

Are Loot Boxes Gambling? Random reward mechanisms in video games

Rune Kristian Lundedal Nielsen¹

IT University of Copenhagen
Rued Langgaards Vej 7
2300 S
+45 72 18 51 54
rkln@itu.dk

Paweł Grabarczyk

IT University of Copenhagen
Rued Langgaards Vej 7
2300 S
+45 72 18 50 00
pawg@itu.dk

ABSTRACT

In this paper we investigate the phenomenon colloquially known as “loot boxes” or “loot crates”. Loot boxes became a hot topic towards the end of 2017 when several legislative bodies proposed that they were essentially gambling mechanisms and should therefore be legislated as such. We argue that the term “loot box” and the phenomena it covers are not sufficiently precise for academic use and instead introduce the notion of “random reward mechanisms” (RRMs). We offer a categorization of RRM, which distinguishes between RRM that are either “isolated” from real world economies or “embedded” in them. This distinction will be useful in discussions about loot boxes in general, but specifically when it comes to the question of whether or not they represent instances of gambling. We argue that all classes of RRM have gambling-like features, but that only one class can be considered to be genuine gambling.

Keywords

Gambling, gaming, addiction, Internet gaming disorder, classification, taxonomy, loot boxes, loot crates, random reward mechanisms.

INTRODUCTION

There is no doubt that the phenomenon of so called “loot boxes” was one of the dominant controversies discussed in the specialized gaming press in 2017. What is even more important, though the term “loot boxes” belongs to the gaming jargon and is often discussed in a very technical way, it managed to break into the mainstream discourse, provoking general, socially relevant questions such as the question about the relation between gaming and gambling or an inquiry as to whether some of the game mechanics could be considered to be psychologically exploitative. For this reason, loot boxes became the subject of public political debates ([link](#)) and it seems that some form of judicial regulations of this aspect of gaming is imminent. As is often the case with new phenomena (or at least new notions),

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the way the term “loot box” is used is rather haphazard. It is not obvious if the discutants refer to the same mechanism and how many types of similar existing and hypothetical future implementations of such mechanisms should be considered under the same moniker. Discussing and especially regulating games using ill-defined or understudied concepts may lead to two possible risks. First of all, some of the future regulations may end up using a notion that is too general (and thus throw the baby out with the bathwater). Second of all, they may end up using a notion which is too narrow (and focus on a particular implementation which can then be easily circumvented by future developers). For this reason, we believe creating a better conceptual apparatus and a typology of “loot boxes” is needed. A better description of the phenomenon of “loot boxes” and a classification of its different implementations is the main aim of this paper. The main intent of this classification is to facilitate public and academic discussion of this new trend in gaming and to help establish its relations to gambling. It is especially important because, even though taxonomies of gambling games exist, they are not very well suited for the "loot box" discussion. For example, a taxonomy proposed by Gainsbury et al. (2015) proposes four categories of gambling games: "social casino game", "social game or virtual world with casino features", "practice game", "Stand-alone console, online or mobile game". Even a cursory glance at the names of the categories shows that it cannot be used to discern categories of "loot boxes" as they could just as well appear in all four types of games.

We provide a general definition of the “loot box” mechanism in the following section and their typology later. We are going to argue, that this classification reveals, that some of the implementations of “loot boxes” are so different from each other that they should be studied and discussed separately.

THE NOTION OF A RANDOM REWARD MECHANISM

Even though invoking the term “loot box” is important in a preliminary discussion as it helps to put our paper in the contemporary context, we will refrain from using this term from now on. We believe that using this particular term may be misleading as its etymology suggests a particular implementation of a more general phenomenon, that is the implementation of random procedures used for selection and delivery of rewards in video games. This may obfuscate the fact that there are many other, functionally similar, implementations that use different visual representations and metaphors (for example card packs) but do not differ from “loot boxes” in significant respects. Since the relation between the random mechanism in games and other, better studied, phenomena (for example gambling) is yet to be established, we believe, that at this point it is best to use a neutral, technical notion of “Random Reward Mechanism” (RRM for short). In order to cover many different implementations of RRM we can describe their structure in a very general form according to which any RRM consists of three components:

Eligibility condition → Random procedure → Reward

The “eligibility condition” is the requirement the player has to meet in order to trigger the random procedure. What exactly this requirement boils down to depends on particular implementation. It can be the death of a given monster, achieving a certain number of experience points, spending a given number of minutes in a game or a micropayment made with one of existing currencies. The random (or pseudo-random) procedure can be achieved by any of the popular methods used in programming.² The technical details of this procedure are irrelevant to our discussion - the procedure could be just as well replaced by any physical method of achieving randomness, such as shuffling.

In a similar fashion, we do not specify the nature of the reward in question. It can be any element of the game that can be awarded to the player (a digital object, in-game currency, a new character, a new weapon, a character costume, new color scheme, new game mode or level).

HISTORY OF RRMS

It is important to remember that RRMs are fairly common in games and that they are also not exclusive to gaming. Before people started to use the notion of a “loot box” they referred to various forms of RRMs using the notion of “loot”. A widely recognized example of this type of mechanism can be found in games such as *Diablo* (Blizzard North 1996) (or *Borderlands* (Gearbox Software 2009) where killing a certain enemy [eligibility condition] triggers an event [random procedure] which awards the player a new object [reward]. These forms of RRMs have been extensively used in digital games almost from the beginning of the medium and have often been accompanied by other techniques of random content generation (Toy et al. 1980). One obvious reason of the popularity of RRMs in early games was that they gave the developer an inexpensive way of introducing variety, novelty and replayability to the game because the player could be constantly surprised by the objects they found during their playthrough. For the same reason RRMs are often used in contemporary independent games which also experience a demand for using cost-effective techniques (consider the resurgence of popularity of rogue games as an example of this (Garda 2013))³. It is also worth pointing out that one of the popular marketing strategies used in the 1980s (especially in the case of the British ZX Spectrum market) was to use the completion of whole games as eligibility conditions in lotteries. Players who finished a given game and proved this feat to the publisher were then able to win a prize. RRMs are also easy to come by in analog games – Monopoly chance cards are a good example of this. If the player lands on a specified field (eligibility condition), they draw one of the pre-shuffled cards (random mechanism) and receives a reward (or sometimes a penalty).

