increasing the **time** players spend playing Fortnite, and (b) increasing the amount of **money** a player spends on in-game purchases."*

- *Fortnite case, between A.B. and Epic Games* ¹²

More directly relevant for this report are the concerns raised by the legal team about a variety of specific behavioral design elements:

- **Monetization practices:** Fortnite is thought to pressure players into making in-game purchases. In this context, time-limited purchasing windows for in-game items are mentioned, as well as artificial scarcity of in-game items. Rewards are provided for purchasing these cosmetic items and game passes and as such, users are exploited into spending more money within the game because they are rewarded with points for doing so. Deceptive practices are also mentioned, including misrepresentation of the normal price of in-game items when offering a discount, confusing interfaces, one-click purchases and hidden refund/cancellation options.
- **Agenda setting / timed play pressures:** Fortnite is thought to stimulate players to increase time spent on the game with pressures that go beyond just offering an enjoyable gameplay experience. For example, Fortnite offers rewards for completing challenges each day (**playing by appointment**). These rewards are doubled on weekends, stimulating play on these days. Also, Fortnite incorporates various social events, which are thought to stimulate "*fear of missing out*". Rewards that are available for a limited time only feed into this pressure to play now, or miss rewards.
- **Attention grabbing and commitment building.** Firstly, according to the legal team, Fortnite uses **variable rewards systems** that are compared to slot machines or other gambling-like activities. Players therefore keep on playing, hoping to receive additional or greater rewards. The content in the game changes every ten weeks and continuously updates (**content refresh**), which keeps players' interests and encourages them to keep coming back to the game. A heavy emphasis on customization of characters and purchases or unlocks of cosmetic items, further raises individual commitment - as well as financial investment - in the Fortnite account.

While this specific complaint deals with Fortnite, we do not wish to single out this game. We highlight that fairly similar legal complaints have been raised in other cases that cover a wider variety of games and publishers. For example, the case of "Casey Dunn vs Game companies".¹³ That case covers a wide range of major video game publishers, including Activision Blizzard, Electronic Arts, Epic Games (Fortnite), Ubisoft and others. Specific behavioral design elements discussed are somewhat similar to the previous case.

0.5 Aim: Raising public awareness about behavioral design

The previous examples indicate that a diverse group of societal actors raise concerns about current trends in game design, while also highlighting options for 'fair' and health-supportive video game design. While our examples are arguably non-exhaustive, all of them are relevant and they converge on similar main themes to a large degree. Concerns are repeatedly raised about pressures that are placed on money, time and attention via design. Our analysis thus highlights that some of the challenges with behavioral design are increasingly known among NGOs, law firms and market regulators.

But we suspect the average gamer - and particularly their social environment - will still have a very hard time staying informed about the various design trade-offs and behavioral pressures that they are exposed to. This raises the question if public information efforts are already in place, to properly inform the general gaming audience and their environment.

For video games and audiovisual productions more broadly there are multiple systems in place that convey to consumers through pictograms and text what type of **content** is present in a game, such as Kijkwijzer, PEGI and Gamewijzer. These systems are explained in more detail in [Section 3.2.1](#).

All in all, we believe that existing approaches do not cover behavioral design to the degree that parents and gamers could be considered to be fully informed on the potential behavioral pressures that they might encounter in games.

The current project aims to provide an effort that might enrich or supplement these systems in the future, with a specific focus on behavioral design pressures. We formulate the following aim:

- **How can we increase awareness about behavioral design in gamers and their environment?**

0.6 Limitations and scope

Due to the complexity of the subject matter, we demarcate the scope of this project, indicating some limitations and ambitions:

Firstly, we approach public information very **broadly**, given the complexity of the subject matter. While informative icons and text about (forms of) behavioral manipulation may potentially be an effective way to inform people, this project departs from a broader initial perspective. It considers multiple options that might educate the public better on what is happening in video games in terms of behavioral design. We are cautious as behavioral design is potentially quite a bit harder to explain than the presence or absence of certain types of content (let's say: depictions of tobacco smoking or scary images).

Secondly, we depart with a focus on **direct design pressures** that include well-being and behavior, including user-visible elements. This means that we exclude safety issues related to social interactions between players as well as privacy and data protection related monetization and marketing issues, for example. Hidden forms of behavioral design are acknowledged, but ultimately out of scope for the initial prototype we develop.

We **do** focus on behavioral design elements that directly pressurize user's financial or time-related behavior, cognitive load, and/or well-being in the broadest sense of the word (see the WHO definition on well-being).

Finally, we focus on providing **transparency first** and foremost, so that the consumer/gamer and their environment can make their own decisions in an informed capacity. There is a normative discussion to be had about many elements: are they valid marketing approaches or do they cause harm? If so: how much harm? Do some choices violate (young) gamers' consumer or data protection rights? Follow-up work can pursue these questions: the current report focuses on classification and education.

Section 1. Classification system

As highlighted in the introduction, we identified a need to classify behavioral design in games.

Our earlier work² already provided insights into the history and challenges of behavioral design. It indicates a need for a classification tool that allows people interacting with games to classify what behavioral design mechanisms a game uses, how these mechanisms are used, and if these mechanisms are potentially harmful. It also summarizes behavioral manipulation and deceptive patterns and provides the required grounding in psychological literature.

In addition to these frameworks and earlier research focused on behavioral design, we now discuss existing approaches to categorize media content (see [section 3.2.1](#)), i.e., PEGI, Kijkwijzer, USK, IARC, and ESRB.

1.1 Frameworks of psychological manipulation

Changing business models in the games industry and especially free-to-play games and microtransactions have opened up opportunities for the use of a range of psychological techniques to foster engagement and purchase.² Some of these techniques are outright deceptive - they make the user believe, for example, the need to purchase within a certain time frame - which then is simply reset and the same items are still available.¹⁴

Psychological work on biases, persuasion, and addiction is essential to understand the underlying mechanisms that are used to optimize player engagement and funding.

We identified and reported that modern games leverage psychological mechanisms to foster user engagement and conversion. Some examples of specific motivations to purchase are *unobstructed play, social interaction, competition, economical rationale, or using video games to engage children while parents attend to other tasks*.¹⁴ On a deeper level well known behavioral change approaches can also be identified and seen to be regularly applied in games. Examples include *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, and conditioning and cue altering*.¹⁴

When games are being optimized for spending, the inherent logic is that player retention is key to convert time spent on a game into purchases. For example, the more often a player logs in, the longer they play, and the more they immerse during a single session the more likely they will spend. Hamari et al. (2020) address the tension between creating an engaging freemium product and user willingness to purchase⁷. They describe the value of a large user base, where even small increments in purchasing behavior lead to substantial revenue. They also identify that making a 'freemium' game more enjoyable without facilitating further purchases is a double edged sword. It increases the size of the user base (and thus increases profits as a larger game also attracts more paying customers), but additional enjoyable and free content can simultaneously reduce purchases and in-game spending as the incentive to spend is lower.

1.2 Rating systems & coding of behavioral design

Game rating systems have shown awareness of the impact of digital commercial practices on consumers since the recognition of in-game purchases in 2018, e.g., ESRB¹⁵ and PEGI¹⁶, and expanded their labels in 2020 to recognize random items such as Loot Boxes. See [Section 3.2.1](#) for an overview and brief explanation of systems.

Since Germany's Entertainment Software Self-Regulation Body - Unterhaltungssoftware Selbstkontrolle (USK) - has expanded its system to recognize "Pressure to Play Excessively" and "Increased Incentives to Purchase"¹⁷ following the introduction of the German Youth Protection Act in May 2021. We will briefly explain it a bit further here as well.

The coding of game content to age labels relies on self-reports through structured questionnaires for all major rating organizations.^{15,16} The different organizations have audits or committee-based systems to evaluate the games based on the reported content and verify the age-appropriateness depending on the rating system criteria.

The USK system (see Figure 3), for example, asks explicitly about "chat (text, voice, media)," "in-game purchases," "in-game purchases + randomized objects," "location sharing," and "Other" features included in the product.¹⁷ Features that lead to pressure to purchase, such as multiple in-game currencies, pay2win-mechanism, and/or pushy messaging like purchase timers, would require self-declaration in the self-report form or to be discovered when audited. Examples of pressure to play excessively include push messages, season passes, and/or rewards such as comeback gifts or mechanisms that punish not playing, e.g., loss of progress or loss of avatars.

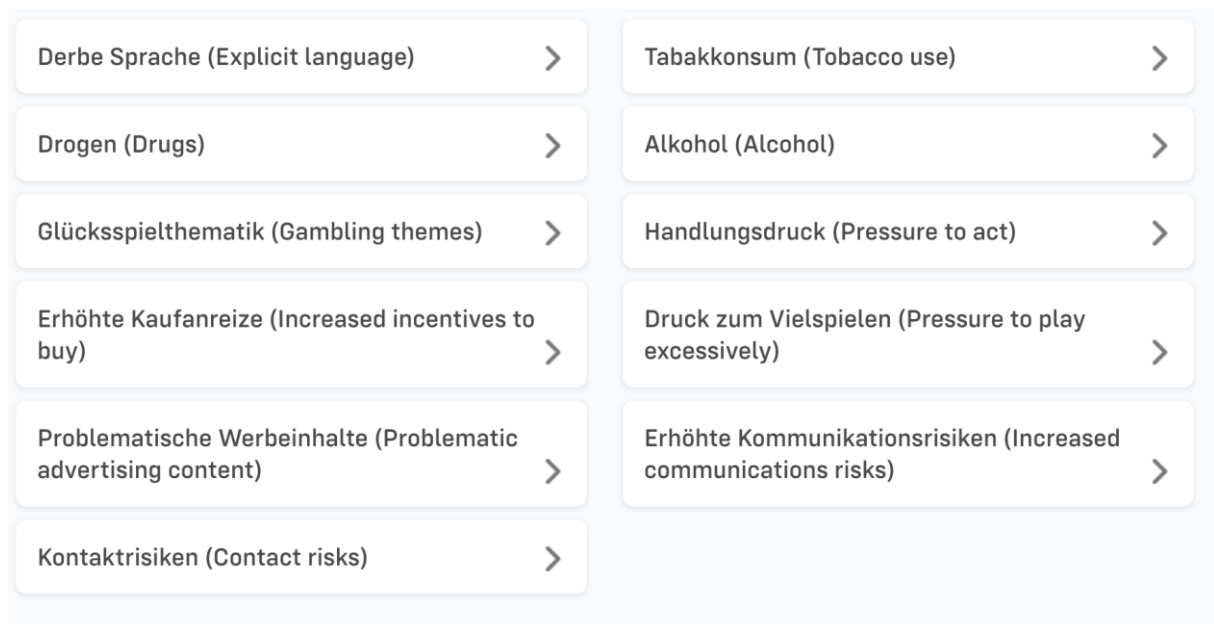


Figure 3: USK. A screenshot of <https://usk.de/> showing various categories, including "Pressure to play excessively", and "Increased incentives to buy".¹⁷

1.3 Game-check version 1.0

In our work on the 'game-check'-tool, we drew from our background work on psychological manipulation in games and previous work on video game classification conducted by rating systems and their coding of behavioural design.

To design the classification system, we aimed for two iterations, each complemented by a stakeholder meeting that would provide an expert perspective of the value and capacity to be promoted as supporting existing classification approaches. Details of our stakeholder meetings and future implementation efforts can be found in [Section 3](#).

Creating a comprehensive classification system for video games is challenging due to the high complexity and variability of games. One approach - which we pursued in the second iteration - is to classify observable features, e.g., season passes.

In this first version of game-check, we aimed to investigate and code behavioral design techniques from the perspective of a game developer - that is, from a perspective of game design and accounting for opportunities and limitations of the technical implementation of a game.

When designing the classification system, we draw from our collective professional expertise:

- Max V. Birk, PhD brings experience in game design, human-computer interaction research, and research on the effect of design on experience, cognition, and behavior. He has played games on different devices all his life and engaged with different business models. Personally and professionally he has observed changes in the technological landscape closely. He teaches game design, human factors, and courses on technology and well-being at the [Eindhoven University of Technology](#)
- Antonius J. van Rooij, PhD (Tony) is the lead researcher on gambling and digital media at the [Trimbos Institute](#). He has almost twenty years of experience in setting up and executing applied research projects on these topics. His current activities within the Trimbos Institute focus on promoting the responsible use of video games and new media. He also focuses on prevention of gambling disorder/addiction and gambling related harms. He is specifically interested in scientifically based interventions and applied research that helps gamers, gamblers, and media users find a healthy balance.
- Simone van der Hof, PhD is a full Professor of Law and Digital Technology at the [Center for Law and Digital Technology \(eLaw\)](#) at Leiden Law School, Leiden University. Her research focuses on the intricate relationship between children's rights and digital technologies, with a particular emphasis on three vital dimensions: privacy and data protection, protection against economic exploitation, and the fundamental right to play. Her work explores the ever-evolving landscape of children's rights in the digital era, seeking to understand and address the unique regulatory challenges posed by digital technologies to the rights and well-being of children.

We identified 11 focus areas relevant to behavioral design (table 1). Each focus area contains several questions. The presented list of questions is non-exhaustive. For a full overview, see [Appendix 1](#).

Table 1: Focus areas relevant to behavioral design

Category	Description	Example Questions
1. Game Description	Basic information about the game and its core mechanics	• What's the name of your game? • What are the mechanics of the game?
2. Monetization	How the game generates revenue and whether spending is required	• Does the game include in-game purchases? • Are the objectives of the game achievable without spending money?
3. Resources	In-game assets, currencies, or items that players can collect or use	• What resources does the game feature? • Are resources distributed dynamically, i.e., using any kind of distribution algorithm?
4. Time	Time-based mechanics and restrictions	• Are any features of the game time-sensitive? • Are time-sensitive features restricted to daytime?
5. Content Generation	How game content is created and distributed	• Does the content generation follow a fixed algorithm? • Is there a marketplace for user-generated content?
6. Deception	Transparency in game mechanics and interfaces	• Are in-game events accurately represented in the game's interface? • Is deception used to improve gameplay?
7. Engagement	Mechanics designed to increase player retention and playtime	• Are player data evaluated to increase time spent? • Does the game contain features that auto-engage you in new content, e.g., auto-start?
8. Social Features	How players interact with each other through gameplay	• Does the game enable players to play together? • Does the game feature a comparison between players' resources?
9. Novelty	How new content is introduced to maintain player interest	• Is the content of the game finished at purchase? • Is new content introduced regularly?
10. Player-to-Player Communication	How players can communicate with each other	• <i>Features:</i> Can players text each other directly? • <i>Interventions:</i> Is text communication filtered?

11. Game-to-Player Communication	How the game communicates with players	• Does the game use push-notifications to communicate with the player outside of the game? • Are players invited back to game?
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1.3.1 Testing gamecheck 1.0

To test the system, we used the system for coding games on multiple platforms, i.e., mobile, console (PS4), and PC. A strong focus is placed on mobile games: mobile game app stores contain a high number of free-to-play games, with a variety of purchase mechanisms and microtransactions.

In total, we coded 48 unique games on varying platforms. The majority were smartphone/tablet games (30, 62.5%). A few games could be played on varying platforms (6, 12.5%), only on a computer/laptop (5, 10.5%), or game consoles (7, 14.5%).

For comparison reasons, we coded three games that are classified as “Infinite Runner” games. These are games where the player continuously moves forward and can take minimal actions, e.g., change lanes or jump. We chose Infinite Runner games because they offer plenty of options for commercial practices and behavioral design. We chose three infinite runner games: Despicable Me: Minion Rush, Subway Surfers, and Alto’s Adventure. These games were advertised for different market segments and, after a brief inspection, suggested that they would use varying levels of behavioral design. We chose these similar games to demonstrate the tool’s capacity to identify different levels of behavioral design. The full results can be found in [Appendix 2](#).

1.3.2 Stakeholder Engagement with tool 1.0

We presented the coding tools, a summary of the coded games, and our impressions of the process to our stakeholder group.

Our main findings were that the tool was too complex to apply. The level of abstraction was considered a bit too high, e.g., some of the concepts are difficult to observe or normative without proper scientific grounding. The need for expertise on the game (including knowledge that only developers have), was perceived as reducing the pool of people who can code a game too much. This approach would exclude users and parents as well. Moreover, it would make it challenging to objectively observe some of the mechanisms highlighted. Overall, the tool was perceived as too broad. While the directions we took sparked interest, the implementation would require additional reduction and streamlining. Additional information on the involved group of stakeholders can be found in the [final chapter](#).

Consequently, for the next iteration, we shortened the tool. We also provided additional focus on central topics, made decisions that removed difficult to grasp concepts, and we removed concepts that steered away from the central issue of identifying behavioral design mechanisms. Topic-wise, we decided to focus on the most central issues highlighted by ourselves and other parties for the next iteration of the game-check tool, namely pressure on money, time, and attention. These themes converge and are seen as

centrally relevant during the stakeholder meeting, the expert interviews, and the exploratory interviews with parents and gamers (see next chapter). They also align with the concerns raised by other parties, as discussed in the introduction of this report, and our own experiences.