There are also well-known forms of entertainment that can be said to be built around RRMs – for example: collectible baseball and football cards, collectible card games such as *Magic the Gathering*, random capsule toy dispensers (so called gacha toys⁴) popular in Japan and chocolate eggs containing random toys (so called Kinder Eggs or Kinder Surprise), just to give a few examples. The main idea behind these types of purchases can probably even be traced as far as to 19th century collectible picture cards attached to cigarettes⁵ because, contrary to the main item (the cigarettes), they were not chosen by the customer, but given semi-randomly (depending on what was left in stock and which pack the seller randomly happened to choose). One important reason why these mechanisms became popular is that they increased sales of products because the more cards or pictures the customer already had, the less probable it was that they got what they wanted with a single purchase. The result of this statistical scarcity was that the customers had to purchase more items to increase the odds. Contemporary producers of collectible cards (and their digital equivalents) embraced this phenomenon by introducing artificial scarcity as the cards are classified as common, rare, very rare etc., depending on the probability of getting them (which results from the variability of the cards issued). The same techniques have been implemented in most games which classify the rarity of objects in a similar manner. The connection between these earlier forms of RRMs and the solutions found in contemporary video games is even stronger once we realize that some of the earlier implementations of the contemporary style RRMs in games originated as digitalization of collectible or used the iconography and metaphors of collectible cards (e.g., *Plants vs Zombies Garden Warfare* (PopCap Games 2014)). It is worth noting here, that the random elements in RRMs are not truly random but rather constricted or designed.

It is also worth mentioning, that RRM's are similar to some of the marketing strategies which gained popularity in recent years – specifically to various “blind” purchases such as (aptly named) “Loot crate” or “Humble Bundle Monthly” - a subscription service that lets the customer buy an undisclosed set of games which become revealed only after the sales for the particular set are closed. One important difference between “blind” purchases and RRM's is that, although both of them bank on uncertainty and the enjoyment that people feel when they are pleasantly surprised, the “blind” purchases do not contain a random procedure (or the appearance of a random procedure). For this reason, we do not treat them as a form of implementation of RRM's but rather as a related phenomenon.

Still, even though RRM's are hardly new, they have been the subject of hot public debates only recently. Players of older games (even those which used randomness heavily, such as *Diablo* or *Borderlands*) might have not even realized that the reward deciding procedure was random. Even though the information on the randomness of the procedure wasn't in any way hidden from the player (for example, it was often present in marketing materials), the games themselves did not indicate this with their iconography. Contrary to this, many newer implementations of RRM's accentuate randomness by using easily recognizable tropes such as spinning wheels, dice shaking sounds, shuffling, packs of collectible cards openings etc. It can be argued that this ostentatious glorification of randomness represents a genuinely new trend in video games. This shift can be seen in all of the early examples of modern RRM's which appeared around 2006-2007: Chinese action RPG game *ZT Online* (Giant 2006), *UEFA Champions League 2006–2007* (EA Sports 2007) and *Team Fortress 2 Mann-Conomy Update* (Valve 2010).⁶ The crucial difference between earlier implementations of RRM's and this new trend is that even though the older games celebrated the reward the player got, the newer ones celebrate the random procedure itself by objectifying it. Instead of a hidden procedure, it becomes a box, a pack a wheel or something similar. The importance of this aspect of the modern implementation of RRM's can be seen in the fact that the sheer act of opening a box, a card pack, or spinning the wheel (in other words the sheer act of triggering the random procedure) is transformed into a form of entertainment as players transmit it and broadcast it viewers on streams.⁷

It is not a surprise, that all of this iconography as well as the unusual focus on random procedures inspired comparisons of games containing RRMS to gambling which opens a new chapter in the study of the relation of both of these ludic phenomena.

THE RELATIONSHIP BETWEEN VIDEO GAMES AND GAMBLING

Similarities and differences between gambling and gaming have long been a topic of academic and public interest. In the 1980's and 1990's, researchers argued that the two were similar based on rather superficial similarities such as audio-visual feed-back following winning or digital displays:

Sound effects have been used on fruit machines to give the impression that winning is more common than losing (e.g. sound of falling coins onto the machine's metal tray or machines which buzz loudly or play a musical tune after a win). Since there are usually several slot machines in one venue, this illusion is magnified. Sound effects are a vital component of video games and provide a sense of realism and drama. Apparently, playing a popular game like *Tetris* with the sound off, is a greatly diminished experience and players report the game as being less tense and/or exciting. (Griffiths and Fisher, 1995, p. 243).

However, less superficial similarities were also noted. Fisher (1993) points out how slot machine arcades and casinos, like coffee bars and pool halls, are commercially provided cultural spaces, monopolized by young people. In these spaces “teenagers can meet peers, relieve boredom, act on emerging sexual identities [...]” (Panelas, 1983, p. 62 in Fisher, 1993, p. 401) and find shelter from the authorities and institutions that usually govern their lives. Arguably, coin-operated video game arcades can function in largely similar ways. In the U.K. arcades featured both types of machines side by side (Fisher, 1995). Fisher (1995) describes their similarities as follows:

Competition is encouraged by electronic features such as digital bank displays and screening the initials of top video scores to enhance the egos of successful players. Both video and fruit machines incorporate stunning visual displays and electronic jingles, so that they are visually and aurally attractive to children and adolescents. (Fisher 1995)

Griffiths (1991) refer to both types of machines under the umbrella term “amusement machines” (p. 53). He further argues that “a video game could be considered as a non-financial form of gambling, and taken to excess, both behaviors can be considered non-substance addictions” (p. 54). The main difference, according to Griffiths (1991), is that of *skill* versus *luck* and *points* versus *money*. However, he argues that the similarities outweigh the differences:

Amusement machines [...] are typically played upon by older male adolescents, some of whom develop gaming machine addictions which can cause a number of negative behavioral consequences (Griffiths 1991)

As coin-operated video games were all but completely replaced by other platforms such as consoles, smartphones, computers etc., the focus of video game addiction research has shifted. Recently, massively multiplayer online role-playing games (MMORPGs) have been the focus of video game addiction research. This interest in online games at the expense of offline or single player games is reflected in the terminology employed by the American Psychiatric Association (APA) which has proposed that video game addiction needs to be further researched under the term “Internet gaming disorder” (American Psychiatric Association, 2013). According to the APA, Internet gaming disorder is also known as “Internet use disorder”, “Internet addiction”, or “gaming addiction” (p. 796). These broader terms imply a reorientation away from games as addictive objects and towards games as addictive spaces. Yee (2006) condenses player motivations for playing MMORPGs into three clusters, or components:

Achievement component

Advancement—The desire to gain power, progress rapidly, and accumulate in-game symbols of wealth or status

Mechanics—Having an interest in analyzing the underlying rules and system in order to optimize character performance

Competition—The desire to challenge and compete with others

Social component

Socializing—Having an interest in helping and chatting with other players

Relationship—The desire to form long-term meaningful relationships with others

Teamwork—Deriving satisfaction from being part of a group effort.

Immersion component

Discovery—Finding and knowing things that most other players don't know about
Role-Playing—Creating a persona with a background story and interacting with other players to create an improvised story

Customization—Having an interest in customizing the appearance of their character. (Yee, 2006, p. 773)

Based on his analysis of player motivations, Yee argues that the concept of 'addiction' is too simplistic to adequately describe people's complex interaction with digital games. In line with this argument Weinstein and colleagues (2017) conducted a longitudinal study of Internet gaming disorder and concluded that unfulfilled needs were the underlying cause of people's gaming 'addiction-like' behavior. Interestingly, they also found that no one who exhibited 'addiction-like' behavior when they were first surveyed did so six months later.

There are multiple debates about video game addiction: does it even exist to begin with? Is it a symptom of underlying disorders or is it a disorder in its own right? These questions and many more are still debated in the academic community (e.g. Aarseth et al., 2016; Bean et al. 2017; van Rooij et al., 2018; Griffiths, Kuss, Lopez-Fernandez, & Pontes, 2017).

In our view, video games can only be addictive in the sense that any human activity that is rewarding can be addictive, i.e. there does not appear to be anything uniquely addictive about video games (Nielsen, 2017). So as long as other activities, such as sex, work, and exercise are not officially considered to be addictive it is incongruent to argue that games are. The introduction of purchasable random reward mechanisms⁸ into mainstream video games, however, may force us to reconsider. As mentioned, the introduction of 'real world currencies', random rewards and "pay-to-win" mechanics has caused a significant outcry in the gaming community. This outcry has moved legislative institutions, who had not previously considered whether gaming was gambling, to reconsider. This spawned articles with titles such as "This game is a Star Wars-themed online casino designed to lure kids into spending money" (Phillips, 2017) and "Why EA is Wrong to Say That 'Star Wars Battlefront II' Loot Crates Aren't Gambling" (Kain, 2017).

Gambling is currently the only human behavior which is officially recognized as addictive by the two most influential diagnostic systems: the American Psychiatric Association's DSM-5 and the World Health Organization's draft version of the ICD-11 (Bean et al. 2017)⁹.

Are gambling mechanisms at play in video games with RRM's?

This section will discuss some of the characteristics of gambling that are believed to explain why people gamble. These characteristics go by different names such as: psycho-structural elements (Karlsen, 2010), biases and irrational thinking (Rogers, 1998), heuristics and biases (Wagenaar, 1988), or cognitive distortions (Toneatto et al., 1997).

The Gambler's Fallacy

According to Wagenaar (1988) this bias occurs when: "the expectation that the probability of winning increases with the length of an ongoing run of losses" (chapter 1, n.p.). In the context of RRM's, the similarity seems straightforward: a player easily starts to overestimate the chances of receiving the loot that they want the most during "a run of bad luck".¹⁰

Near misses

Schüll (2012) describes how slot machines are designed to artificially produce situations where the player experiences nearly winning by for example showing the winning symbols just above or below the losing ones that the player actually got. This is supposed to encourage the player to try again. This same mechanism is arguably also at play in games like Star Wars Battlefront 2 where players first get to see how rare the rewards they are about to receive are, before it is revealed if the player already owns the rewards (and thus will not benefit as much from it).

Losses disguised as wins

According to Schüll (2012), “multi-line slot machines” introduced a subtle yet radical innovation. By allowing players to control the number of lines they are betting on along with the amount they bet players experience winning more, even if they are still losing steadily. The actual fact of losing is masked by a new kind of “quasi winning” or “losing disguised as winning” (p. 123). Losses disguised as winning is especially interesting in the context of video games and RRM. When people purchase RRM in digital games and get “common” rewards, instead of “uncommon”, “rare”, or even “epic” rewards are they then winning or are they in fact quasi-winning (and actually losing)?

Cognitive entrapment

This cognitive bias is also sometimes referred to as “sunk cost bias”, it describes a decision-making heuristic where an individual escalates their commitment to a previously chosen, but unsuccessful course of action in order to justify these prior investments (Rogers, 1998, p. 120).

Illusion of control

Research shows that even in games of pure chance, like lotteries, people are more likely to overestimate their chances of winning if they for example are allowed to pick their lottery number themselves (Rogers, 1998). This tendency is seen even more clearly in sports betting, horse betting and the like where people have been shown to falsely believe that they are better than random chance at predicting winners and losers (Wagenaar, 1988).

Chasing

Karlsen (2010) describes *chasing*, a gambling behavior where losses are sought recuperated by even more gambling with devastating economic results. Griffiths and Hunt (1998) liken his behavior to when people try to beat their own high score in video games. But is this a fair comparison? This will be the subject of the following discussion.

INVESTMENTS OF TIME VERSUS INVESTMENTS OF MONEY

The above mentioned behavioral heuristics or cognitive biases do not belong exclusively to the realm of gambling. The advice given to designers to: “don’t be afraid to kill your darlings” is not only good advice for designers, who in an attempt to justify time spent on a project that is going nowhere, keep sinking more effort into it. This advice would also be sound for gamblers who have already lost and are perhaps about to further compound those losses with even more gambling. One might also argue that it is good advice for certain people playing certain digital games. Karlsen (2010) makes the argument that RRM in World of Warcraft can also “entrap” players in similar ways (as an interesting side note it is worth mentioning that Karlsen also shows how players devise social systems that also effectively entrap them).

It seems to us, though, that an important difference exists between gambling and gaming when it comes to these cognitive traps. In gambling games players can lose money that should have otherwise been used to cover important expenses such as food, rent, and so forth. In gambling games, one can also take out loans in order to win back money that have already been lost. For someone who has lost more than they can afford to on the roulette it may be tempting to try and redeem those losses by taking out a large loan and betting everything on black. However, it is not reasonable to believe that you can win back lost time if that is what you have invested. In some ways, the old adage that “time is money” is true, but when it comes to gambling it is also decidedly untrue: one cannot regain lost time by spending more time.

Similar differences exist in relation to purchasable RRM. Someone who has unsuccessfully spent a month’s salary in an attempt to find a copy of a virtual Cristiano Ronaldo in FIFA Ultimate Team by purchasing RRM may fall prey to the Gambler’s Fallacy and falsely believe that the odds of finding him has magically increased as a result of previous failures to do so. However, since it is not possible to sell virtual players for real currency no one would ever think that the already incurred financial losses could be recuperated with additional spending (even if the sunk cost fallacy might drive players to try to justify previous spending with further spending).