1.3.3 Student Contributions

The process was supported through several student projects.

- Sigi van Lindt performed the coding of 40+ games, documented and categorized behavioral design methods (see [Appendix 3](#)), and provided active feedback on the value of the classification tool.
- Charlie Rijvers conducted interviews with parents to understand how parents with and without experience with games perceive behavioral design methods. Her thesis highlights that parental video game literacy varies based on their personal gaming experience.¹⁸ Their literacy affects their ability to supervise and educate their children on in-game behavioral strategies. The findings suggest that improving parental awareness through accessible resources could enhance their ability to guide their children's gaming habits.

1.4 Game-check version 2.0

Considering that the first iteration was perceived as to require substantial background knowledge and sometimes inaccessible game developer knowledge, and that the outcomes of such an assessment would be challenging without access to the game code, we decided to change perspective. We changed to an approach that departs from more public facing information, starting out by categorizing observable features in games.

While this removes algorithmic manipulation in games, it allows one to focus on aspects of gameplay that can be observed by experts and lay people. We drew from the categorization we performed in our initial report, "Behavioral Design in Games," and the examples categorized by student Sigi van Lindt.

The second iteration of the classification tool is divided into pressure on **money**, pressure on **time**, and pressure on **attention**/engagement, and includes 28 categories of game elements, e.g., "Daily Quest", that are potentially used to exert pressure and a brief description of these elements, e.g., "Reset every 24 hours, offering special rewards for players who complete them within the day (e.g., Genshin Impact, Fortnite)".

The approach is different to our first iteration by focusing on observable characteristics of game play, e.g., the presence of battle passes or not. Based on the feedback we received for the first iteration we decided to increase the accessibility of the tool to different stakeholders, i.e., game developers, parents, professional media coders, researchers, and players. The approach is easier to evaluate, requires less inside knowledge or users guessing about the intentions of the developers. Thus, the second iteration of the classification tool evaluates only what can be observed.

In addition to providing the means to identify game elements that are potentially used to exert pressure, we also provide question about game elements that have a positive intent, e.g., "All transactions are denominated in Euros", "Timed feature rewards can also be obtained in regular play", or "Extended breaks in play have no adverse

consequences". The focus of the tool has been on identifying potentially harmful behavioral design elements. Hence, the positive side of design leaves space for future development. An overview of all questions as presented during the stakeholder meeting can be found in [Appendix 3](#).

1.4.1 Pressure on Money

In this category, we categorize game-elements that have the potential to exert direct pressure to spend money on players (table 2). Examples are in-game currencies or seasonal battle passes. In total this section of our tool includes 9 top-level categories - i.e., Microtransactions, Downloadable Content (DLC), Battle Passes, Pay-to-Progress Systems, Subscription Models, Cosmetic Customization, In-Game Convenience Sales, Seasonal and Event-Based Monetization, and Patreon/Crowdfunding/In-App Support - and 24 subcategories, e.g., Cosmetics/Skins. Additionally, we provide examples of games that use game elements in each subcategory, e.g., "Clash of Clans".

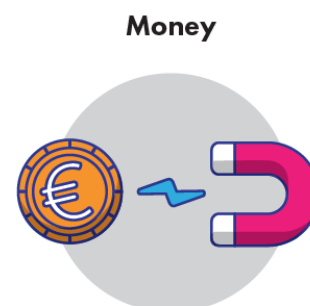


Table 2: Pressure on money

Subcategory	Description	Examples
Microtransactions		
In-Game Currency	Players purchase virtual currency with real money to buy cosmetic items, boosts, or other non-essential features.	Fortnite V-Bucks, Genshin Impact Primogems
Cosmetics/Skins	Non-gameplay-altering cosmetic skins for characters, weapons, or environments.	Fortnite Skins, League of Legends Champions/Skins
Emotes/Animations	Special animations, victory poses, or emotes for in-game interactions.	Fortnite dances, Destiny 2 emotes
Gameplay-Relevant Content	Players purchase upgrades, boosts, characters, or unlocks impacting gameplay. Can lead to 'pay-to-win' scenarios.	Clash of Clans speed-up timers
Loot Boxes/Gacha Systems	Players purchase randomized rewards such as rare characters, weapons, or skins.	Genshin Impact banners, Overwatch loot boxes
Complex Purchasing Options	Systems like piggy banks, sequential offers, or accumulated vaults requiring a purchase to unlock rewards.	Tiny Tower offers, in-game vault unlocking systems
Downloadable Content (DLC)		

Expansions/Story Packs	Paid expansions adding new missions, storylines, or areas.	The Sims expansion packs, Destiny 2 expansions
Character/Weapon Packs	Additional characters, weapons, or items as optional DLC for gameplay enhancement.	Smash Bros. DLC characters, Mortal Kombat Kombat Packs
Battle Passes		
Premium Battle Pass	Players purchase premium battle pass tracks for additional rewards.	Apex Legends, Valorant Battle Pass
Seasonal Battle Pass	A tiered system with both free and premium tracks rewarding cosmetics, currency, and items upon progression.	Fortnite, Call of Duty: Warzone Battle Pass
Battle Pass Level Skips	Players pay to advance in battle pass tiers, unlocking rewards faster.	Fortnite Level Skips, Apex Legends Tier Skips
Pay-to-Progress Systems		
Time-Savers/Boosters	Players pay for faster progression through experience boosters or resource multipliers.	Clash of Clans speed-up timers, FIFA Ultimate Team boosters
Early Access to Content	Paying for early access to new content before public availability.	Call of Duty early weapon unlocks
Subscription Models		
Ongoing (Premium) Subscriptions	Subscriptions offering exclusive perks, like faster progression and premium items.	Runescape Membership, World of Warcraft Subscription
Temporary Monthly/Seasonal Subscriptions	Recurring or seasonal subscriptions providing limited-time bonuses or exclusive content.	Fortnite Crew, Genshin Impact Blessing of the Welkin Moon
Cosmetic Customization		
Character Customization	Paid customization for avatars, outfits, accessories, or hairstyles.	The Sims 4, Roblox customization options
UI Themes and Decorations	Custom user interface themes or home base decorations.	Clash of Clans custom bases, League of Legends ward skins
In-Game Convenience Sales		

Inventory Space Expansion	Players pay to expand inventory space, allowing them to carry more items.	Destiny 2 vault expansions, Genshin Impact inventory expansions
Character/Loadout Slots	Additional character or loadout slots for varied builds.	Warframe extra slots, Call of Duty loadout expansions
Fast Travel/Teleportation	Players purchase fast travel or teleportation options to reduce in-game travel time.	Black Desert Online fast travel systems
Seasonal and Event-Based Monetization		
Event-Specific Purchases	Limited-time event-exclusive skins, items, or packs.	Overwatch holiday skins, Apex Legends event loot
Seasonal Currency	Special event currencies requiring real money for exclusive rewards.	Destiny 2 event currencies
Patreon/Crowdfunding/In-App Support		
Patreon/Creator Support	Direct player support for content creators via subscriptions or donations.	Roblox creator commissions
Crowdfunding for New Content	Players fund game features through platforms like Kickstarter, often receiving exclusive rewards.	Star Citizen crowdfunding for ships

1.4.2 Pressure on Time

This section of our tool categorizes game elements that utilize time pressure and limited availability to drive player engagement, encompassing 6 top-level categories - i.e., In-Game Events, Time-Gated Content, Real-World Time-Based Features, Competitive or Social Features, Energy/Resource Recovery, and Real-Time Multiplayer Synchronized Events - and 18 subcategories, e.g., Daily Quests or Challenges (table 3). Additionally, we provide examples of games that implement these mechanics in each subcategory, e.g., "Genshin Impact" or "Fortnite". This highlights how developers leverage time constraints to maintain player retention and encourage regular gameplay sessions.

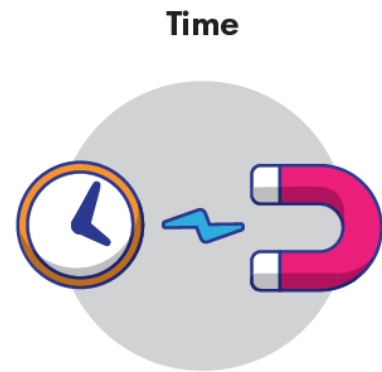


Table 3: Pressure on time

Subcategory	Description	Examples
In-Game Events		
Daily Quests or Challenges	Reset every 24 hours, offering special rewards for players who complete them within the day	Genshin Impact, Fortnite
Weekly Quests or Challenges	Available for a week and then rotate, providing limited-time objectives and rewards	Destiny 2, World of Warcraft
Seasonal Events	Special events tied to real-world holidays or seasons, such as Christmas or Halloween, often feature exclusive rewards and content	Overwatch, Animal Crossing
Limited-Time Game Modes	Game modes that are only available for a limited time, such as a weekend or during specific event periods	League of Legends' ARURF mode
Time-Gated Content		
Timed Raids or Dungeons	Raids or boss battles that are only accessible during specific in-game times or dates	Final Fantasy XIV, World of Warcraft
Flash Sales/Shop Rotations	In-game stores that offer special discounts or rare items for short durations, typically resetting every few hours or days	Fortnite, Apex Legends
Exclusive Time Windows for Specific Content	Certain in-game activities or NPCs are only available during specific in-game time periods, such as nighttime	The Legend of Zelda: Breath of the Wild
Event-Specific Rewards	Rewards that can only be earned during specific events or limited-time promotions	Call of Duty battle pass content, FIFA

		Ultimate Team promos
Time-Limited Loot Boxes or Gacha Pulls	Special loot boxes or gacha banners that offer exclusive rewards for a limited period	Genshin Impact banners, Hearthstone expansions
Real-World Time-Based Features		
Real-World Timers	Features or events tied to real-world time, such as daily resets, weekend-specific content, or events tied to player location's time zones	Pokémon GO community days
Daily Login Rewards	Rewards given for logging in on consecutive days, usually resetting after a certain period	Clash of Clans, Genshin Impact
Progression Loss Risks When Not Playing	Risk to in-game progression exists when not playing, for instance, in-game buildings or the city can be attacked, resulting in progression loss. Often combined with options to buy 'protection' for x hours	Clash of Clans, EVE Online
Competitive or Social Features		
Time-Limited Tournaments	Competitive events or tournaments that take place for a limited period, often with unique rewards	Fortnite competitive seasons, Rocket League events
Leaderboards Reset	Leaderboards or rankings that reset weekly or monthly, often tied to special in-game rewards	Hearthstone ranks, League of Legends ranked rewards
Energy/Resource Recovery		
Energy Systems	Many games limit player action through energy or stamina systems that regenerate over time, requiring players to wait to continue	Candy Crush, Clash Royale
'Real World Time' Timers	Building or upgrading structures that take real-world time, sometimes with options to speed up via currency. Variants include in-game currency pickups that accumulate periodically with limited storage capacity	Clash of Clans, Hay Day
Real-Time Multiplayer Synchronized Events		
Scheduled PvP Matches	Some competitive games schedule real-time multiplayer events or matches, requiring players to log in at a specific time	Call of Duty tournaments
Guild Events/Clan Wars	Team-based events or wars that take place at specific times, require coordination among players	Clash of Clans, World of Warcraft guild raids

1.4.3 Pressure on Attention/Engagement

This section of our tool categorizes game elements designed to capture and maintain player attention, encompassing 9 top-level categories - i.e., Direct Calls for Attention, Login and Streak-Based Incentives, Advertising/Partnerships and Redirected Attention, Progression Systems, Social and Multiplayer Features, Narrative and Content Updates, Customization and Collectibles, Competitive Play and Rankings, Personal Milestones and Goals, and Community and Content Creator Engagement - and 19 subcategories, e.g., Daily Login Rewards. Additionally, we provide examples of games that implement these engagement mechanics in each subcategory, e.g., "Fortnite" or "Pokémon GO," highlighting how developers utilize various psychological techniques to maximize player retention and session frequency (see table 4).

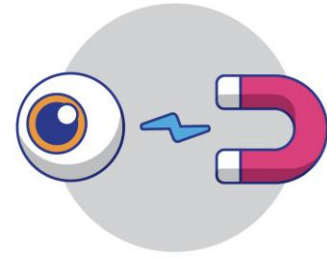


Table 4: Pressure on attention/engagement

Subcategory	Description	Examples
Direct Calls for Attention		
(Pop-up) Notifications About Gameplay	Notifications to come back to the game, when outside of the game. Can involve specific in-game tasks, timer completion, or specific purchases	Mobile games push notifications
Sales Notifications Disrupting Gameplay	Notifications that disrupt regular gameplay with offers (e.g. screen filling advertisement, buy ... now / special offer, etc.)	Free-to-play mobile games
Social Feedback/Notifications	Notifications about purchasing or playing activity of friends in and around the game	Facebook games, mobile titles with friend networks
Notifications for New Content	Notifications about new content in and around the game	Fortnite, Call of Duty updates
Login and Streak-Based Incentives		
Daily Login Rewards	Players receive rewards for logging into the game daily, incentivizing frequent participation	Genshin Impact, Fortnite, Clash Royale
Streak-Based Rewards	Players earn increasingly better rewards for maintaining a continuous streak of actions, such as logging in daily or completing missions	Pokémon GO 7-day Pokéstop streak, Call of Duty: Mobile streak logins
Advertising/Partnerships and Redirected Attention		

In-Game Ads Watching	Free-to-play games feature banner ads, video ads, or product placements, sometimes offering rewards to players who watch them	Candy Crush, Clash of Clans
Brand Collaborations	Partnering with real-world brands for exclusive in-game content or events, often with themed cosmetics or items	Fortnite Marvel and Star Wars skins, Animal Crossing Sanrio packs
Diverting User Attention to Other Games	The game redirects the user to other games, generally for a reward in the primary game. If tasks are completed in the secondary games, the reward is granted, with an intermediary app tracking fulfillment	Cross-promotional offers in mobile games
Progression Systems		
Leveling and Progression Systems	Players unlock new content, abilities, or rewards by leveling up characters or accounts, motivating them to keep playing	World of Warcraft, Overwatch, FIFA Ultimate Team
Challenges and Achievements	Players complete specific objectives or challenges to earn rewards, badges, or achievements, encouraging them to aim for difficult or varied goals	League of Legends, Assassin's Creed, Xbox Live Achievements
Progression on Time-Limited Precommitment Systems	Progression on systems that require an upfront currency/token/item investment and that involves tracked progress that is retained between game-sessions	Battle passes in Fortnite, Apex Legends
Social and Multiplayer Features		
Social Features and Clan Systems	Encouraging players to join guilds, clans, or groups to team up with friends or fellow players, fostering community and shared progress	Clash of Clans, Destiny 2, World of Warcraft
Narrative and Content Updates		
Narrative-Driven Content Updates	New storylines, characters, or missions are added over time, keeping players engaged with a continuously evolving narrative	Destiny 2 seasonal storylines, Final Fantasy XIV expansion updates, The Witcher 3 DLC expansions
Customization and Collectibles		

Player Customization	Offering extensive customization options for characters, homes, or in-game items, motivating players to spend time personalizing their experience	Animal Crossing: New Horizons, The Sims 4, Fortnite skins
Collectibles and Unlockables	Players collect rare items, characters, or unlockables, driving them to complete content to show off achievements	Pokémon GO Pokédex, Super Smash Bros. character unlocks, Genshin Impact character banners
Competitive Play and Rankings		
Competitive Rankings and Leaderboards	Ranked modes or leaderboards encourage players to compete for higher ranks or rewards, fostering replayability and competitive interaction	League of Legends, Rocket League, FIFA Ultimate Team
Personal Milestones and Goals		
Personal Goals and Milestones	Players set personal milestones or goals, such as unlocking a specific item or completing a mission, driving engagement and focus	Minecraft building goals, Stardew Valley farming goals, Animal Crossing: New Horizons village development goals
Community and Content Creator Engagement		
Content Creator and Community Engagement	Engaging players through community events, content creation (like streaming or custom levels), or highlighting community achievements keeps players active	Fortnite streamer events, Minecraft custom maps/mods, Roblox user-generated content

1.4.4 Stakeholder engagement with tool 2.0

We presented the coding tools, a summary of the coded games, and our impressions of the process again to our stakeholder group.

The more tangible version of the tool raised questions regarding consistency of coding, implementation potential, and future development of the tool. Points of attention and a more detailed perspective of the tool are presented in the [final chapter](#), where we discuss stakeholder engagement and explore potential pathways to implementation.

1.4.5 Visualizing results from Coding Tool Version 2.0

To test the coding tool, we applied it to three games. These games are known for different approaches to monetization, i.e., Tiny Tower - which follows a fairly aggressive approach to monetize, Diablo IV - which is known to be a AAA game with a fairly steep purchase price and includes monetization mechanisms, and Stardew Valley - which monetizes only on units sold.