We have yet to find instances of PRRM where there is no reward. In games like FIFA Ultimate Team or Star Wars Battlefront 2, the player may not get what they want, but they always get something (which in the long run can be exchanged for the thing they really want, at least in the case of these two games). An interesting question, however, is whether the “something” that one always gets is actually best described as “winning something”, or if it is better described as an instance of “losing disguised as winning”? In “multi line slot machines”, as described by Schüll (2012), it is possible (though perhaps not straightforward) to identify “losing disguised as winning” because it is possible to compare winnings and losses in cents and dollars. However, in digital games that do not have a market for virtual items it is impossible to evaluate the monetary value of winnings, exactly because there is no market on which to sell them.

The differences in RRM warrants classification, which will be the topic of the next section.

CLASSIFICATION OF RANDOM REWARD MECHANISMS

To reiterate – even though the idea of RRM is fairly old and has been used in gaming rather extensively, its current incarnation differs from earlier implementations in that it objectifies and celebrates randomness. Still, this easily recognizable difference is hardly everything there is to the “loot box” phenomenon. As mentioned in section 1, we believe that in order to facilitate further discussions and regulations of current RRM (with a specific focus on the relation between gaming and gambling) we have to discern between their different types.

Genuine vs simulated gambling

One key distinction we should start our classification considerations with is the distinction between simulated and real gambling. It is important because some of the games (or sections of games) directly simulate gambling (particular games like poker or roulette or sometimes even whole casinos) and because of this use RRM presented via gambling iconography. This distinction is hardly new as it was proposed in (King et al 2012) and incorporated in practical categorizations such as ERSB¹¹. Using this distinction is also good for practical reasons because recognizing games containing such sections isn’t difficult,

although some of the sections of this type may be accessible only after many hours of play.¹² What is especially interesting from our point of view, the number of games simulating gambling directly declined over the years. In particular, none of the games that spawned the current “loot boxes” discussion contain such sections. A natural way of expanding this category would be to look past the representational aspect of games because focusing only on audiovisual elements seems to be rather naïve and too much tied to the particular types of gambling games and machines that are known today (and these can change at any time).

Scholars recognized this problem and proposed the notion of non-standard simulated gaming (King et al, 2012) which boil down to the idea that some activities, even if they do not use gambling iconography, are structurally similar or in other words, are modelled on gambling (and thus should be classified as gambling simulations).

The need for this category is hardly surprising as games excel in modelling different domains of human activity and procuring structurally similar experiences or playable models can often be the main aim of the developers (think of the usage of the word “simulator” in many games as an indicator of this).

The big problem with this seemingly intuitive notion is that it is far from obvious which properties are to be treated as constitutive for this structural similarity. A good exemplification of a controversial choice of constitutive properties can be found in the literature which compares coin operated games with fruit machines (Fisher et al 1995). Should we treat them as structurally similar just because they happen to be operated in a similar manner (they require the user to put in a coin and push buttons to initiate the game)?

The most radical solution for the problem of the status of RRM would be to declare all games containing these procedures as simulated gambling (standard or non-standard). It could be argued that, even though RRM had been present in many earlier games they were simply overlooked, or underappreciated by scholars. For example, they were not listed amongst similarities between games and gambling presented in (Fisher et al 1995) and the only paper which specifically addresses the modern RRM implementation is (Griffiths & King 2015) (although it does not treat it as a separate category of games). Maybe the only thing that the current prominence of RRM introduced to the discussion is that they made us more aware of the characteristics which were present in games almost from the beginning? An obvious upside of this radical solution is that it provides a clear-cut distinction and gives the policymakers a convenient classification tool because it is easy to differentiate between games containing RRM and those which do not contain them. The downside of this line of argumentation is that mechanisms of this type are very common in culture and there is no non-arbitrary way of differentiating between their usage in games and other activities based on surprise and randomness. For example, in an ironic twist one of the newest studies on the relation between gambling and gaming used RRM as an incentive for the participants of the experiment (the participants could win a \$50 gift card) (Macey & Hamari, 2018).

What is even more important is that, even if we treated all games containing RRM as simulated gambling, we would still have to answer the question as to how simulated gambling relates to real gambling (and how games containing simulated gambling should be treated). The reason for this is that there is no obvious general relation between simulated activities and real activities that can be discovered without empirical studies. Players simulate a plethora of things, from killings, through formula 1 races to farming. It

is possible that some of these activities influence changes in their behavior in real life but it is impossible to speculate on the specifics of these changes.

The problem of the relation between simulated gambling (no matter if representational or structural) and real gambling can be analyzed from two different angles. The first angle is empirical - as we said we still need to study the effects of simulated gambling on future players' behavior. But there is also a second, conceptual angle, as we can wonder if it is possible that some games transcend the boundary between simulation and the reality they depict and simply become a form of gambling. It is easy to see that this particular question remains to be at the heart of the current discussions on the effects of RRM^s.¹³

One attractive way of singling out suspicious cases would be to say that RRM^s slide into gambling whenever a game containing it involves real currencies. This constraint seems natural because it is compliant with some of the existing social practices (a poker game played by a family with Monopoly money is not typically considered gambling) and existing regulations.

This gives us the possibility of reframing the question about the relation of games to gambling in a more precise way: are games which combine RRM^s with real currency a form of gambling? It is worth to point out that this line of argumentation led to institutional investigations¹⁴ and remains to be the most controversial aspect of RRM^s amongst users and journalists (Cross 2017a). Unfortunately, talking about the involvement of „real currency” or „real value” without additional restrictions is hardly helpful as it only introduces confusion to the discussion.

However, it is not only fruitful to distinguish between games that allow the player to spend money and games that do not; but also, to distinguish between games allow players to 'withdraw' money or virtual items that can be translated into other currencies. The Danish Gambling Authority does not consider loot-boxes in Star Wars Battlefront 2 to be gambling because the content of the loot-boxes cannot easily be exchanged for money whereas skin-betting¹⁵ in Counter-Strike: Global Offensive (CS:GO) (Valve, 2012) is considered gambling because the skins can relatively easily be changed into currency. According to the Danish Gambling Authority skin-betting is covered by the Danish Gambling Act, which regulates gambling games (2017, n.p.), but it is unclear from its statement whether the agency views the purchase of access to RRM^s in CS:GO to be gambling or if it only becomes gambling when the skins are used as currency in gambling games. In the words of the agency:

The winnings obtained in a loot box in Star Wars Battlefront 2 cannot be converted into financial means, as the fictional items in the loot box cannot be sold or otherwise converted into money. Therefore, loot boxes in their present form in Star Wars Battlefront 2 are not covered by the gaming act. This is also the reason why skinbetting [sic.] in connection with computer games such as Counter Strike Global Offensive etc. are covered by the Danish Act on Gambling. They are covered by the Act on Gambling because skins from these games can be sold on different websites, and thus converted into money. (Danish Gambling Authority, 2017, n.p.)