Table 5 below shows counts for each subcategory within each of the categories, pressure on money, pressure on time, and pressure on attention/engagement. The table shows that as expected, Stardew Valley is using almost no elements that are used to apply pressure to players - the game provides information about progression and offers opportunities to customize and collect items, but does not have monetization strategies for those game elements. A detailed breakdown of the subcategories can be found in [Appendix 4](#).

Table 5. Game-check coding tool - counts per category.

	Tiny Tower	Diablo 4	Stardew Valley
Pressure on Money			
Microtransactions	5	3	0
Downloadable Content (DLC)	0	1	0
Battle Passes	1	3	0
Pay-to-Progress Systems	1	0	0
Subscription Models	1	0	0
Cosmetic Customization	2	2	0
In-game Convenience Sales	1	0	0
Seasonal and Event-Based Monetization	2	1	0
Patreon etc.	0	1	0
Pressure on Time			
In-Game Events	4	3	0
Time-Gated Content	4	3	0
Real-World Time-Based Features	2	1	0
Competitive or Social Features	0	2	0

Energy/Resource Recovery	2	1	1
Real-Time Multiplayer Synchronized Event	0	0	0
Pressure on attention/engagement			
Direct calls for attention	3	4	0
Login and Streak-Based Incentives	2	0	0
Advertising/Partnerships and Redirected Attention	3	2	0
Progression Systems	3	3	2
Social and Multiplayer Features	1	1	0
Narrative and Content Updates	0	1	0
Customization and Collectibles	2	2	2
Competitive Play and Rankings	0	1	0
Personal Milestones and Goals	1	1	1
Community and Content Creator Engagement	0	1	0

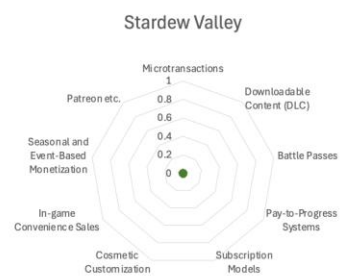
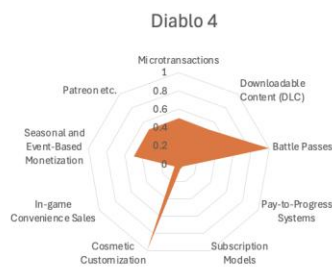
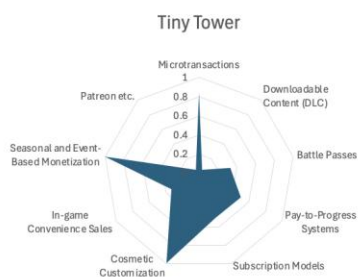
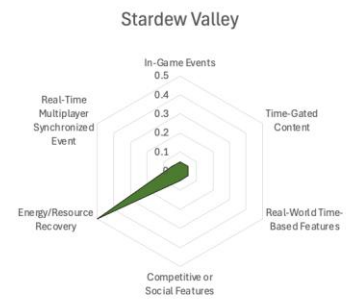
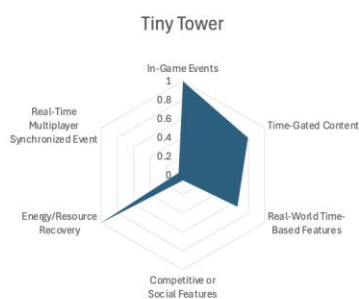
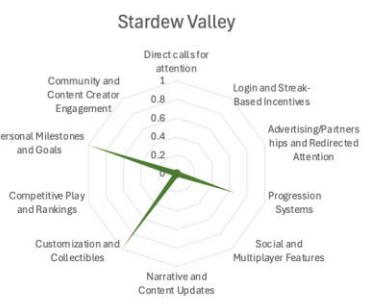
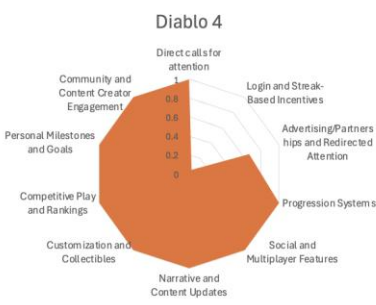
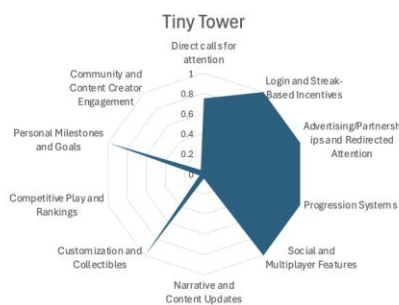
Pressure on Money**Pressure on Time****Pressure on Attention/Engagement**

Figure 4: Radial plots, split for pressure on Money/Time/Attention

Figure 4, above, shows radial plots of three games (Tiny Tower, Diablo IV, and Stardew Valley) by the three categories of pressure, i.e., money, time, attention/engagement. Each radial plot shows fulfillment of measurement criteria by category over the total items in each category.

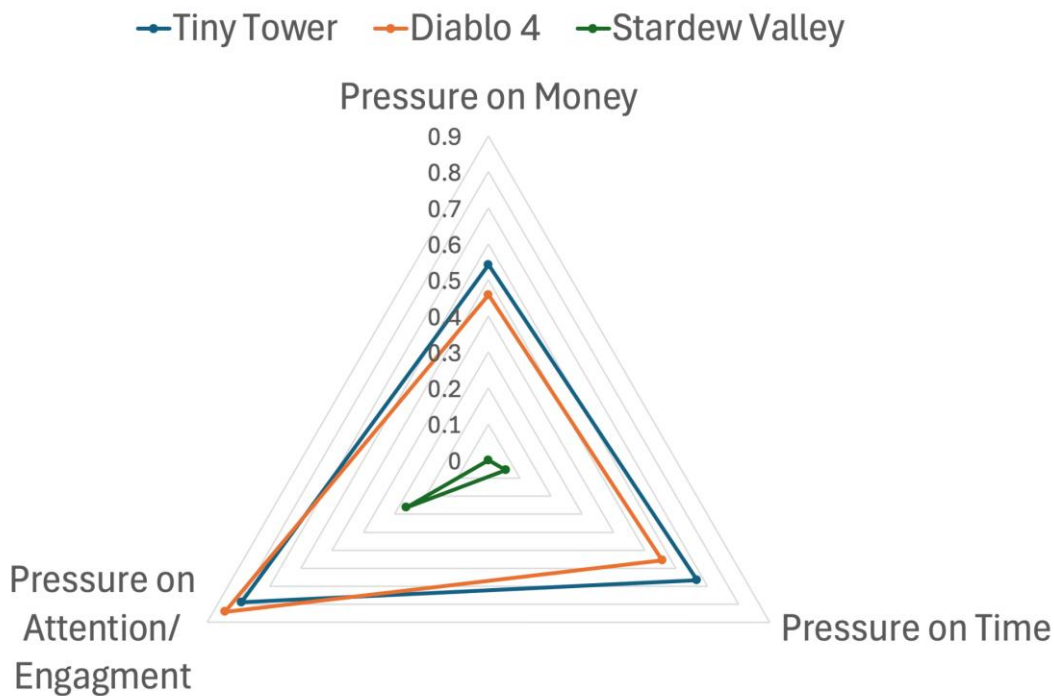


Figure 5: Radial plot Pressure Money/Time/Attention

This radial plot (figure 5) shows the sum of all mechanisms by category, i.e., *Pressure on Money*, *Pressure on Time*, and *Pressure on Attention*, over the total number of categories displayed for each game.

For the three games we coded, we visualized each of the fulfilled categories, i.e., Money, Time, Engagement/Attention, over the total number of categories to display percentual fulfillment of a category. Figure 5 above shows this plot. What is surprising is that despite being very different games Tiny Tower and Diablo 4 show very similar patterns in the amount of different mechanisms used within each game. Stardew Valley, in comparison, shows none to very low pressure on time, money, or engagement. The mechanism used in Tiny Tower and Diablo 4, however, are different - Diablo 4, for example, uses less microtransactions and avoids pay-to-progress or subscription models altogether. Both games use pressure on time, but Diablo 4 utilizes social or competitive features, while Tiny Tower relies slightly more on timed content, time-gated content, real-world timed content, and energy or resource management.

The current system does not provide a normative perspective on mechanisms, e.g. loot boxes have equal value as energy systems. Partially, because the research for each mechanism and the exact effect on behavior varies. However, we believe that in the future these mechanisms could be weighted considering their potential for pressure on individual resources, e.g., time, money, or attention.

1.5 Future Work

The system intentionally leaves room for growth and adaptation. The game industry is not standing still and we can expect new developments in the future. The tool is flexible enough to allow the integration of new developments and approaches.

The tool does not feature any classification of risk or normative interpretation of one category of game mechanism over the other. We intentionally avoided comparative interpretation, because argumentation about the impact and implications of different approaches are complex and require further research to be adequately addressed.

However, as it is, the tool would allow to apply weights to different categories, e.g., to more heavily weigh pay-to-progress mechanism, because they provide a direct barrier to gameplay. More research on the short- and long-term effects is required to differentiate risk categories.

Risk classification of individual mechanisms is also closely associated with how to take indications of different categories into account when formulating advice. For example, the sum of categories as displayed in *Figure 5: Radial plot Pressure Money/Time/Attention* provides valuable insights in the representation of pressure on money, time, and engagement/attention. The graphs show that Tiny Tower and Diablo IV use a range of mechanisms across all three categories, while Stardew Valley mostly refrains from applying pressure. The expectation in Tiny Tower is the use of recovery times, personal milestones, customization, and a progression system. While the visual access is helpful to differentiate patterns of features that pressure behavior, additional work is required to assess potential harms empirically.

The first iteration of the tool demonstrated the importance of focusing on observable features in games to avoid difficulties in coding, interpretation, and the potential to generate diverging codes for the same game. While the second iteration focuses now on observable features, coding these features still requires an understanding of what exactly characterizes a specific feature and how a feature is expressed in a game. For instance, customization can be implemented as customization of the character or of in-game items such as ships or clothing. Consequently, there is a need for training on the use of the tool and the interpretation of game mechanisms in-game. As of today there is no agreed on classification system of game mechanism.

The system is required to evolve over time - emerging technology such as AI or XR will provide new challenges that potentially require subcategories or pathways of exerting pressure. We might also gain more insights into how interaction patterns in games and complex game mechanisms show effects over time, which might, for example, lead to considerations regarding a temporal component of the tool, e.g., exerts slow pressure of many months versus pushes users at the end of each game session to purchase.

The game-check tool as it provides the required flexibility allows future implementation to consider novel developments in game mechanisms, but also new trends and developments driven by emerging technologies.

Section 2. Educational approach development

2.1 Development methodology

On the basis of the classification system that was developed in WP1, we also pursued the development of a 'prototype' educational approach for (young) gamers and their parents.

Our development strategy followed five main steps, including various sub-steps. Intervention Mapping, a framework for theory- and evidence-based health promotion program planning, was used to ensure that the educational tool matches priority population needs and intervention contexts.¹⁹ All five steps are outlined below.

1. **Needs assessment.** In the first step, we conducted a simple problem analysis to gain a better understanding of parents' knowledge and awareness of the use of behavioral design elements in video games. To inform this analysis, semi-structured interviews with parents were organized. In these interviews, we specifically talked about three behavioral elements in games, i.e., pressure on time, money, and attention/engagement.
2. **Design briefing.** In the second step, we combined insights from the coding tool (WP1) and needs assessment to draft the foundational document needed to guide the development of the educational tool. This design briefing outlined the project's goals and objectives, defined the target audience and gave designers a creative direction to explore.
3. **Concept development.** In step three, team ideation sessions were held to generate creative solutions and sketch out initial concepts. After three meetings, the most promising ideas were selected and refined to ensure alignment with the goals and objectives defined in the briefing. Finally, the design agency created a tangible representation of the design for testing and iteration.
4. **Testing and validation.** In step four, we tested and validated whether the design concept met its objectives and worked as intended. We collected feedback from parents and gamers and iterated based on test results.
5. **Deliver the design.** In the final step, the agency created the final version of the design of the educational tool. The main conclusions of these five steps in the current project are summarized on the next pages.

2.2 Needs assessment

Before beginning the development of the educational tool, we conducted a needs assessment to create a logic model of the problem, thereby describing the context for the tool, including the target group(s) and setting.

While behavioral design in video games can enhance gaming experiences, gamers and parents should be informed about its potential impact to make well-informed decisions. Therefore, the idea is to specifically focus on educating (young) gamers and parents. Overall, we aim to raise their *knowledge* and *awareness* on the use of behavioral design elements in video games.

- *Knowledge* is often described as a critical determinant in designing and implementing preventive interventions. It represents the degree of information and understanding that a target population possesses about a particular issue. This can refer to factual information (e.g., "Games contain behavioral design elements."), but also to conceptual understanding (e.g., "By putting pressure on player's time or attention, game developers can monetize their content.")
- *Awareness* refers to the extent to which individuals are conscious of a problem, behavior, or opportunity for change. Unlike knowledge, which involves understanding specific information or procedures, awareness focuses on recognizing the existence and relevance of an issue in one's personal life. It involves problem recognition (e.g., "When I play a free-to-play game, chances are that the game puts pressure on my time and attention.") and relevance awareness ("The possibility to buy skins for my avatar affects me personally.")

Intervention Mapping categorizes knowledge and awareness as modifiable determinants, i.e., they can be enhanced through educational components in an intervention.

We specifically aim to increase parents' and (young) gamers knowledge and awareness on three forms of pressure that a video game can put on a user's behavior after the initial decision to purchase the game or to play a 'free to play' version of the game, namely:

- Pressure on money
- Pressure on time
- Pressure on attention/engagement

Semi-structured interviews with parents

As part of the needs assessment, we first evaluated parents' current level of knowledge and awareness of the use of behavioral design elements in video games. The gamer perspective was already included via student work and the research team expertise (see [student contributions](#) and further explored in [validation testing](#) later on).

This assessment was conducted through online interviews with parents with children between 3 and 17 years old. Recruitment of these parents took place via the social media account of one of project team members (RH). The final sample represented five mothers and one father. All interviews took place in October 2024.

Interviews were conducted via Microsoft Teams and lasted approximately 30 minutes. All parents signed a consent form immediately preceding the interview indicating willingness to participate. All participants provided their permission for the video recording of the interview. Parents received a 10 euro gift cheque for their participation.

A semi-structured approach with open questions was used. There was a flexible approach in the order and number of questions asked for each of the key discussion points.

All interviews were transcribed verbatim by one of the project team members (RH). The transcripts were analysed manually.

Insights from these interviews are summarized below.

Knowledge and awareness related to monetization strategies and game elements

Most parents understand that games use techniques to encourage children to spend money, such as purchasing skins, extra lives, or virtual currency. Parents perceive in-game purchases as "part of the game" and a way for developers to be compensated for their efforts.

[Parent] "Well, just like we are seduced to buy things at the Mediamarkt, this is also part of the games they play. These games also have some kinds of discounts."

Various parents reported negative experiences with monetization, such as uncontrolled spending or recurring discussions about in-game purchases. As a result, most parents have set rules for in-game purchases, such as requiring prior permission or linking spending to pocket money. Some parents implemented security measures after negative experiences; others did so preventively. In many households, in-game purchases are a point of discussion; the degree of freedom granted varies between parents.

[Parent] "I find it really annoying that they try to extort money from these children. I know for sure that if we did not have control over that, our children would spend a lot more money on that. I think it is really awful that a game is actually allowed to do that."

Knowledge and awareness related to time-sensitive game elements

The majority of parents immediately associate gaming with screen time. The time spent on gaming is often a subject of discussion within families. Some parents enforce strict rules about gaming time, while others are more indulgent.

[Parent] "That's a bit of a thing, that you apparently cannot stop until something is finished, because then you'll fall back or whatever, or you'll lose everything?"

With some help from the researcher, parents recognize techniques used in games to encourage longer playtime, such as regularly recurring activities, time-limited events or rewards to require waiting. It should be noted, however, that although parents may recognize these techniques, they cannot always concretely link them to specific elements in the game.

[Parent] "I cannot recall these time pressure elements, but I believe they will definitely be in those games."

Knowledge and awareness related to pressure on attention/engagement

The majority of parents immediately associate attention with their child being fully immersed in a game and having a lack of attention for other matters. Yet, some parents, depending on their familiarity with games, recognize game elements such as avatar personalization, regularly recurring activities or advertisements and notifications.

[Parent] "You have these advertisements... When you are finished and then watch an advertisement, you get more blocks."

To summarize, these interviews showed that while parents may have basic knowledge and awareness of the behavioral techniques used in games, their level of knowledge and

awareness varies significantly depending on their own experience and involvement in their children's gaming habits.

Summary

With regard to the three behavioral elements in games, i.e., pressure on money, time, and attention/engagement, we conclude that although most parents can mention some common monetization strategies in games, they are less or not at all familiar with industry terms and features related to these game elements.

It also became clear most parents lack a clear understanding of how behavioral design elements in games specifically work and impact their children's playing behavior. This is in line with previous interviews that were conducted with parents, demonstrating that parents' knowledge of specific game elements did not guarantee that they could correctly recognize these elements in the games their children play.

Furthermore, we noticed that many parents did not fully understand the distinction between time and attention/engagement strategies in games and how they are operationalized in games. Many parents associate the concept of 'time' with 'screen time' or 'time dedicated to gaming', whereas they relate 'attention' to 'immersion' or 'being so deeply engaged in the game that there is no attention to other things anymore' instead of referring to specific behavioral game elements.

2.2 Iterative development of the educational approach

In the next step, we combined insights from the interviews with those collected during the development of the coding tool (WP1) to draft the design briefing for the development of the educational tool.

This design briefing outlined the project's goals and objectives, defined the target audience and gave designers a creative direction to explore. This briefing was sent to Flatland Agency - a visual thinking and design consultancy. They use visual thinking and storytelling to enhance thought processes and articulate ideas, insights and strategies.

We requested them to develop two concepts that could be used to educate (young) gamers and parents about the use of behavioral design elements in video games.

A short summary of our briefing is outlined below.

Concept 1:

Develop a set of icons/pictograms that can be used in online and offline communication towards (young) gamers and parents. These icons must represent the different game elements – pressure on money, time and attention/engagement – in a simple and visually attractive manner. It is important that these icons also can be deployed in different formats, such as brochures, leaflets and presentations.

Concept 2:

Develop an animation that visualizes and explains the three game elements and their impact on behavior. Specifically, we ask for a short, comprehensible and educational (simple) animation explaining behavioral design in video games, including recognizable examples from games and the connection to the gamer's (playing) behavior.

This animation should be both informative and activating in order for (young) gamers and parents to not only understand the use of behavioral design elements in video games, but also to increase their knowledge and awareness related to the potential risks of these pressures on the user's behavior.

It is important, however, that we are not normative or judgemental.

After exposure to this animation, parents and gamers:

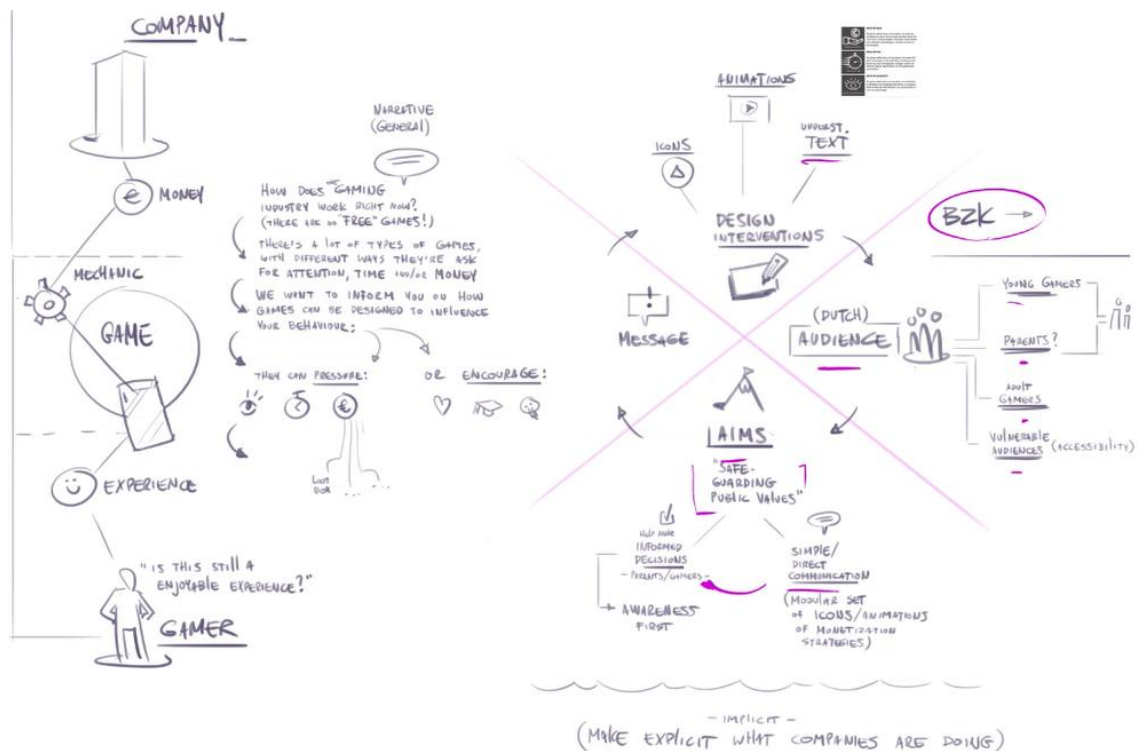
- Understand that games contain behavioral design elements;
- Understand that these elements often put pressure on time, attention and money;
- Understand that games continuously present decision-making moments, which sometimes can steer away from the core experience of the game (i.e., immersing in the game and have a good time);
- Recognize or find familiarity in the examples that are illustrated in the animation.



2.3 Concept development

Following up on the design briefing, team ideation sessions were held to generate creative solutions and sketch out initial concepts.

To provide some insight into this process, we present some intermediate sketches out of this process (figure 6).



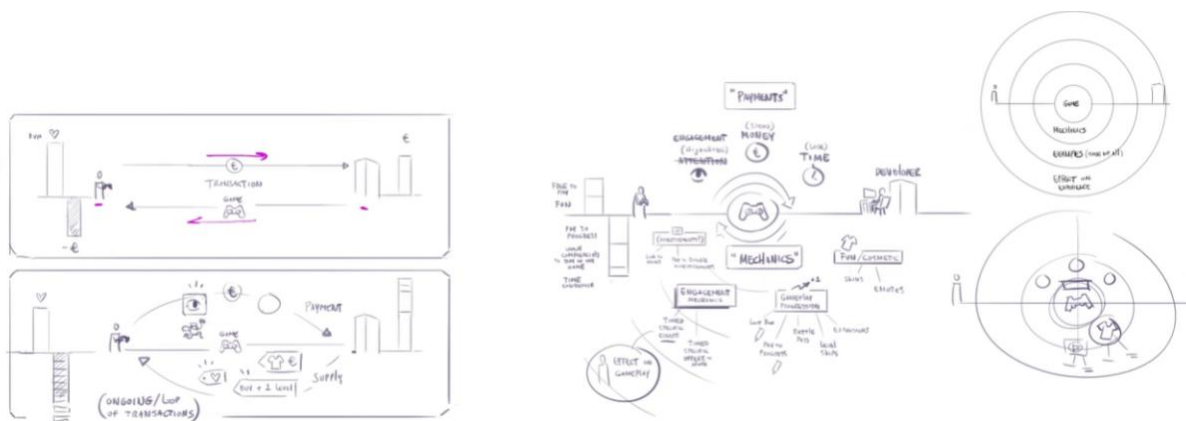


Figure 6: Various sketches out of the conceptual development phase

One core idea that came up in co-creation with the agency and our team was the idea to explain modern behavioral design practices in video games via a loop like structure (figure 7).

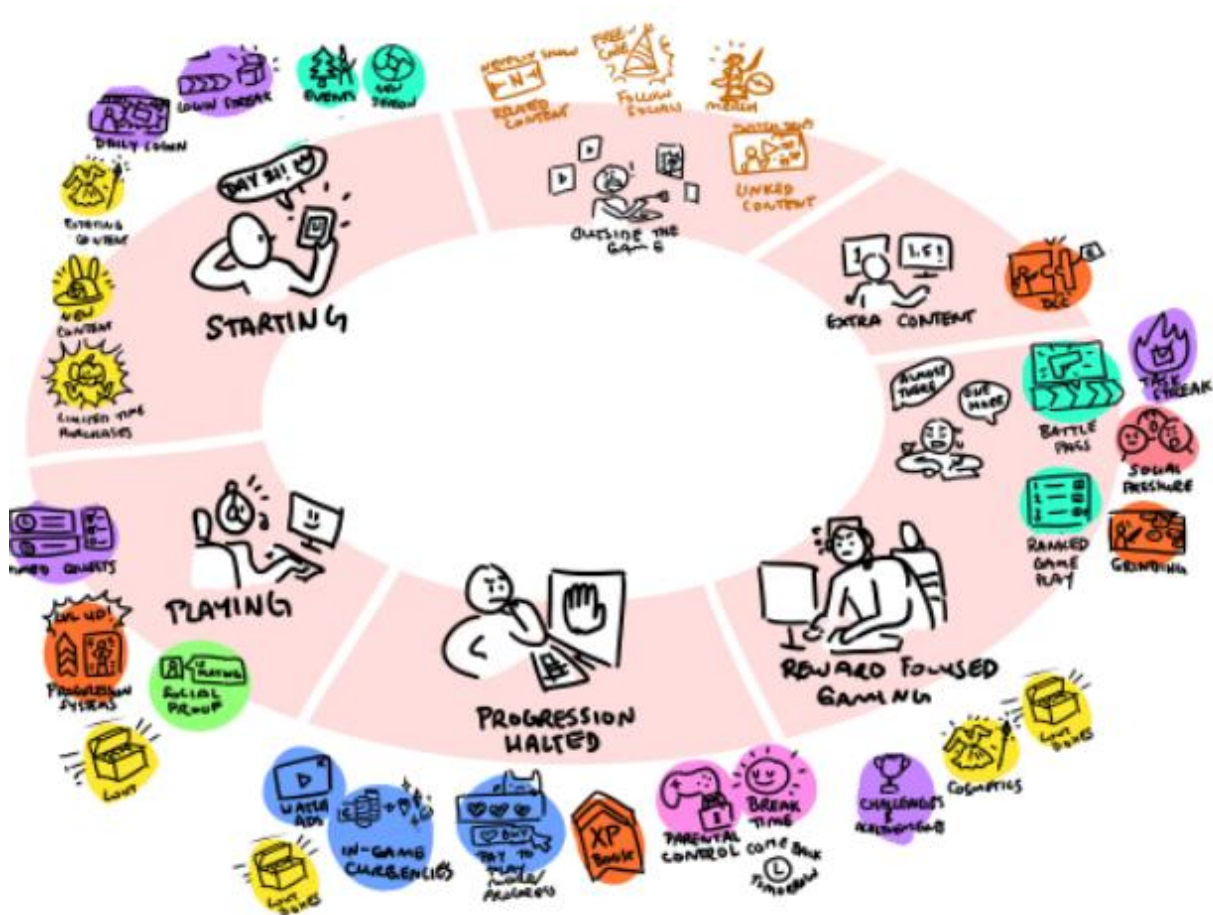


Figure 7: Sketched idea of a loop structure, wherein gamers encounter 'decision' moments when gaming (do you want to buy something, do you want to watch an advertisement, etc.)

After three meetings, we selected the two most promising ideas and refined these together to ensure alignment with goals and objectives of our project. After this, Flatland created a first representation for testing and iteration with the target group. The final concepts are outlined below (figure 8).



Figure 8: Final concept for testing Concept 1, the static icons/pictograms

Final concept for testing Concept 2, the animated explanation of changed practices in video games (figure 9).



Figure 9: Final concept 2: visual explanation of changed practices in video games

2.4 Testing and validation

In the fourth step, we conducted a pilot test at Museum Beeld en Geluid in Hilversum to evaluate and refine the two concepts targeted at (young) gamers and parents. The primary aim of this pilot test was to test the target group's understanding and engagement with our concepts.

The pilot involved interactive sessions where participants engaged with the concepts, providing feedback on usability, engagement, and overall appeal. Qualitative notes were collected during these interactions.

Procedure

The pilot test was conducted following a semi-structured procedure to gather valuable insights on the two design concepts. The steps were as follows:

1. **Approaching potential participants:** We actively reached out to visitors of the museum that fitted the descriptions of our target group. Both adults and teenagers were then invited to participate in our pilot study.
2. **Explaining the purpose:** Participants received a clear explanation of the test's purpose and the importance of their feedback.
3. **Requesting consent:** Explicit consent was requested prior to participation.
4. **Interview about gaming experience:** We began with an interview to understand the participants' gaming experiences and preferences.
5. **Interview about Concept 1:** Participants shared their opinions on the first design concept.
6. **Interview about Concept 2:** They then provided feedback on the second design concept.
7. **Closing:** We concluded with a word of thanks and an opportunity for participants to share any additional questions or remarks.

This approach ensured a structured and participatory test, with the target audience's input at the core.

We recruited a total of 11 adolescents (6 participants identified as male, 5 as female, and 0 as non-binary) and 6 parents (3 identified as male, 3 as female, and 0 as non-binary). All interviews took place in December 2024 and were fully anonymous in terms of documentation, we only documented the results out of the conversations.

Insights from these interviews are summarized below.

Interviews with gamers

Overall, the icons were mostly clear to the gamers.

- **Attention Icon:** The majority did not recognize the reference to a person's eye. As a result, participants found this icon unclear without proper guidance or explanation.
- **Money Icon:** Icon was clear for all participants. However, one of the gamers questioned whether this icon would be universally understood, noting that a debit card is usually not used by gamers to make in-game payments. Secondly, one

person questioned the use of the magnet, asking himself whether players had indeed no control over the pull (as with a real magnet).

- **Time Icon:** Icon was clear for all participants. However, two of the gamers questioned whether the calendar was appropriate to indicate time as it reminded them mainly of time-based events rather than time-of-playing.

From the interviews, however, it also became clear that the accompanying explanatory text was essential for a complete and correct understanding of the intended meaning of each icon. Within this context, participants did not have any content-related remarks about the text; they found it clear and appropriate for the icons. The text resonated with their in-game experiences and provided recognizable insights into the pressures they may encounter in games.

All in all, we concluded that while the visual representation of the icons generally worked well, the accompanying text played a critical role in ensuring clarity and comprehension. It also became apparent, however, that clarity and interpretation of all three icons could benefit from some additional refinements.

In addition to presenting the icons (Concept 1), we explored the behavioral design loop or 'loop' in games with several gamers (Concept 2). This involved explaining the loop observed in games that exerts influence on time, attention, and money.

Overall, the concept of a loop was clear to most of the participants (figure 10).

- **Clarity and awareness:** The explanation of the loop served as a strong foundation for participants to understand how these pressures operate. Young gamers recognized the pattern and found it insightful, with discussions further enhancing their knowledge awareness.
- **Effective discussion starter:** The behavioral design loop acted as a powerful conversation starter. As participants talked through the loop, their understanding deepened, and they could relate it to their in-game experiences.
- **Supporting role of icons:** While the icons (Concept 1) provided helpful visual representations of specific elements within the loop, they were not sufficient on their own to convey the broader context. The explanatory discussion about the loop was crucial to making the pressures more tangible and meaningful.



Figure 10: visual impression of test setup

These findings highlight that the behavioral design loop is central to building a clear understanding of the pressures in games. The icons serve as a complementary tool, but the depth and clarity achieved through discussing the loop are indispensable.

Interviews with parents

The three icons were generally clear to participants, although their understanding was largely influenced by their familiarity with games and gaming culture.

- **Influence of gaming familiarity:** Parents with more personal experience in gaming, or who were more familiar with the games their children play, demonstrated a better understanding of the icons.
- **Attention icon:** Similar to the gamers' feedback, the attention icon was not sufficiently clear to the parents. They also did not interpret it as a reference to an eye or face.
- **Money and time icons:** The other two icons were well understood by parents and did not require additional explanation.

These findings suggest that while the icons are generally effective, their clarity depends on the viewer's familiarity with gaming contexts. Also, while talking with participants it became clear that the accompanying explanatory text was essential for a complete and correct understanding of the intended meaning of each icon (see: figure 11).

Similar to our conversations with gamers, Concept 2 (the behavioral design loop) proved indispensable in explaining the actual workings of behavioral design in games to parents. This was especially critical for parents with limited gaming experience, as it provided the necessary context to understand how games exert pressure on time, attention, and money.

- **Clarity for inexperienced parents:** For parents with little or no gaming experience, the explanation of the loop was essential to grasp the mechanisms of behavioral design in games. Without it, the concepts remained abstract and difficult to understand.
- **Conversation starter for experienced parents:** For parents who were more familiar with games, the loop served as an effective conversation starter. It deepened their knowledge and provided insights into aspects of games they may not have previously considered.

These findings emphasize that the behavioral design loop (Concept 2) is crucial for fostering understanding among parents, regardless of their gaming experience. It provides a comprehensive framework that supports a better understanding of how behavioral design in games operates and can put pressure on gamer's time, attention and money.