The legal legitimacy of this position by the Gambling Authority was recently cemented when the agency won a case in court to have 24 illegal gambling sites closed, six of which were skin-betting sites for games such as Dota 2 and CS:GO (Danish Gambling Authority,

2018). This case demonstrates the importance of discussing what “real value” is in terms of virtual items and currencies. This will be the focus of the next section.

“Real” money and “real” value

First of all, we have to explain precisely how „real value” or „real currency” is to be understood in this discussion. The easiest way to approach this problem is to start with a simple question: what is the opposition of „real” value in this particular context? It is rather obvious that it should not be presented as an opposition to digital currency. The fact that all of the games which are invoked in the current public discussions do not allow the player to put physical money in the slot (which makes them dissimilar to fruit machines) is hardly important for the problem at hand, as contemporary gambling is also often fully digitized (King et al, 2012).

Another option would be to juxtapose “real” money with so called „in-game” money, or virtual money that players use while playing. On the face of it, this opposition seems quite straightforward, but it is important to be cautious with this classification as there are important differences between the virtual currencies used by developers, which we believe to be crucial for our discussion. If you look at many contemporary games (especially in the mobile market) you might be surprised by the number of different in-game currencies they contain. What is important from our point of view is that they typically contain at least two different currencies and even though both of them can be spent in the game, one of them can also be earned outside of the game (for example with a purchase in the platform holder store).¹⁶ In practice, this second, purchasable currency functions as a proprietary currency usable only in one place (but still related to other currencies, since its value is expressible in acceptable value measurement systems, that is commonly accepted currencies). Note that the practice of using additional proprietary currencies is something that is typical for gambling (casino tokens is the classic example of this) so it seems to be highly relevant for the discussion. In order to avoid confusion coming from the usage of many related, overlapping notions such as “virtual”, “digital”, “proprietary” “in-game” etc. we propose to differentiate between currencies (or any tokens of value) which are either “isolated” from, or “embedded” in, the everyday economy. The difference should be relatively easy to grasp: a token which is embedded in everyday economy has a relation to other objects embedded in this economy which makes it possible to establish its value in different currencies. For example – if the currency the player uses in game can be bought or sold with one of the existing accepted currencies, it can be said to be embedded in the economy. Contrary to this, tokens which are isolated from the economy have no established relations to any other objects of value outside of the game. This difference can be easily illustrated by systems implemented in mobile games. As we already pointed out, it is fairly typical for games of this type to contain different types of currency. It is very common for one of these currencies to be embedded in the economy and for the rest of them to be isolated from it. What this means in practice is that only one of the currencies can be purchased with an existing accepted currency and that the currencies are not related to each other or that the relation between them is restricted.¹⁷

It should also be pointed out that in some cases players can exploit the game by changing the character of the reward – from isolated to embedded or from embedded to isolated. The first case can be illustrated by the phenomenon of “gold farming” or selling virtual items obtained via RRM on on-line auctions. The second case can be illustrated by a practice of hacking or exploiting a game containing purchasable RRM so they can be triggered without paying.

Buying, selling or both?

It is not enough to talk about the involvement of real currencies as it also should be specified if the involvement concerns only the eligibility condition, only the reward or maybe both of them. In other words, we have to decide which side of the diagram has to include real currency for a given game to be treated as similar to gambling. On the face of it this may seem like nitpicking but even a cursory glance at the state of discussions of the subject show that the intuitions and preconceptions of the disputants can be very different. Some of the existing popular and academic discussions focus mostly on eligibility conditions.¹⁸ Others focus mostly on the reward side of the diagram and argue that a given activity should be considered gambling only if the reward the player is getting has real economic value.¹⁹ Contrary to this, for some of the disputants, the sheer fact that the players are guaranteed a reward (as RRM by definition give something to the player) excludes games containing RRM from the class of gambling games.²⁰

Paying attention to the difference between the value of the eligibility condition and the value of the reward becomes even more important in our context once we realize that what RRM do is that they disrupt the connection between the payment and the value of the reward. In any normal transaction (for example in any regular in-game purchase of some additional game content) the distinction between the payment and the value of the object is not necessary, because the payment itself can be used as a measure of this value. To simplify – we could assume that the value of the game content is whatever the company charges for them. But the moment we introduce an RRM procedure as an intermediary between the payment and the reward, the evaluation of value based on the price of the eligibility condition becomes impossible²¹ because it varies from user to user. We could try to minimize this by disclosing the probability ratio of a given reward (a regulation which has been implemented for RRM in several Asian countries and by Apple in the app-store) but even this solution does not eliminate uncertainty completely. What it means in practice is that in case of an RRM we have to evaluate the value of the eligibility condition and the real value of the reward separately.

Taking both distinctions into account (the distinction between embedded and isolated economic value as well as the distinction between the value of the eligibility condition and the value of the reward) we can classify games containing RRM as belonging to four distinct categories (see Table 1 below).

As can be seen in Table 1, one distinction we consciously avoided (even though it is often raised in popular discussions of the subject) is the difference between so called “pay-to-win” rewards and “cosmetic” rewards. In a nutshell, the difference between these implementations hinges on whether the objects awarded to the player affect the mechanics on the game or only its aesthetics. A typical example of the former is the ability to win a new weapon for a competitive shooter game.²² Typical example of the latter is the ability to get a new costume for a game character. The reason we do not address this difference in our classification is that it concerns all additional content that can be purchased in games (independently of whether they are acquired via RRM or not) so it does not seem crucial for our discussion.²³

Resources (required for achieving the eligibility condition)	Reward	Example
Isolated	Isolated	Diablo 1, Diablo 2, ²⁴
Isolated	Embedded (virtual sellable object)	Diablo 3 (with auction house)
Embedded (real money purchase)	Isolated (virtual unsellable object)	Overwatch, Star Wars Battlefront 2, FIFA 17 Ultimate Team
Embedded (real money purchase)	Embedded (virtual sellable object)	PUBG, Team Fortress 2, CS:GO

Table 1: Different kinds of implementations of random reward mechanisms (RRMs)

An important advantage of our typology is that it helps us to avoid some of the conceptual pitfalls typical for the discussion of loot boxes.

First of all, it enables us to single out the implementation of RRMs typical for the earlier games (the first type). How exactly games containing this implementation relate to gambling remains to be seen, but every study which wishes to focus on the newer implementations of RRMs should take this difference into account.

Secondly, it shows that there is actually only one implementation of RRMs which is functionally similar to gambling (the last type) and that, surprisingly, games which spawned the current controversy, do not contain this particular implementation (because the rewards they give to the player are not embedded in the economy). It is also important to observe that (at least in some cases) the structural similarity between type 4 of implementation of RRMs extends to the amounts of money involved in the process. For example - the cost of a crate in PUBG can be as low as 1 Euro but the player could hope to win an object they can sell for as much as 1000 Euros which is functionally very similar to a lottery.

Thirdly, it shows that the analogy between modern RRMs and collectible cards is somewhat faulty, as most of the implementations of RRMs (types 1-3) reward the players with economically isolated objects. Interestingly, this aspect of RRMs cannot be treated simply as a side effect of digitization because some of the existing implementations give the player the ability to sell their rewards on the market.

Needless to say, having a classification is only a first step to answering the question as to how similar games that contain RRMs are to gambling. A full answer to this question demands further empirical studies. Still, we believe that one important preliminary

condition which any further serious study of this phenomenon should meet is that it does not talk about RRM*s tout court*, but that it studies different implementations of it separately. It is thus crucial that we do not conflate the four types of RRM*s* we listed above as this may severely affect the results.

CONCLUSION

This paper has introduced four distinct conceptualizations of random reward mechanisms (RRM*s*) in digital games. The central point of our paper is that the debates over RRM*s* should not conflate them as the differences between the four types we distinguish are important in the context of gambling. Furthermore, we argue that only RRM*s* that are embedded in the broader economy in terms of both the eligibility condition as well as the reward can be said to be structurally similar to gambling. In other words, only games where the player can both purchase random rewards and sell them using ‘real world’ currencies can be considered gambling.

Thus, not all games that feature RRM*s* are instances of gambling. However, as we have argued, the cognitive distortions that are said to underpin gambling behavior can also be found in RRM*s* in digital games.

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BIBLIOGRAPHY

- Aarseth, E., Bean, A. M., Boonen, H., Colder Carras, M., Coulson, M., Das, D., ... Van Rooij, A. J. (2016). Scholars’ open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal. *Journal of Behavioral Addictions*, 1–4. <https://doi.org/10.1556/2006.5.2016.088>
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition: DSM-5* (5 edition). Washington, D.C: American Psychiatric Publishing.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition: DSM-IV* (4th edition). Washington, DC: American Psychiatric Association.
- Bailey, K., (2017), “Gamers Like Opening Loot Boxes Too Much to Stop Now, Even at the Expense of Balanced Gameplay”, USGamer, <http://www.usgamer.net/articles/gamers-like-opening-loot-boxes-too-much-to-stop-now-even-at-the-expense-of-balanced-gameplay>
- BBC News, (2017), Call to regulate video game loot boxes over gambling concerns, BBC News, <http://www.bbc.com/news/technology-42110066>
- Bean, A. M., Nielsen, R. K. L., Rooij, A. J. van, & Ferguson, C. J. (2017). Video Game Addiction: The Push To Pathologize Video Games. *Professional Psychology: Research and Practice*. <http://dx.doi.org/10.1037/pro0000150>
- Brown, R., (2017), “Loot boxes and skin betting in video games: What are they, are they gambling, and should they be banned in the UK?”, Mirror, <https://www.mirror.co.uk/tech/loot-boxes-controversy-what-they-11566776>
- Chalk, A., (2017), “Belgium's Justice Minister calls for loot box ban in Europe”, PCGamer, <http://www.pcgamer.com/belgium-says-loot-boxes-are-gambling-wants-them-banned-in-europe/>

- Crecente, B., (2017), "State Legislators Weigh Law to Block Sale of 'Battlefront II' to Children", Rolling Stone, <https://www.rollingstone.com/glixel/news/state-legislators-weigh-law-to-block-battlefront-ii-sale-w512412>
- Cross, K., (2017a), "How the legal battle around loot boxes will change video games forever", The Verge, <https://www.theverge.com/2017/12/19/16783136/loot-boxes-video-games-gambling-legal>
- Cross, K., (2017b), "New Zealand says lootboxes 'do not meet the legal definition for gambling'", Gamasutra, https://www.gamasutra.com/view/news/311463/New_Zealand_says_lootboxes_do_not_meet_the_legal_definition_for_gambling.php
- Danish Gambling Authority. (2017, November 29). Statement about loot boxes / loot crates. Retrieved February 8, 2018, from <https://spillemyndigheden.dk/en/news/statement-about-loot-boxes-loot-crates>
- Danish Gambling Authority. (2018, February 6). Court decides in favour of The Danish Gambling Authority: 24 illegal websites to be closed. Retrieved February 8, 2018, from <https://spillemyndigheden.dk/en/news/court-decides-favour-danish-gambling-authority-24-illegal-websites-be-closed>
- Dingman, H., (2017), "How loot boxes are turning full-priced PC games into pay-to-win games of chance", PCWorld, <https://www.pcworld.com/article/3231668/gaming/loot-boxes-ruining-gaming.html>
- Fisher, S., & Griffiths, M. (1995). Current trends in slot machine gambling: Research and policy issues. *Journal of Gambling Studies*, 11(3), 239-247.
- Fisher, S. (1994). Identifying video game addiction in children and adolescents. *Addictive Behaviors*, 19(5), 545-553. [https://doi.org/10.1016/0306-4603\(94\)90010-8](https://doi.org/10.1016/0306-4603(94)90010-8)
- Fisher, S. (1995). The amusement arcade as a social space for adolescents: An empirical study. *Journal of Adolescence*, 18(1), 71-86.
- Fisher, S. (1993). Towards a sociological understanding of slot machine gambling in young people. In W. R. Eadington & J. A. Cornelius (Eds.), *Gambling behavior and problem gambling* (pp. 395-403). Institute for the Study of Gambling and Commercial Gaming, College of Business Administration, University of Nevada, Reno.
- Gainsbury, S.M., Hing, N., Delfabbro, P.H., King, D.L. (2015), "A taxonomy of gambling and casino games via social media and online technologies", *International Gambling Studies*, 14:2, 196-213, DOI: 10.1080/14459795.2014.890634
- Garda, M., (2013), Neo-rogue and the essence of roguelikeness, *Homo Ludens* 1(5) 2013
- Garda, Maria B., and Paweł Grabarczyk. "Is every indie game independent? Towards the concept of independent game." *Game Studies* 16.1 (2016).
- Good, O.S., (2017), Battlefront 2 loot crates draw lawmakers' attention in US, Belgium, Polygon, <https://www.polygon.com/2017/11/22/16690182/battlefront-2-loot-crates-hawaii-belgium-banned-regulation-investigate>
- Griffiths, M. D. (1991). Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *Journal of Adolescence*, 14(1), 53-73. [https://doi.org/10.1016/0140-1971\(91\)90045-S](https://doi.org/10.1016/0140-1971(91)90045-S)
- Griffiths, M., & Hunt, N. (1998). Dependence on Computer Games by Adolescents. *Psychological Reports*, 82(2), 475-480. <https://doi.org/10.2466/pr0.1998.82.2.475>