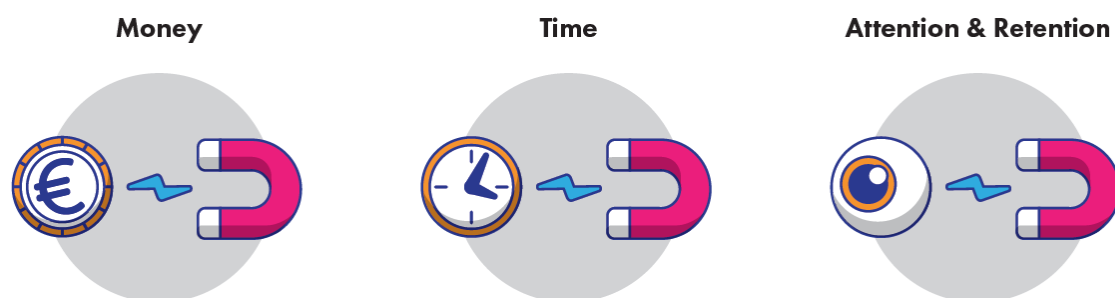


Figure 11: intermediate updated version of the icons, post-testing

2.5 Delivery of the design

In the final step, the agency created the final version of the design of the educational tool.

The pre-final version of the icons was updated one last time from the perspective that icons, when viewed from a greater distance or very quickly, were perceived to be too similar.

The result is presented below (figure 12):

Concept 1: Iconography behavioral design in games

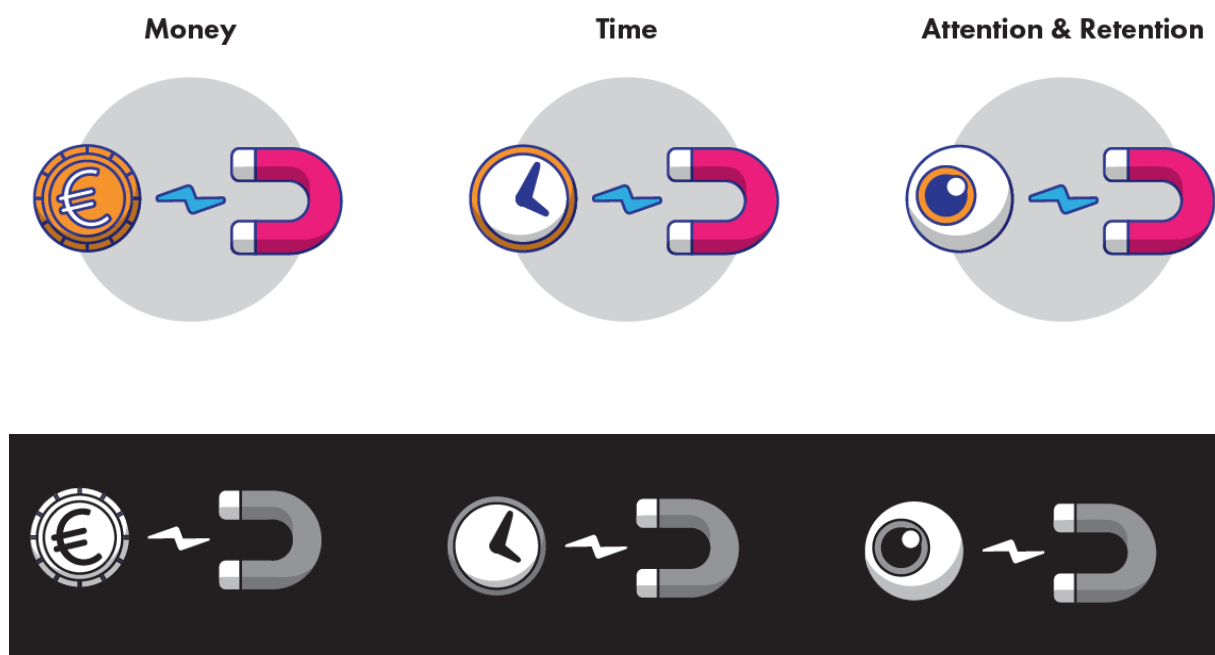


Figure 12: Final version of the icons, color and black and white

Concept 2: Stepped animation graphic behavioral design (pre-final version)

The concept 2 animation that illustrates the 'looping' nature of video game design is in the final feedback round, and will be published on the project's open science location along with the project materials (<https://osf.io/5qzda/>). It involves a visual explanation of the historical (and for some games current) 'simple' purchase model (figure 13) and the new situation in various games, where behavioral design is more prevalent.

OLD PURCHASE TRAJECTORY



Figure 13: Purchase trajectory, old

A simple stepped looping animation will illustrate the cyclical nature of current game experiences, where games involve a continuing sequence of micro-decisions when engaging in gameplay that pressures attention, money, and time. The current draft of the static version of this "loop" is presented below (figure 14):

"THE LOOP"

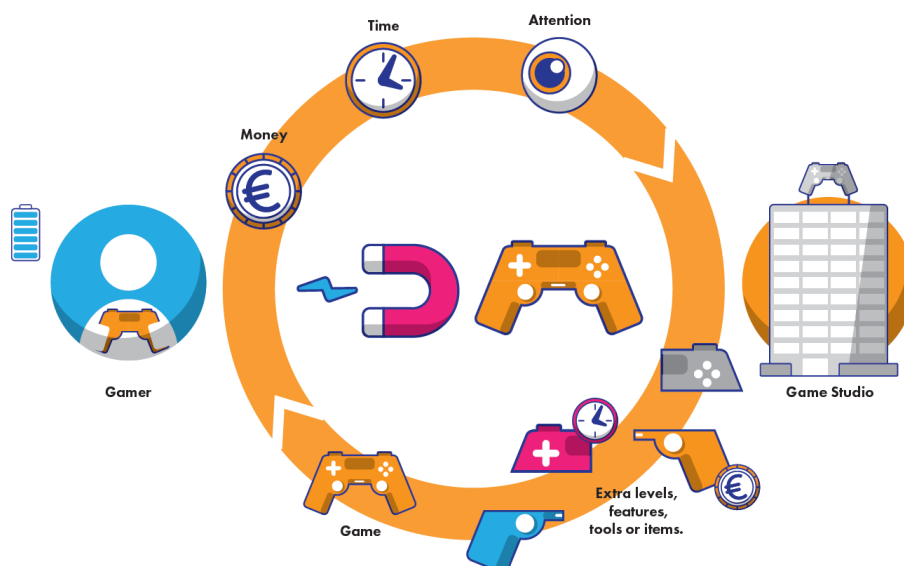


Figure 14: Static impression of the draft animation that explains behavioral design in games

Section 3. Engagement with stakeholders and implementation exploration

The aim of this Gamecheck project was to develop a prototype for a coding tool for behavioral design in video games that can be implemented in real-world context.

In this way, it can be used to generate, maintain and provide audience information on the basis of which players of video games, or persons responsible for players of video games, can make an informed decision about playing a game. Additionally, it can provide parents with a tool to support informed decisions about the games that they allow their children to play and seek or offer targeted guidance on design choices that may be challenging or harmful to players. More specifically, audiences should be empowered to avoid certain behavioral design choices by purposefully changing a game's settings, asking for help in dealing with behavioral design choices, or deciding not to play a digital game with certain behavioral design choices.

The educational methodology provides direction on how public information about behavioural design in games can be given and shaped. This **last part of the project deals with fine tuning the Gamecheck coding tool and the educational methodology and design as well exploring possibilities of implementing** (and further development of the prototype) so that ownership and governance are realised such that the implementation is effective, efficient and reliable. Given the limited scope of the project, it is not possible to come up with a comprehensive implementation proposal for the Gamecheck coding tool and education methodology, but based on our exploration, scenarios for implementation can be presented with which follow-up steps can be taken in coordination with involved stakeholders.

The **aim of fine tuning Gamecheck and exploring its implementation** is to use stakeholder engagement to improve the tool and develop implementation scenarios.

This was done using the following three approaches:

- *Firstly*, we incorporated stakeholder insights on Gamecheck and opportunities for implementation through meetings with a stakeholder-board and interviews with other stakeholders into Gamecheck's further development and scenario development.
- *Second*, a rapid desk review of public information initiatives that have a close relationship with content or design in digital media and, in particular, video games, has been carried out.
- *Thirdly*, there was a face-to-face scenario development session with one of the stakeholders who has a lot of experience in the field of informing the public, and in particular parents and children, about harmful content and behavioral design through the management and implementation of age classification and other systems, such as Kijkwijzer Online, Gamewijzer and PEGI.

This may somewhat pre-empt the choice of the party that could do the implementation, but given the limited field in the Dutch context and the advantages of alignment with existing systems that function well, this approach seems obvious.

3.1. Setting up the stakeholder-board

A stakeholder-board was formed with stakeholders from relevant contexts (including protection of minors, consumer protection and the game industry)^a where interdisciplinary scientific knowledge was contributed through the researchers within Gamecheck.

During the project we had two on-site meetings with the stakeholder-board to discuss all three parts of the project - Gamecheck coding tool, educational methodology and implementation scenarios.

In these two meetings with the stakeholder-board: (1) a first version of the gamecheck tool (V 1.0) was discussed (meeting 1), (2) a second, further developed version of the gamecheck tool (V 2.0) was discussed, (3) the results of the educational part of the project were presented and discussed, and (4) there was an exchange of ideas on possible scenarios for implementation (meeting 2). Then next sections (3.1.1 - 3.1.3) provide an overview of issues raised.

3.1.1 Stakeholder meeting #1: Game-check tool 1.0

During the first stakeholder meeting, on 30 May 2024, the initial version of the Gamecheck coding tool was presented and discussed. The coding tool was presented based on the main categories distinguished in that version, including monetization, time, deception, social features, and novelty. These categories were later adjusted to pressure on money, time, and attention to classify the most critical aspects more precisely.

Additionally, an initial demonstration of the coding tool in action was provided using a selection of games that had been classified with Gamecheck. Furthermore, insights from research conducted by students were presented.

The main takeaways from the meeting included the recognition that discussing the tool with various stakeholders was highly valuable, as it generated diverse perspectives and insights.

It was noted that the tool is highly comprehensive, raising the question of whether it would be more effective to focus on specific forms of behavioral design, potentially based on public interest or the possible effects of such design choices on gamer behavior and well-being. Moreover, some questions overlap and some questions are multi-interpretable. The question raised of whether it is also possible to specifically identify the risks for children (potentially based on their age) had to be answered in the negative because that is not the purpose of the current tool (purpose: transparency with regard to game design).

Particular challenges are the fact that games have multiple modes that need to be addressed by the tool and games constantly change (moving targets). Moreover there

^a Stakeholders that have been involved are: Autoriteit Consument & Markt, Dutch Video games Industry / Video Games Federation Netherlands (VGFN), Dutch Games Association, NICAM / Nederlands Instituut voor de Classificatie van Audiovisuele Media, Ministry of the Interior and Kingdom Relations.

are relevant meta game aspects (e.g. the use of discord servers and accounting for money spent outside the game). And how do you make sure the questions are answered honestly by game publishers?

Given the substantial workload required to implement the tool, participants also questioned whether its application could be made more efficient through artificial intelligence. Initial tests conducted after the meeting suggest that the answer to this question is a cautious “yes”.

Furthermore, certain terms used in the tool can be interpreted in multiple ways. While the tool was intentionally designed to be non-normative (e.g., by using only yes/no questions), some terms carry inherent normative connotations (such as “deceptive design”), which may be better avoided.

Ultimately, much will depend on how the Gamecheck scoring of video games is communicated to the public. Effectively capturing this information in a clear and meaningful visualization may prove to be a significant challenge.

Some other points that were mentioned in the discussion:

- Potential focus on social features in games as a factor: Reactive chat filter/proactive chat filter, chat open by default? Voice filtering? Examples of how players interact in the game.
- Loot Boxes could be included, the same is true for layered currencies, currency exchange rates, disclosure of prices (including the sum of spending) and complex pricing systems.
- Attention for extra vulnerable groups (of children) such as to people with autism spectrum disorder, mental health issues, or other conditions that entail vulnerability towards commercial practices, is important when providing information on behavioral game design.

3.1.2 Interviews 1 and 2 with external experts

Our team held two interviews with external experts that have both gaming and legal expertise. In both interviews, we presented our coding tool (Version 1), along with a verbal summary of the feedback we had received in the stakeholder group and an overall impression of our work on the educational approach and iconography.

In the *first interview*, we spoke to both Dr. Valerie Verdoodt and Dr. Pieterjan Declerk, both situated in Belgium (Ghent University).

The main takeaway from the conversation was that both of them confirmed and indicated that **time** and **money** are two central topics that cause issues/stress in game design. Both topics should be included in efforts like the current project. At the time of this interview, the third topic was still very much in flux, covering ‘**engagement**’ as a central term, but also covering elements of attention grabbing and focus redirection (ad watching). They indicated that this topic was still underdeveloped and could hypothetically be excluded in our work, given that many of the issues could be reduced to issues with pressures on time and money. They also noted that concerns around engagement were hard to delineate, as the examples provided often reflected game design choices that were fundamentally monetisation-driven.

Actions taken: Our team opted to not exclude the third topic (engagement/attention) as we are of the opinion that there is added information in that topic space that is relevant for our effort, but it did receive additional attention following this interview. It is not our goal to demarcate normative boundaries in this project, but we agree with these experts that pressure on time and money are more straightforward to assess in future normative work than attention redirection and other efforts that are very close to traditional marketing and communication efforts.

In the *second interview*, we spoke to Prof. Bart Schermer (Considerati, Leiden University). He expressed appreciation for the current effort, but also stressed it is quite a difficult topic to tackle, particularly emphasizing the challenges in the implementation phase of this project (to what extent can we motivate industry parties to contribute or engage with this effort?). At this stage, we had the basic three icons visualized (magnet plus topic for each of the three topics) and Prof. Schermer could follow our reasoning on this.

Content wise, the third behavioral design topic of pressure on attention/engagement received attention again, as it remained a relevant but tricky topic to tackle. A **key** insight that emerged from the conversation was that *engagement* might need to be separated out of the core communication effort. Increasing engagement with a videogame is a key construct, because people do not generally proceed to sacrifice time, money, or attention unless they are engaging strongly with this game over a period of time. But growing engagement with a game, coupled with emotional/personal investment in the game is a process that evolves over time and not something that is easily isolated on the level of informing/warning consumers about, for example, 'pressure to spend money in a game'.

Actions taken: The key insights from the second interview steered improvement in our terminology and communication approach.

3.1.3 Stakeholder meeting #2: Game-check tool 2.0 & educational approach & implementation

In the second stakeholder meeting, on 9 December 2024, three topics were discussed: (1) Gamecheck 2.0, (2) educational approach and (3) implementation of Gamecheck.

Ad1.

After a presentation of Gamecheck 2.0, the following issues were raised or discussed: The questions posed are highly detailed, which presents a challenge in tracking all developments. The rapid pace of these changes makes it difficult to maintain clarity, and the level of detail only adds to the complexity, as observed by NICAM. Additionally, there's the need to define what consequences we are addressing (BZK), ensuring the scope of the issues is clear. A key question to address is how to prevent ambiguity in the questions themselves, which NICAM also raised. Moreover, there's the matter of defining the vision for the final result - what exactly is the desired outcome? It's also important to clarify the intended audience for this tool - will it be for the government, the public, or another group? The attention and engagement topic also warrants further attention in development.

Ad2.

After a presentation of the educational methodology, the following issues were raised or discussed:

The magnet icon was perceived as too negative, as it tends to focus on drawing attention, money, or time away, according to the Industry. When the design becomes too complex, icons lose their effectiveness, as they need to be instantly recognizable at a glance, as highlighted by NICAM. This raises the question of whether all games will feature icons, and if so, how these icons will maintain clarity and effectiveness without becoming overwhelming.

Ad3.

The discussion on implementation of gamecheck focused on the role of stakeholders and essential elements of implementation.

From the industry perspective, the role and involvement in the development and implementation of this tool largely depend on its intended audience and use. There are questions about whether it is aimed at developers, parents, or another group, and whether its adoption will be voluntary or mandatory. The industry's response could range from choosing not to engage with the tool (if it doesn't align with their interests), to actively promoting it if they see value in it.

While industry sees potential in using the tool, especially for providing context rather than content, the level of involvement could vary significantly. For example, using the tool as a means of parental guidance could be seen as a feasible option. Certain features, like monitoring time, attention, and engagement, could align with existing parental control measures. However, concerns arise about whether the tool should flag certain behaviors, such as pressure to make in-game purchases, as this could be seen as too normative. The industry's interest also depends on the tool's geographic scope - whether it's intended solely for use in the Netherlands or if it has a more global reach. A narrow focus might not resonate with the industry, which may prefer broader applications.

From a supervisor and regulator perspective, it is clear that maintaining oversight will play a crucial role in the success of the tool. Ensuring that it remains accessible and valid for the public is another key responsibility, which involves collaboration across various sectors. The cooperation between the industry, government bodies, and independent private oversight organizations, like NICAM, is essential for ensuring the tool's effectiveness and integrity.

Implementing the tool will require significant time and effort, and it's recognized that proactive steps should be taken as soon as possible. PEGI's use of questionnaires to engage with the industry offers a model for how to begin gathering relevant insights and assessing the tool's feasibility. Collaboration with the Commissariaat voor de Media, the industry, and regulatory bodies like NICAM will be vital for moving forward.

A key consideration for regulators is whether the tool will be legally mandated, or if it will operate as a self-regulatory mechanism. It is important to approach the tool from a descriptive standpoint, focusing on providing information rather than, as mentioned also by the industry, imposing a normative perspective. The regulatory role could involve shaping the educational aspects of the tool, while leaving the ultimate decisions in the hands of consumers. As a first step, regulators can collaborate with Kijkwijzer online and engage with industry partners to establish a framework for the tool's use.

3.2 Preliminary exploration of external environment

Gamecheck as a tool and associated education methodologies should relate to (1) existing initiatives and (2) any applicable regulations. First, with respect to existing initiatives, the tool must add something. The fact that there is a need to develop Gamecheck indicates that Gamecheck brings something new, or more, than already existing initiatives. From the implementation perspective, however, more important is whether Gamecheck in the Netherlands can be linked to one or more of these existing initiatives. To this end, a brief exploration of specific (Dutch) initiatives follows in Section 3.2.1. Secondly, the question arises how the implementation fits in with applicable regulations and the scope for the Netherlands to claim competence for the implementation of Gamecheck within the framework of the EU digital law and consumer law acquis. The aim of this section is to make a preliminary exploration in Section 3.2.2. It needs further elaboration when final policies for Gamecheck implementation are developed. This further elaboration will preferably be led by the party administering Gamecheck with the cooperation of the initial Gamecheck developers. Special attention must then also be given to the independence of the work process because significant revenue is generated from behavior-influencing business models, and various interests are at play from stakeholders and experts.

3.2.1 Relation of Gamecheck to other initiatives

Various initiatives exist for providing public information about media, including video games. With some exceptions, these initiatives primarily focus on informing parents and children about harmful content rather than on providing information about behavioral design that may be detrimental to video game players. Nevertheless, these initiatives are relevant given their aim to inform the public, enabling individuals to make informed choices about consuming content or playing video games.

Moreover, some of these initiatives are based on coding tools in the form of questionnaires, a methodology also employed in Gamecheck. From an implementation perspective, aligning with initiatives that use a similar methodology is an interesting option, not least because they are already embedded within an organization with an established governance structure.

Therefore, relevant initiatives aimed at providing public information about media, particularly video games, are briefly outlined here.

- **Kijkwijzer online:** With the amendment of the Media Act, major Dutch online video channels on the YouTube platform (and, in the future, also on Instagram and TikTok) are now required to use Kijkwijzer to protect children by warning them about potentially harmful videos. This is achieved by registering with the Dutch Media Authority (Commissariaat voor de Media) and subsequently joining NICAM. By affiliating with NICAM, content providers can classify their videos using the Kijkwijzer system coding tool and assign the appropriate age and content rating symbols (figure 15). The Kijkwijzer system is based on co-regulation in which the government has transferred part of its responsibility to the industry

under the conditions set by the Media Act and the system is developed and administered by the independent organisation NICAM.^b



Figure 15: [Kijkwijzer](#) icons (12 feb. 2025)

- PEGI:** PEGI assigns age ratings to video games and is used in 38 European countries. The age rating indicates whether a game is suitable for players of a certain age. PEGI assesses the appropriateness of a game for a specific age group. Based on these age ratings, parents and video game players can decide whether to purchase a particular game (for their child). In addition to age rating icons (3, 7, 12, 16, 18, figure 16), PEGI also provides content descriptors that indicate why a video game has received a specific age classification. These content descriptors relate to potentially harmful content (bad language, discrimination, drugs, fear, sex, violence) as well as harmful services or functionalities, such as gambling and in-game purchases. Gamecheck further develops these last two categories, specifically focusing on behavioral design that may be used to, for instance, put pressure on the player. The PEGI system was developed by the Interactive Software Federation of Europe (now Video Games Europe). PEGI is managed by two independent organizations: NICAM and the UK Games Rating Authority. Although a complaints and enforcement system exists as part of the code of conduct underlying PEGI and there is commitment from the video game industry, the system is essentially voluntary.^c



— The PEGI pictograms.

Figure 16: [PEGI ICONS \(via NICAM\)](#) (12 feb. 2025)

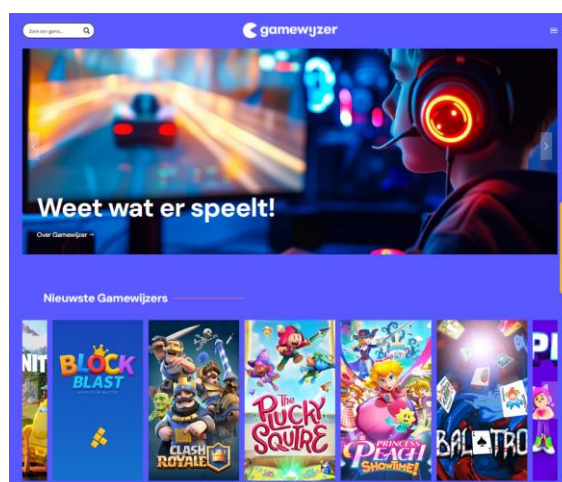
- USK:** Germany has its own age rating system for video games, which is similar to PEGI but noteworthy because it includes a specific category for Pressure ('Druck'), distinguishing between different types of pressure exerted on players, i.e. Pressure to act, pressure to play excessively and increased incentives to buy. The USK system is based on self-regulation by the industry, with the involvement of civil society and the industry in an advisory role. Companies that have registered with USK are, under the German Youth Media Protection State Agreement, in

^b See <https://www.kijkwijzer.nl/>

^c See <https://pegi.info/>

principle only subject to a decision by USK in the event of an alleged violation of that law.^d

- The **International Age Rating Coalition (IARC)** is a global age classification coalition that covers multiple systems for digitally delivered games and apps. While it provides its own rating suggestions, the coalition partners generally provide ratings in their respective territories themselves. Partners include the ESRB (Entertainment Software Rating Board) for North America, PEGI (**Pan-European Game Information**) for Europe and USK (**Unterhaltungssoftware Selbstkontrolle**) for Germany, among others.
- **Gamewijzer**: Gamewijzer is offered by NICAM as a public information tool, primarily aimed at parents, providing guidance on video games based on its expertise with Kijkwijzer and PEGI. Gamewijzer consists of a website with in-depth information about popular games. The most popular games are determined via sales and downloads. Parents and guardians can find information about everything they need to know about the specific game, such as what is the game about, what is the age advice, which rules do you set about screen time, is it possible to spend money on the game, with whom are they in contact, and more. While information is supplied on details in games, game reviews and feedback on behavioral design aspects is **not** standardized or visualized (with standardized icons/animations).^e



[Gamewijzer website](https://www.gamewijzer.nl/) (Screenshot, 23 mar., 2025)

- **Common sense media**: Common Sense Media is a US-based nonprofit organization that provides education and advocacy to help children, parents, and educators navigate media and technology. It offers age-based ratings and reviews of all movies, TV shows, video games, apps, and books, assessing their content for factors like violence, language, and educational value. Additionally, the organization promotes digital citizenship, online safety, and media literacy through research, policy advocacy, and educational resources.^f
- **AdWiseOnline**: Information and education about possible manipulative strategies in games, aimed at parents and caregivers, teaching staff and young people themselves. Developed as part of the Better Internet for Kids (BIK+) programme of the European Commission's Safer Internet Unit.^g

^d See <https://usk.de/>

^e See <https://www.gamewijzer.nl/>

^f See <https://www.common sense media.org/>

^g See <https://better-internet-for-kids.europa.eu/en/adwiseonline>

The inventory reveals that the various initiatives providing public information about video games are organized in different ways

- The public information offered focuses either on harmful content or, to a certain extent, includes other aspects relevant to behavioral design.
- Where public information on behavioral design is available, it remains highly limited. In other words, it does not provide a comprehensive overview of behavioral design elements that may be relevant for the public to be informed about.
- Some initiatives are based on a structured system, such as a so-called coding tool, which may take the form of predefined criteria or a questionnaire and results in predefined ratings.
- Governance structures vary significantly, encompassing co-regulation, self-regulation, and voluntary systems. Some systems are mandated by legislation (e.g., the Dutch Media Act), while others provide companies with a degree of exemption from oversight or fines if they adhere to the system (e.g., the German model). Additionally, the degree of independence of the organization responsible for implementing or managing the system can be a distinguishing factor. Hybrid models also exist, for example, combining self-regulation with independent administration of the system.

3.2.2 Relation of Gamecheck to law

Gamecheck focuses on coding behavioral design in video games. Regulation is therefore only applicable if it deals with both regulating video games and behavioral design. This means that EU law that deals with specific services, namely video sharing platforms (regulated by the AVMSD) and online platforms (regulated by the DSA) does not apply, respectively, only to a limited extent.²⁰ The Audiovisual Media Services Directive (AVMSD) is currently under evaluation and may be revised as a result. Given that the obligations in the AVMSD - both in terms of content and design - are highly relevant to the protection of minors in video games, it is noteworthy that they do not apply to this sector. As a result, the scope of the directive may be expanded. If this happens, it would require an amendment to the Dutch Media Act. In the Netherlands, oversight of the protection of minors is carried out by NICAM (Netherlands Institute for the Classification of Audiovisual Media), with meta-supervision provided by the Dutch Media Authority (Commissariaat voor de Media).

GDPR - Game publishers employ data-driven behavioral design, enabling them to target players and their specific vulnerabilities more precisely. Data-driven targeting must comply with the GDPR. The data protection authority in the EU that is competent to oversee the activities of game publishers depends on their place of establishment. Under the GDPR's one-stop-shop mechanism, if a game publisher has its main establishment in an EU member state, the Data Protection Authority (DPA) of that country acts as the lead supervisory authority for cross-border processing activities. However, if the publisher does not have a main establishment in the EU but processes data of EU users, multiple DPAs may have jurisdiction, and enforcement could be coordinated by the European Data Protection Board (EDPB). Since Gamecheck currently focuses on visible behavior design strategies, data driven behavioral design strategies or the data driven nature of those strategies is not covered (yet).

Unfair commercial practices directive (and Dutch implementation in the Civil Code) - Behavioral design in video and mobile games may constitute an unfair commercial practice when it (potentially) leads to a transaction with the game publisher involving misleading information (including omissions) or undue influence on the player. This occurs when the player's economic behavior is materially distorted or likely to be materially distorted, preventing them from making a free and autonomous decision. The Dutch Authority for Consumers and Markets (ACM) is the national enforcement authority with respect to Dutch consumers and has provided Guidelines.²¹ Children are seen as vulnerable consumers under the UCPD which means game publishers should take into account that some commercial design practices have a greater impact on them and are therefore more likely to be considered unfair, if it is reasonably foreseeable that children are players. In 2024, the ACM fined EPIC for using unfair monetization strategies (fake countdown timer and direct exhortation) to which children in particular are vulnerable.

Future Digital Fairness Act - New EU legislation will be introduced to strengthen consumer rights and in particular the UCPD by addressing among others addictive design in digital services, including digital games. If adopted, the Dutch Authority for Consumers and Markets (ACM) is expected to become the national enforcement authority with respect to Dutch consumers.

3.3 Implementation scenarios: Short-Term and Long-Term Approaches

Based on stakeholder meetings and a preliminary exploration of initiatives and the legal landscape, we have identified two possible scenarios. The first scenario can be implemented in the short term, while the second scenario requires more time as it necessitates amendments to Dutch legislation for full implementation. Since NICAM plays a role in both scenarios, an in-depth discussion was conducted with them following the two stakeholder meetings in which they participated.

Both scenarios offer the advantage of being implementable within the Netherlands (with potential for later expansion across Europe) and build upon extensive knowledge, expertise, and experience in disseminating public information on content and design, as well as a solid and demonstrably effective governance system. Connecting with existing expertise is very important and necessary because the video and mobile game context is complex and constantly evolving. In that respect, it is important to have thorough knowledge of the potential differences between (paid) video games and often freemium mobile games in app stores.

3.3.1 Scenario 1 (Short-Term): "Gamewijzer+"

NICAM has independently developed the [Gamewijzer](#) (see also Section 3.2.1), which provides public information on video games popular among children, drawing on its experience with Kijkwijzer and PEGI. Gamewijzer provides additional information and tools of instructions for parents on how to deal with, for instance, screentime, in game spending, advertisements, chat, etc. By integrating Gamecheck into Gamewijzer, the tool could be significantly enriched with insights that are often not visible to parents or other audiences prior to purchasing or downloading a game - or even while playing it.

A limitation of this scenario lies in NICAM's capacity constraints, as it would be infeasible to classify all (millions of) games using Gamecheck. Involving the industry in the classification process is a possibility, but this forms part of Scenario 2, which focuses on a long-term solution for public information on behavioral design in video games.

Another potential avenue for exploration is the use of crowd-sourced information (e.g., reviews on Common Sense Media, see Section 3.2.1). This approach aligns with NICAM's experiences, in collaboration with the British Board of Film Classification (BBFC), in the You Rate It project, where a combination of classification by uploaders on video platforms and crowd-sourced ratings was tested. However, crowd-sourced information also presents challenges, particularly regarding data quality and volume, which could place additional demands on organizational capacity.

Considering all factors, we recommend enriching Gamewijzer with public information on the most popular video games, particularly those games or gaming platforms that are widely used by children. Partnerships and mutual reinforcement can be sought with other public-facing game information sites, such as the [Gameninfo.nl](https://www.gameninfo.nl) site by Trimbos-institute, which focuses more on health benefits and risks of video games (including excessive use).

An additional potential benefit of increasing public information on video games is that it may prevent a scenario in which game publishers choose not to release their games in the Netherlands due to heightened scrutiny. Instead, greater attention to their video games in a way that can be positively framed may encourage continued market participation.

The stakeholder meeting clearly highlighted that the industry has a vested interest in public information that is non-normative and communicated in a neutral manner.

Scenario 1 can be integrated into Gamewijzer within a relatively short time frame after the transfer of the components of the Gamecheck system to NICAM. This requires the establishment of provisions for the structural embedding of the system within NICAM, ensuring sufficient resources for the further development and maintenance of Gamewijzer+.

3.3.2 Scenario 2 (Long-Term): "Full co-regulated classification"

A longer-term scenario involves transforming Gamecheck into a design classification system based on co-regulation, anchored in and subject to legal requirements.

The model for this second scenario is the Kijkwijzer (Online) system, in which the protection of minors in terms of age and content classification is assigned to the regulatory body NICAM, under the meta-supervision of the Dutch Media Authority (Commissariaat voor de Media, CVDm). This system is funded by Dutch audiovisual industry sectors and the government. NICAM manages and develops the classification system, which is based on scientific insights to keep up with technological developments and impact on children, oversees industry compliance, and provides public education.

This scenario will involve positioning choices with regards to existing infrastructure, and can be represented as a plus option for the PEGI system (PEGI+), if that system can find

room to supplement existing efforts with behavioral design information. Differentiation might also be needed between game sub-markets, such as traditional boxed games and online games (or apps) that are both higher in volume and might evolve / change quicker, requiring a different rating or self-rating approach. Distributors and creators of audiovisual media established in the Netherlands are required to join NICAM and assume responsibility for classifying their content and informing the public. NICAM conducts random quality checks on industry classifications and handles public complaints about potentially incorrect classifications.

One key advantage of implementing Scenario 2 as envisioned here is that it can build upon an existing infrastructure with extensive knowledge and experience in developing, maintaining, and managing classification systems. This includes PEGI, which is also managed by NICAM and provides ex-ante oversight, as well as expertise in industry supervision, researching public information needs, and developing public information materials and campaigns in various forms. Furthermore, alignment can be sought with the various committees that are already part of the existing model, including, in addition to oversight bodies, a scientific committee and an advisory committee composed of societal stakeholders.

A second advantage is that video games would display classification labels on a much larger scale, as industry participation in the classification of their own video games would become a legal obligation. From a legal perspective, this requirement would not necessarily have to be limited to game publishers based in the Netherlands, as the country-of-origin principle, which applies to audiovisual media but is increasingly outdated due to technological developments, would not be applicable in this case.

A third advantage is that the system would include oversight and enforcement mechanisms, ensuring it is not merely voluntary. Meta-supervision could be assigned to the Dutch Authority for Consumers and Markets (ACM), which is responsible for consumer protection, particularly regarding behavioral design (see Section 3.2.2). In this case, public information could differentiate between lawful behavioral design and potentially unlawful behavioral design (for example, if it constitutes an unfair commercial practice), which would fall under ACM supervision.

A fourth advantage is that this system would cover more digital services, not just (uploaders on) video sharing platforms (as in Kijkwijzer Online), and would expand the existing classification framework beyond age and content categories to include other classifiers relevant to informed decision-making by the public. It would align with existing design requirements in the current system, such as broadcast time restrictions and technical protection measures.