- Griffiths, M. D., & King, R. (2015). Are mini-games within RuneScape gambling or gaming?. *Gaming Law Review and Economics*, 19(9), 640-643.
- Griffiths, M. D., Kuss, D. J., Lopez-Fernandez, O., & Pontes, H. M. (2017). Problematic gaming exists and is an example of disordered gaming: Commentary on: Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal (Aarseth et al.). *Journal of Behavioral Addictions*, 6(3), 296–301.
- Hern, A., (2017), “How much?! – Star Wars Battlefront II and the problem with paid-for video game rewards”, *The Guardian*, <https://www.theguardian.com/games/shortcuts/2017/nov/26/how-much-star-wars-battlefront-ii-and-the-problem-with-paid-for-video-game-rewards>
- Hio, L., (2017), “Loot boxes in video games: Cool rewards or gambling trap?”, *The Straits Times*, <http://www.straitstimes.com/singapore/cool-loot-or-gambling-trap>
- Hood, V., (2017), Are loot boxes gambling?, *Eurogamer*, <http://www.eurogamer.net/articles/2017-10-11-are-loot-boxes-gambling>
- Kain, E. (2017, November 16). Why EA Is Wrong To Say That “Star Wars Battlefront II” Loot Crates Aren’t Gambling. Retrieved February 9, 2018, from <https://www.forbes.com/sites/erikkain/2017/11/16/why-ea-is-wrong-to-say-that-star-wars-battlefront-ii-loot-crates-arent-gambling/>
- Kamper, S., (2017), “It will take 4,528 hours of gameplay (or \$2100) to unlock all base-game content in star Wars: Battlefront 2”, *Star Wars Gaming*, <http://www.swtorstrategies.com/2017/11/it-will-take-4528-hours-of-gameplay-or-2100-to-unlock-all-base-game-content.html>
- Karlsen, F. (2011). Entrapment and Near Miss: A Comparative Analysis of Psycho-Structural Elements in Gambling Games and Massively Multiplayer Online Role-Playing Games. *International Journal of Mental Health and Addiction*, 9(2), 193–207. <https://doi.org/10.1007/s11469-010-9275-4>
- Kim, T., (2017), “EA to miss its guidance due to ‘Star Wars’ game loot box controversy, analyst predicts”, *CNBC*, <https://www.cnbc.com/2017/12/21/ea-to-miss-its-guidance-due-to-star-wars-game-loot-box-controversy-analyst-predicts.html>
- King, D.L., Delfabbro, P.H., Derevensky, J., and Griffiths, M.D., (2012), A Review of Australian Classification Practices for Commercial Video Games Featuring Simulated Gambling, *12 Int’l Gambling Stud.* 231–242.
- Knaus, C., (2017), “Gambling regulators to investigate 'loot boxes' in video games”, *The Guardian*, <https://www.theguardian.com/games/2017/nov/24/gambling-regulators-to-investigate-loot-boxes-in-video-games>
- Kuchera, B., (2017a), “Loot boxes are the video game issue of the year”, *Polygon*, <https://www.polygon.com/2017-best-games/2017/12/14/16772900/loot-boxes-loot-crates-2017>
- Kuchera, B., (2017b), “PUBG now features what looks a lot like gambling”, *Polygon*, <https://www.polygon.com/2018/1/9/16870828/pubg-loot-crates-probability-odds-gambling>
- Macey, J., & Hamari, J. (2018). Investigating relationships between video gaming, spectating esports, and gambling. *Computers in Human Behavior*, 80, 344-353.
- Miller, M., (2017), “The Design Failure Of The Loot Box”, *Gameinformer*, <http://www.gameinformer.com/b/features/archive/2017/10/19/the-design-failure-of-the-loot-box.aspx>
- Newman, J., (2017), “How Loot Boxes Led to Never-Ending Games (And Always-Paying Players)”, *Rolling Stone*,