Scenario 2 requires significantly more time for implementation, as it necessitates legislative amendments, the detailed development of governance structures, regulatory frameworks, and enforcement systems, as well as the establishment of training programs for coders and the development of public information tools. This system goes far beyond merely informing the public and could potentially compel game publishers to actively adjust behavioral design in video games to enhance the protection of minors. Again, this requires the structural embedding of the system within NICAM, ensuring sufficient resources for further development; however, the required investments are considerably higher.

3.3.3 Final considerations

Within the scope of this project, we have only conducted a preliminary exploration of the implementation possibilities for Gamecheck. This means that further elaboration is necessary in many areas, depending on which scenario is prioritized for implementation. It is advisable that this further development be assigned to - and carried out in collaboration with - the designated managing authority of the system.

On top of that, some issues remain open, or at least need further consideration, as part of the implementation trajectory. It is reasonable to assume that developments in the gaming industry will continue to evolve, leading to new monetization strategies. Therefore, it is essential that cutting-edge research is available to ensure that the system remains up to date. The scientific committee as part of the governance should play a key role in this process by assessing existing academic research into the effects of game mechanics and monetization strategies on player behavior and wellbeing.

Additionally, other innovative methods can make significant contributions to gaining insights into behavioral design in video games, such as data donation by video game users^h as well as long-term analysis of gaming behavior through data housing, i.e. collection, storage, and management of large datasets relevant to analyzing how video games influence users. The latter may include data on playtime, in-game behavior, microtransactions, social interactions within games, and players' physiological or psychological responses and may be particularly suited to assess how specific game mechanics and monetization strategies (such as loot boxes or microtransactions) influence player behavior and well-being. These developments should be monitored and, where possible, encouraged.

^h See <https://www.york.ac.uk/news-and-events/news/2024/research/smart-data-donation-service/>.

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Appendix 1: Game-check 1.0 Coding Tool

The document contains a brief description of the underlying assumptions when creating the tool, and all questions of version 1.0 of the tool.

<https://osf.io/keb39>

Partial preview of file content:

Content Generation

- ☐ Does the content generation follow a fixed algorithm? (Yes/No)
- ☐ Is dynamic content in the game informed by play performance? (Yes/No)
- ☐ Is the dynamic content in the game informed by other players' behaviour? (Yes/No)
- ☐ Is the dynamic content in the game optimized to increase spending in the short term (days)? (Yes/No)
- ☐ Is the dynamic content in the game optimized to increase spending in the long term (month)? (Yes/No)
- ☐ Does the game include user-generated content? (Yes/No)
- ☐ Is there are marketplace for user-generated content? (Yes/No)
- ☐ Are there any other aspects of content generation in the game that are relevant for players behaviour in and outside of the game? (Open question)

Deception

- ☐ Are in-game events accurately represented in the game's interface? (Yes/No)
- ☐ Does the game's interface deceive the user? (Yes/No)
- ☐ Is deception used to improve gameplay? (Yes/No)
- ☐ Is deception optimized for spending? (Yes/No)
- ☐ Are there any other aspects of deception in the game that are relevant for players' behaviour in and outside of the game? (Open question)

Engagement

- ☐ Are player data evaluated to increase time spent? (Yes/No)
- ☐ Are features of the game optimized to increase the frequency of player engagement? (Yes/No)
- ☐ Does the game include features that enable impulsive engagement, i.e., irreversible engagement through waiting or pressing a commonly used key/button? (Yes/No)
- ☐ Does the game contain features that auto-engage you in new content, e.g., auto-start? (Yes/No)
- ☐ Is the commitment key/mouse button that is used for central gameplay also used to engage directly in a new play session or activity? (Yes/No)
- ☐ Are there any other aspects of player engagement that are relevant for players behaviour in and outside of the game? (Open question)

Appendix 2: Game-check 1.0 Coding Tool applied to 48 coded games

The table contains questions of version 1.0, and data of 48 coded games.

<https://osf.io/mpaz5>

Partial preview of file content:

What's the name of your game?	Minion Rush	Minion Ru...	Diablo 4	Star Trek ...	Animal Cr...	Baldur's G...	Borderland...
What is the name of the publisher of the game?	Gameloft	Gameloft SE	Activision Bl...	Tilting Point ...	Nintendo	Larian Studios	2K Games
Does the game feature multiple modes? Please list the modes.	n.a.	Assuming th...	1. Seasonal ...	Single playe...	No	Yes, the ga...	Single-playe...
What player interaction patterns does the game feature?	Single-playe...	Single-playe...	Single-playe...	Single-playe...	In Animal Cr...	Single-playe...	Single-playe...
What is the premise of the game?	Endless run...	Minions rus...	Diablo 4 put...	You develop...	The player c...	Baldur's Gat...	Borderlands...
What are the objectives of the game?	-Get a high ...	From the FA...	1. Upgradin...	Story line co...	During the i...	a. Completi...	The main ob...
What resources does the game feature?	-Bananas -B...	The main re...	a. Gold, Te...	Credits (reg...	Bells are the...	Gold is the i...	Players enc...
What are the mechanics of the game?	-Challengin...	The mechan...	a. 6 button, ...	Card collecti...	In Animal Cr...	a. Turn-bas...	Borderlands...
What central rules does the game implement?	hard to ans...	Assuming th...	a. Attack pat...	Statistical i...	I don't see a...	This game u...	The game i...
Does the game feature live game operations?	Yes	Yes	Yes	Yes	Yes	No	Yes
What features are included in the game?	-Collectable ...	What featur...	1. 5 different...	Card collecti...	Seasonal ev...	a. 8 different...	First-person...
Does the game feature player-to-player communication?	No	No	Yes	Yes	Yes	No	Yes
Can players text with each other directly?	N/A	No	Yes	Yes	Yes	No	Yes
Is text communication filtered?	N/A	N/A	N/A	No	No	N/A	Yes
Can players use voice-chat to communicate with each other?	N/A	No	Yes	No	No	No	Yes
Is voice communication filtered?	N/A	N/A	N/A	N/A	N/A	N/A	No
Is text communication monitored?	N/A	N/A	N/A	No	No	N/A	N/A
Is communication changed, e.g., words blurred or replaced?	N/A	N/A	Yes	No	N/A	N/A	Yes
Are there any other aspects of player-to-player communication in the g...	N/A	Currently th...	- Mature lan...	Players are ...	In Animal Cr...	Baldurs Gat...	N/A
Does the game include in-game purchases?	Yes	Yes	Yes	Yes	No	No	No
Does the game convert currency?	Yes	Yes	Yes	Yes	No	No	N/A
Is there more than one converted currency?	Yes	Yes	No	Yes	No	No	N/A

Appendix 3: Game-check 2.0 Coding Tool

The game-check coding tool seeks to provide questions that reveal a **pressure** on time, money, and attention/engagement in video games. These are pressures that a video game can put on a user's behavior after the initial decision to purchase the game or to play a 'free to play' version of the game.

The document below contains an overview of the game check tool, all questions, and introductions to the different sections as presented during the stakeholder meeting. The tool can be found here: <https://osf.io/cp2a8>.

Note that this pressure regularly serves a direct or indirect monetization aim, it is not necessarily negative. Moreover, cases of positive pressure exist, such as the stimulation of breaks in play.

Note that while we split the strategies into their dominant element (time/money/attention-engagement focus), strategies can cover multiple of these aspects and regularly do.

Game descriptive questions

- **What is the name of your game?**
 - Example: "Skyward Quest"
- **On which platforms can this game be played?**
 - Example: "Skyward Quest is available on PC, PlayStation, Xbox, and Nintendo Switch."
- **Who is the publisher of the game?**
 - Example: "Epic Realm Studios"
- **Does the game feature multiple modes (e.g., multiplayer, versus, sandbox)? If yes, please list all the modes.**
 - No / Yes. Example: it features a single-player campaign, co-op multiplayer, and a sandbox exploration mode."
- **What player interaction patterns (e.g., player-vs-game, player-vs-player) are featured in the game?**
 - Example: "Player-vs-game (PvE), with occasional co-op elements."
- **In a maximum of 100 words, describe what your game is about.**
 - Example: "Skyward Quest is an action-adventure game set in a mythical world of floating islands. Players take on the role of a hero tasked with defeating an ancient evil threatening to consume the sky realm. Explore dungeons, solve puzzles, and engage in fast-paced combat while upgrading abilities and forging alliances with various factions."
- **Are there any important rules that are central to understanding how the game works? If so, please describe them.**
 - Example: in Tetris, "completing a line makes the line disappear" and "a brick touching the top of the screen ends the game." "In Skyward Quest, players must manage stamina while attacking or dodging. If stamina runs out, the character becomes vulnerable for a short time. Defeating enemies restores small amounts of health and mana."
- **Does the game feature live operations, meaning it can be updated after purchase?**
 - Example: "Yes, the game receives regular updates, including new quests, events, and content patches."
- **Which mode would you like to describe using the game check tool?**
 - Example: "Single-player campaign."

Gamecheck 2A: Pressure on money

Monetization Strategies and Game Elements

Monetization strategies in games refer to design elements that are **aimed at generating revenue without being necessary for the core gameplay experience**.

These strategies often revolve around optional purchases that enhance a player's customization, progression, or access to exclusive content (e.g., cosmetic skins, experience boosters). A common example is the sale of in-game currencies, which players can purchase with real money and use to buy non-essential items like character outfits or cosmetic upgrades.

Monetization can also rely on reward structures like *battle passes*, where players unlock additional cosmetic rewards by purchasing a premium version. Similarly, games may introduce *microtransactions*, allowing players to buy random rewards through systems such as *loot boxes* or *gacha mechanics*, which promote spending by offering the chance to receive rare or exclusive items. Additionally, time-limited offers and exclusive event-based purchases create a sense of urgency, encouraging players to spend quickly to acquire items that won't be available later, as seen in *seasonal sales* or *flash events*.

Subscriptions and premium memberships offer recurring benefits like extra in-game currency or exclusive content, while *pay-to-progress* models give players the option to speed up gameplay by purchasing time-saving boosts. These strategies effectively balance generating revenue with maintaining optional, non-essential gameplay elements.

Below, you will find an evolving list of known monetization strategies and some more general questions about this domain.

Please review the options and check all that apply:

Wellbeing supportive measures

- ☐ **All in-game purchaseables available in regular non-restricted gameplay**
- ☐ **All transactions are denominated in Euros**
- ☐ **Maximum spending limits are in place (caps)**

Microtransactions

- ☐ **In-Game Currency**
 - o Players purchase virtual currency with real money, which can then be used to purchase cosmetic items, boosts, or other non-essential game features (e.g., Fortnite V-Bucks, Genshin Impact Primogems). The following examples refer to purchases in both real money and converted currency, regardless of whether or not items can also be obtained through regular gameplay.
- ☐ **Cosmetics/Skins**
 - o Players can purchase non-gameplay-altering cosmetic skins for characters, weapons, or environments (e.g., Fortnite skins, League of Legends champions/skins).
- ☐ **Emotes/Animations**
 - o Players can purchase special animations, victory poses, or emotes for in-game interactions (e.g., Fortnite dances, Destiny 2 emotes).
- ☐ **Gameplay relevant (temporary) content**
 - o Players can directly purchase upgrades, boosts, characters or unlocks that impact gameplay directly. In social games these purchases can result in 'pay to win' situations.
- ☐ **Loot Boxes/Gacha Systems**
 - o Players can purchase loot boxes/gacha systems that offer randomized rewards, such as rare characters, weapons, or skins (e.g., Genshin Impact banners, Overwatch loot boxes).
- ☐ **Complex purchasing options (e.g. piggy bank, sequential offers)**
 - o Claim offers alternate free and paid rewards, visualized as a ladder/track ('claim each offer to unlock free rewards'), as implemented in, for instance, Tiny Tower. Or a Piggy-bank system. Accumulating vault with in-game reward/currency, which can be unlocked at any time for a price, serving as an on-going attempt to establish at which price-point the user is ready to purchase the entire vault content.

Downloadable Content (DLC)

- ❑ **Expansions/Story Packs**
 - Paid expansions or story content that adds new missions, storylines, or areas to explore but is not necessary for the core game (e.g., The Sims expansion packs, Destiny 2 expansions).
- ❑ **Character/Weapon Packs**
 - Games sell additional characters, weapons, or items as downloadable content that are optional but offer a more diverse gameplay experience (e.g., Smash Bros. DLC characters, Mortal Kombat Kombat Packs).

Battle Passes

- ❑ **Battle pass or premium (non-free) battle pass track**
 - Players purchase premium versions/tracks of battle passes to unlock additional exclusive rewards (e.g., Apex Legends, Valorant). Or the entire battle-pass is paid/purchased to begin with and no free track in the battle pass exists.
- ❑ **Seasonal Battle Passes**
 - Players can purchase a tiered reward system (battle-pass), usually consisting of free and premium tracks, where players can unlock cosmetic rewards, currency, and items as they level up the pass by completing challenges or gaining experience (e.g., Fortnite, Call of Duty: Warzone).
- ❑ **Battle Pass Level/tier Skips**
 - Players optionally purchase advancement in reward tiers. Some games allow players to purchase level skips within the battle pass, advancing them faster through tiers to gain rewards without the grind.

Pay-to-Progress Systems

- ❑ **Time-Savers/Boosters**
 - Players pay for items or features that speed up gameplay progression, such as experience boosters, resource multipliers, or faster construction times (e.g., Clash of Clans speed-up timers, FIFA Ultimate Team boosters).
- ❑ **Early Access to Content**
 - Allowing players to purchase access to new content or updates before they are available to the general player base (e.g., Call of Duty early weapon unlocks).

Subscription Models

- ❑ **On-going (Premium) Subscriptions**
 - Offering players a subscription that provides exclusive perks like faster progression, additional in-game currency, or premium items (e.g., Runescape membership, World of Warcraft subscription).
- ❑ **Temporary Monthly/Seasonal Subscriptions**
 - Monthly subscription packages that give access to exclusive content, recurring rewards, or limited-time bonuses (e.g., Fortnite Crew, Genshin Impact Blessing of the Welkin Moon), but which are non-recurring. Can be seasonal or collected to in-game-seasons.

Cosmetic Customization

- ❑ **Character Customization**
 - Selling individual customization options for avatars, characters, or profiles such as hairstyles, outfits, and accessories (e.g., The Sims 4, Roblox).
- ❑ **UI Themes and Decorations**
 - Paid customizations for the in-game user interface or home bases that don't impact gameplay, like backgrounds, themes, or frames (e.g., Clash of Clans custom bases, League of Legends ward skins).

In-game Convenience Sales

- ❑ **Inventory Space Expansion**
 - Charging players for the ability to expand inventory space, allowing them to carry more items or resources in the game (e.g., Destiny 2 vault expansions, Genshin Impact inventory limit expansions).
- ❑ **Character Slots/Loadout Slots**
 - Selling extra character or loadout slots to let players experiment with different builds without deleting previous progress (e.g., Warframe additional Warframe slots).
- ❑ **Fast Travel/Teleportation**
 - Offering paid fast travel or teleportation options to reduce time spent traveling in-game (e.g., Black Desert Online fast travel systems).

Seasonal and Event-Based Monetization

- ❑ **Event-Specific Purchases**
 - During special events or holidays, offering exclusive items, skins, or packs that can only be purchased during the event (e.g., Overwatch holiday skins, Apex Legends event loot).
- ❑ **Seasonal Currency**
 - Introducing limited-time currencies tied to events, where players need to spend real money to acquire enough of the currency to obtain exclusive items (e.g., Destiny 2 event currencies).

Patreon/Crowdfunding/In-App direct financial development support

- ❑ **Patreon/Creator Support**
 - Some games or platforms allow players to support content creators directly through subscriptions or one-time payments, often with in-game rewards or recognition (e.g., Roblox creator commissions).
- ❑ **Crowdfunding for New Content**
 - Some indie developers use platforms like Kickstarter to fund specific game features, offering backers exclusive content (e.g., Star Citizen crowdfunding for ships).

Gamecheck 2B: Pressure on time

Games can contain time-sensitive elements, i.e., elements such as in-game content, events, rewards, or mechanics that are available only for a specific period or during certain in-game or real-world time frames (e.g., during the night in-game or for a limited event window). These time-sensitive features often incentivize players to log in or participate regularly to avoid missing out on exclusive rewards or opportunities. This can put pressure on the gamer's agenda, encouraging play at specific times. If rewards are subjectively considered to be important for game participation and enjoyment, this can result in situations where gamers engage with the game even though they are not in the mood to play, in order not to miss out on temporary content.

Time-sensitive game elements can be implemented through various design strategies. For example, daily and weekly challenges encourage consistent engagement by offering rewards that refresh on a regular schedule. Additionally, seasonal events or limited-time game modes introduce exclusive content, such as holiday-themed rewards or special gameplay modes, that are only available for a short duration.

Other time-limited mechanics include flash sales or shop rotations, where rare items or discounted bundles are only accessible for a brief window, driving urgency for players to act quickly. Similarly, some games feature timed raids or competitive events that are only available during specific periods, adding an element of scarcity to high-value content. These time-sensitive features help to create a sense of progression, exclusivity, and engagement by capitalizing on specific time-based windows and recurring opportunities.



Figure: Candy Crush Candy Cup event with explanation (middle panel) and qualification timer (right panel).

Below, you will find a list of known time-sensitive elements.

Please review the options and check all that apply:

Wellbeing supportive measures

- ☐ **Gameplay can be ended at any time without consequences**
- ☐ **Timed features do not involve gameplay essential game-content**
- ☐ **Timed content avoids common recovery times (night time, weekend)**
- ☐ **Timed feature rewards can also be obtained in regular play**

In-Game Events

- ☐ **Daily Quests or Challenges**
 - o Reset every 24 hours, offering special rewards for players who complete them within the day (e.g., Genshin Impact, Fortnite).
- ☐ **Weekly Quests or Challenges**
 - o Available for a week and then rotate, providing limited-time objectives and rewards (e.g., Destiny 2, World of Warcraft).
- ☐ **Seasonal Events**
 - o Special events tied to real-world holidays or seasons, such as Christmas or Halloween, often feature exclusive rewards and content (e.g., Overwatch, Animal Crossing).
- ☐ **Limited-Time Game Modes**
 - o Game modes that are only available for a limited time, such as a weekend or during specific event periods (e.g., League of Legends' ARURF mode).

Time-Gated Content

- ☐ **Timed Raids or Dungeons**
 - o Raids or boss battles that are only accessible during specific in-game times or dates (e.g., Final Fantasy XIV, World of Warcraft).
- ☐ **Flash Sales/Shop Rotations**
 - o In-game stores that offer special discounts or rare items for short durations, typically resetting every few hours or days (e.g., Fortnite, Apex Legends).
- ☐ **Exclusive Time Windows for specific content**
 - o Certain in-game activities or NPCs are only available during specific in-game time periods, such as nighttime (e.g., The Legend of Zelda: Breath of the Wild).
- ☐ **Event-Specific Rewards:**
 - o Rewards that can only be earned during specific events or limited-time promotions (e.g., Call of Duty battle pass content, FIFA Ultimate Team promos).
- ☐ **Time-Limited Loot Boxes or Gacha Pulls:**
 - o Special loot boxes or gacha banners that offer exclusive rewards for a limited period (e.g., Genshin Impact banners, Hearthstone expansions).

Real-World Time-Based Features

- ❑ **Real-World Timers**
 - Features or events tied to real-world time, such as daily resets, weekend-specific content, or events tied to player location's time zones (e.g., Pokémon GO community days).
- ❑ **Daily Login Rewards**
 - Daily logging rewards are given for logging in on consecutive days, usually resetting after a certain period (e.g., Clash of Clans, Genshin Impact).
- ❑ **Progression loss risks when not playing**
 - Risk to your in-game progression exists, for instance, your in-game buildings or city can be attacked when you are not playing, resulting in progression loss. This is often combined with options to buy 'protection' for x hours.

Competitive or Social Features

- ❑ **Time-Limited Tournaments**
 - Competitive events or tournaments that take place for a limited period, often with unique rewards (e.g., Fortnite competitive seasons, Rocket League events).
- ❑ **Leaderboards Reset**
 - Leaderboards or rankings that reset weekly or monthly, are often tied to special in-game rewards (e.g., Hearthstone ranks, League of Legends ranked rewards).

Energy/Resource Recovery

- ❑ **Energy Systems**
 - Many games limit player action through energy or stamina systems that regenerate over time, requiring players to wait to continue (e.g., Candy Crush, Clash Royale).
- ❑ **'Real world time' Timers**
 - Building or upgrading structures that take real-world time, sometimes with options to speed up via currency (e.g., Clash of Clans). Variants are possible, like in-game currency pickups that accumulate 1 token every four hour with a storage capacity of 1, encouraging 4 hourly pickups.

Real-Time Multiplayer Synchronized Event

- ❑ **Scheduled PvP Matches**
 - Some competitive games schedule real-time multiplayer events or matches, requiring players to log in at a specific time (e.g., Call of Duty tournaments).
- ❑ **Guild Events/Clan Wars**
 - Team-based events or wars that take place at specific times, require coordination among players (e.g., Clash of Clans).

Gamecheck 2C: Pressure on attention/engagement

Games can contain various **engagement** strategies, i.e., elements designed to keep players returning to the game or focusing on specific aspects of gameplay. These strategies aim to maintain player interest by offering consistent progression, rewards, or social interaction. Engagement strategies are often structured to encourage ongoing participation, whether through (daily) incentives, long-term goals, or competitive features.

Engagement strategies can be implemented through a wide range of design choices. For example, daily login rewards and streak-based incentives encourage players to log in consistently, offering escalating rewards for maintaining a regular schedule. Additionally, progression systems such as leveling up or unlocking achievements motivate players to continue playing to access new content or abilities.

Other strategies include time-limited events and seasonal content, where exclusive items or modes are available for a short duration, driving players to participate before the opportunity passes. Competitive rankings and leaderboards foster ongoing engagement by encouraging players to improve their standing and earn rewards. Furthermore, social features like guilds or multiplayer sync allow for cooperative gameplay, fostering a sense of community and shared progress.

Customization options and collectibles also play a role in engagement, as players are often motivated to personalize their characters or complete collections. Resource regeneration systems, like energy or stamina that replenishes over time, incentivize players to return regularly to continue their gameplay. These engagement strategies collectively promote a sense of accomplishment, personalization, and competition, driving long-term retention and interaction within the game.

Games also use direct calls for **attention**, directing the user back to the game, game-purchases, or game-elements via notifications in and around the game. Often, this approach combines with engagement elements, e.g. when notifications inform you about your daily quest or that you are almost out of time to finish a task.

Below, you will find an evolving list of known attention and engagement strategies and some more general questions about this domain.

Please review the options and check all that apply:

Wellbeing supportive measures

- ☐ **In-game progression/content can not be lost if player turns inactive**
- ☐ **Extended breaks in play have no adverse consequences**

Direct calls for attention

- ☐ **(Pop-up) notifications about game(play)**
 - ☐ Notifications to come back to the game, when outside of the game. Can involve specific in-game tasks (daily quest), timer completion, or specific purchases.

- ❑ **Sales notifications disrupting gameplay**
 - Notifications that disrupt regular gameplay with offers (e.g. screen filling advertisement, buy ... now / special offer, etc.)
- ❑ **Social feedback/notifications**
 - Notifications about purchasing or playing activity of friends in and around the game
- ❑ **Notifications for new content**
 - Notifications about new content in and around the game.

Login and Streak-Based Incentives

- ❑ **Daily Login Rewards**
 - Players receive rewards for logging into the game daily, incentivizing frequent participation (e.g., Genshin Impact, Fortnite, Clash Royale).
- ❑ **Streak-Based Rewards**
 - Players earn increasingly better rewards for maintaining a continuous streak of actions, such as logging in daily or completing missions (e.g., Pokémon GO 7-day Pokéstop streak, Call of Duty: Mobile streak logins).

Advertising/Partnerships and Redirected Attention

- ❑ **In-Game Ads watching**
 - Free-to-play games feature banner ads, video ads, or product placements, sometimes offering rewards to players who watch them (e.g., mobile games like Candy Crush or Clash of Clans).
- ❑ **Brand Collaborations**
 - Partnering with real-world brands for exclusive in-game content or events, often with themed cosmetics or items (e.g., Fortnite Marvel and Star Wars skins, Animal Crossing Sanrio packs).
- ❑ **Diverting user attention to other games and media forms**
 - The game redirects the user to other games, generally for a reward in the primary game (e.g. a form of premium currency). If tasks are completed in the secondary games (e.g. play x hours, purchase 1 microtransaction, etc.), the reward is granted, with an intermediary app tracking fulfillment of this requirement.

Progression Systems

- ❑ **Leveling and Progression Systems**
 - Players unlock new content, abilities, or rewards by leveling up characters or accounts, motivating them to keep playing (e.g., World of Warcraft, Overwatch, FIFA Ultimate Team).
- ❑ **Challenges and Achievements**
 - Players complete specific objectives or challenges to earn rewards, badges, or achievements, encouraging them to aim for difficult or varied goals (e.g., League of Legends, Assassin's Creed, Xbox Live Achievements).
- ❑ **Progression on time-limited precommitment systems (including battle-pass)**
 - Progression on systems that require an upfront currency/token/item investment and that involves tracked progress that is retained between game-sessions. One example would be 80/100 steps complete on a battle-pass system, encouraging the user to come back to complete

Social and Multiplayer Features

□ **Social Features and Clan Systems**

- o Encouraging players to join guilds, clans, or groups to team up with friends or fellow players, fostering community and shared progress (e.g., Clash of Clans, Destiny 2, World of Warcraft).

Narrative and Content Updates

□ **Narrative-Driven Content Updates**

- o New storylines, characters, or missions are added over time, keeping players engaged with a continuously evolving narrative (e.g., Destiny 2 seasonal storylines, Final Fantasy XIV expansion updates, and The Witcher 3 DLC expansions).

Customization and Collectibles

□ **Player Customization**

- o Offering extensive customization options for characters, homes, or in-game items, motivating players to spend time personalizing their experience (e.g., Animal Crossing: New Horizons, The Sims 4, Fortnite skins).

□ **Collectibles and Unlockables**

- o Players collect rare items, characters, or unlockables, often driving them to complete content to show off achievements (e.g., Pokémon GO Pokédex, Super Smash Bros. character unlocks, Genshin Impact character banners).

Competitive Play and Rankings

□ **Competitive Rankings and Leaderboards**

- o Ranked modes or leaderboards encourage players to compete for higher ranks or rewards, fostering replayability and competitive interaction (e.g., League of Legends, Rocket League, FIFA Ultimate Team).

Personal Milestones and Goals

□ **Personal Goals and Milestones**

- o Players set personal milestones or goals, such as unlocking a specific item or completing a mission, driving engagement and focus (e.g., Minecraft building goals, Stardew Valley farming goals, Animal Crossing: New Horizons village development goals).

Community and Content Creator Engagement

□ **Content Creator and Community Engagement**

- o Engaging players through community events, content creation (like streaming or custom levels), or highlighting community achievements keeps players active (e.g., Fortnite streamer events, Minecraft custom maps/mods, Roblox user-generated content).

Appendix 4: Game-check 2.0 Coding Tool applied to three popular games

The table, hosted at <https://osf.io/evs3p>, contains questions of version 1.0, and data of 3 coded games. We provided an abbreviated version of the table below, as it conveys both the game-check 2.0 question list, as well as the answers for three example games.

Gamecheck version 2.0, applied to three example video games	KI*	Tiny Tower	Diablo 4	Stardew Valley
Game descriptive question				
What is the name of your game?		Full version at https://osf.io/evs3p contains these answers, removed to keep the overview brief.		
On which platforms can this game be played?				
Who is the publisher of the game?				
Does the game feature multiple modes (e.g., multiplayer, versus, sandbox)? If yes, please list all the modes.				
What player interaction patterns (e.g., player-vs-game, player-vs-player) are featured in the game?				
In a maximum of 100 words, describe what your game is about.				
Are there any important rules that are central to understanding how the game works? If so, please describe them.				
Does the game feature live operations, meaning it can be updated after purchase?				
Which mode would you like to describe using the game check tool?				
Pressure on money				
All in-game purchaseables available in regular non-restricted gameplay	+	Majority	No	n/a
All transactions are denominated in Euros	+	No	No	Yes
Maximum spending limits are in place (caps)	+	No	No	n/a
Microtransactions				
In-Game Currency	🌀	Yes	Yes	No
Cosmetics / Skins	🌀	Yes	Yes	No
Emotes/Animations	🌀	Indirect	Yes	No
Gameplay relevant (temporary) content	🌀	Yes	No	No
Loot Boxes/ Gacha Systems	🌀	Yes	No	No
Complex purchases (e.g. piggy bank, sequential offers)	🌀	Yes	No	No
Downloadable Content (DLC)				
Expansions/Story Packs	🌀	No	Yes	No
Character/Weapon Packs	🌀	No	No	No
Battle Passes				
Battle pass or premium (non-free) battle pass track	🌀	Yes	Yes	No
Seasonal Battle Passes	🌀	n/a	Yes	No
Battle Pass Level/tier Skips	🌀	n/a	Yes	No
Pay-to-Progress Systems				
Time-Savers/Boosters	🌀	Yes	No	No

Early Access to Content	🌀	No	No	No
Subscription Models				
On-going (Premium) Subscriptions	🌀	No	No	No
Temporary (Monthly/Seasonal) Subscriptions	🌀	Yes	No	No
Cosmetic Customization				
Character Customization	🌀	Yes	Yes	No
UI Themes and Decorations	🌀	Yes	Yes	No
In-game Convenience Sales				
Inventory Space Expansion	🌀	Yes	No	No
Character Slots/Loadout Slots	🌀	No	No	No
Fast Travel/Teleportation	🌀	No	No	No
Seasonal and Event-Based Monetization				
Event-Specific Purchases	🌀	Yes	Yes	No
Seasonal Currency	🌀	Yes	No	No
Patreon/Crowdfunding/In-App direct financial development support				
Patreon/Creator Support	🌀	No	Yes	No
Crowdfunding for New Content	🌀	No	No	No
Pressure on time				
Gameplay can be ended at any time without consequences	+	Yes	No/Yes	Yes
Timed features do not involve gameplay essential game-content	+	Yes	No	n/a
Timed content avoids common recovery times (night time, weekend)	+	No	No	
Timed feature rewards can also be obtained in regular play	+	No	No	n/a
In-Game Events				
Daily Quests or Challenges	🌀	Yes	No	No
Weekly Quests or Challenges	🌀	Yes	Yes	No
Seasonal Events	🌀	Yes	Yes	No
Limited-Time Game Modes	🌀	Yes	Yes	No
Time-Gated Content				
Timed Raids or Dungeons	🌀	No	No	No
Flash Sales/Shop Rotations	🌀	Yes	Yes	No
Exclusive Time Windows for specific content	🌀	Yes	Yes	No
Event-Specific Rewards	🌀	Yes	Yes	No
Time-Limited Loot Boxes or Gacha Pulls	🌀	Yes	No	No
Real-World Time-Based Features				
Real-World Timers	🌀	Yes	Yes (world events)	No
Daily Login Rewards	🌀	Yes	No	No
Progression loss risks when not playing	🌀	No	No	No
Competitive or Social Features				
Time-Limited Tournaments	🌀	No	Yes	No

Leaderboards Reset	🌀	No	Yes	No
Energy/Resource Recovery				
Energy Systems		Yes	Yes	Yes
'Real world time' Construction (e.a.) Timers	🌀	Yes (research)	No	No
Real-Time Multiplayer Synchronized Event				
Scheduled PvP Matches	🌀	No	No	No
Guild Events/Clan Wars	🌀	No	No	No
Pressure on attention/engagement				
In-game progression/content can not be lost if player turns inactive	+	Yes	Yes (except seasonal content)	Yes
Extended breaks in play have no adverse consequences	+	Yes	Yes (except seasonal content)	Yes
Direct calls for attention				
(Pop-up) notifications about game(play)	🌀	Yes	Yes	No
Sales notifications disrupting gameplay	🌀	Yes	Yes	No
Social feedback / notifications	🌀	No	Yes	No
Notifications for new content	🌀	Yes	Yes	No
Login and Streak-Based Incentives				
Daily Login Rewards	🌀	Yes	No	No
Streak-Based Rewards	🌀	Yes	No	No
Advertising/Partnerships and Redirected Attention				
In-Game Ads watching	🌀	Yes	No	No
Brand Collaborations		Yes (TT lego, TT star wars)	Yes	No
Diverting users to other media (e.g. Twitch, Youtube streams.	🌀	Yes (offer wall)	Yes	No
Progression Systems				
Leveling and Progression Systems		Yes	Yes	Yes
Challenges and Achievements		Yes	Yes	Yes
Progression on time-limited precommitment systems (inc. battle-pass)	🌀	Yes	Yes	No
Social and Multiplayer Features				
Social Features and Clan Systems		Yes	Yes	No
Narrative and Content Updates				
Narrative-Driven Content Updates		No	Yes	No
Customization and Collectibles				
Player Customization		Yes	Yes	Yes
Collectibles and Unlockables		Yes	Yes	Yes
Competitive Play and Rankings				

Competitive Rankings and Leaderboards		No	Yes	No
Personal Milestones and Goals				
Personal Goals and Milestones		Yes	Yes	Yes
Community and Content Creator Engagement				
Content Creator and Community Engagement		No	Yes	No

*KI: Key indicator, indicates some type of behavioral pressure in this category.