- <https://www.rollingstone.com/glixel/features/loot-boxes-never-ending-games-and-always-paying-players-w511655>
- Nielsen, R. K. L. (2017). *Is game addiction a mental disorder? A dissertation on the history and science of the concept of Internet gaming disorder* (Doctoral dissertation). IT University of Copenhagen, Copenhagen.
- Phillips, T. (2017, November 22). This game is a Star Wars-themed online casino designed to lure kids into spending money. Retrieved February 9, 2018, from <http://www.eurogamer.net/articles/2017-11-22-star-wars-battlefront-2-loot-crates-belgian-gaming-commission-hawaii-chris-lee>
- Reaseigh-Lincoln, D., (2017), “Loot boxes are the controversial, but unavoidable, evolution of gaming”, Techradar, <http://www.techradar.com/news/loot-boxes-are-the-controversial-but-unavoidable-evolution-of-gaming>
- Rogers, P. (1998). The cognitive psychology of lottery gambling: A theoretical review. *Journal of Gambling Studies*, 14(2), 111–134.
- Shibuya, A., Teramoto, M., Shoun, A., (2015), Systematic Analysis of In-game Purchases and Social Features of Mobile Social Games in Japan, Proceedings of DiGRA 2015: Diversity of play: Games – Cultures – Identities, http://www.digra.org/wp-content/uploads/digital-library/137_Shibuya_et_al_Systematic-Analysis-of-In-game-Purchases.pdf
- Schreier, J., (2017), ESRB Says It Doesn't See 'Loot Boxes' As Gambling, Kotaku, <https://kotaku.com/esrb-says-it-doesnt-see-loot-boxes-as-gambling-1819363091>
- Schüll, N. D. (2012). *Addiction by Design: Machine Gambling in Las Vegas*. Princeton, NJ: Princeton University Press.
- Spencer, K., (2017), “‘Loot boxes’ turning young gamers into gamblers”, SkyNews, <https://news.sky.com/story/loot-boxes-blur-line-between-gaming-and-gambling-11168358>.
- Wagenaar, W. A. (1988). *Paradoxes of Gambling Behaviour*. New York: Routledge
- Weinstein, N., Przybylski, A. K., & Murayama, K. (2017). A prospective study of the motivational and health dynamics of Internet Gaming Disorder. *PeerJ*, 5, e3838. <https://doi.org/10.7717/peerj.3838>
- Wiltshire, A., (2017), Behind the addictive psychology and seductive art of loot boxes, PCGamer,
- Wiltshire, A., (2017), Belgium's Justice Minister calls for loot box ban in Europe, PCGamer, <http://www.pcgamer.com/behind-the-addictive-psychology-and-seductive-art-of-loot-boxes/>
- World Health Organization. (1992). *The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines*. World Health Organization.
- van Rooij, A. J., Ferguson, C. J., Carras, M. C., Kardefelt-Winther, D., Shi, J., Przybylski, A. K., ... Aarseth, E. (2018). A weak scientific basis for gaming disorder: Let us err on the side of caution. PsyArXiv. <https://doi.org/10.17605/OSF.IO/KC7R9>
- VTM Nieuws, (2017), Geens Wil Gokken In Games Verbieden, VRM Nieuws, <https://nieuws.vtm.be/vtm-nieuws/binnenland/geens-wil-gokken-games-verbieden>
- van Rooij, A. J., Ferguson, C. J., Colder Carras, M., Kardefelt-Winther, D., Shi, J., Aarseth, E., ... Nielsen, R. K. L. (2018). A weak scientific basis for gaming disorder: Let us err on the side of caution. *Journal of Behavioral Addictions*, 1–9.
- Yee, N. (2006). Motivations for Play in Online Games. *CyberPsychology & Behavior*, 9(6), 772–775. <https://doi.org/10.1089/cpb.2006.9.772>

LUDOGRAPHY

Blizzard Entertainment. (2004). World of Warcraft. [PC], Blizzard Entertainment.
Blizzard Entertainment. (2012). Diablo III. [PC], Blizzard Entertainment
Blizzard Entertainment. (2016). Overwatch, [PC], Blizzard Entertainment
Blizzard North. (1996). Diablo, [PC], Blizzard
Blizzard North, (2000), Diablo II. [PC], Blizzard
EA DICE. (2017). Star Wars Battlefront 2. [Sony PlayStation], Electronic Arts
EA Sports. (2007). UEFA Champions League 2006–2007. [PC], Electronic Arts
EA Vancouver. (2016). FIFA 17. [Sony PlayStation], Electronic Arts
Gearbox Software. (2009). Borderlands. [PC], 2K Games
PopCap Games. (2014). Plants vs Zombies Garden Warfare. [Xbox One], Electronic Arts
PUBG Corporation. (2017). PlayerUnknown's Battlegrounds (PUBG). [PC], PUBG Corporation
Supercell. (2016). Clash Royale. [iOS, Android], Supercell
Square Software (1998). Final Fantasy 7. [Sony PlayStation], Square Enix
Toy, M., Wichman, G., Arnold, K. (1980). Rogue. [Mainframe]
Valve. (2012). Counter-Strike: Global Offensive (CS:GO). [PC], Valve
Valve. (2007). Team Fortress 2. [PC], Valve

ENDNOTES

¹ The order in which the authors of this paper are presented was decided by a time-honored random procedure known as "the coin flip".

² The status of randomness used in programming is not without merit for the discussion on digital forms of gambling but it is not specific to the problems related to RRM. A good rundown on struggles with generating true randomness can be found at <https://www.random.org/history/>

³ For a detailed description of the notion of an independent game see (Garda & Grabarczyk, 2016)

⁴ See Shibuya et. al (2015) for an analysis of digitized version of gacha.

⁵ See examples of these at <https://www.collectorsweekly.com/tobacciana/tobacco-cards>

⁶ The original game has been released in 2007 but it did not contain RRM in the sense discussed in this paper.

⁷ Interestingly, the streams themselves can contain RRM as the viewers are often randomly rewarded with items by the streamer or a developer.

⁸ Purchasable random reward mechanisms (PRRM) are simple ones where the eligibility condition is the payment of currencies.

⁹ It is worth noting that the notion that behaviors can cause addictions is still controversial and was not a part of the DSM up until the release of DSM-5 in 2013 and the forthcoming ICD-11. In the ICD-10 (World Health Organization, 1992) and DSM-IV (American Psychiatric Association, 1994) 'pathological gambling' is considered an impulse control disorder.

¹⁰ An anecdotal story told to one of the authors of the present paper alleges that a Danish FIFA Ultimate team player spent 120,000 Danish Kroner (the equivalent of about \$20,000) on RRM. If such stories are true, they may be instances of the "sunk cost bias". Unfortunately, we have not been able to verify the story from the source or interview the person in question.

¹¹ ERSB defines simulated gambling as follows: "Player can gamble without betting or wagering real cash or currency", https://www.esrb.org/ratings/ratings_guide.aspx

¹² Final Fantasy 7 (Square Software 1998) is a good example of this. The game contains a whole casino where players can win in-game money but it is only accessible after many hours of gameplay.

¹³ See (Hood 2017, Wiltshire 2017, BBC News 2017)

¹⁴ A good example of this is the intent expressed by representative of the Belgian Gaming Commission who pointed out the danger of mixing real money and gaming (VTM Nieuws 2017). Links to two other similar cases can be found in (Good 2017).

¹⁵ “Skins” are purely cosmetic items in video games that change the appearance of items, characters etc. Skin-betting is the wagering of skins; usually on third party sites.

¹⁶ Sometimes it cannot be earned in-game at all, or it is dispensed randomly.

¹⁷ For example, the popular mobile game *Clash Royale* (Supercell 2016) contains two currencies: gold and gems. It is both possible to buy gems for real currency and gold for gems (therefore indirectly to buy gold for real currency), but it is not possible to buy gems with gold.

¹⁸ For example, in Gainsbury et al.’s (2015) taxonomy the ability to trigger RRM with a real currency is the top classification condition. Similarly, to this Griffith & King (2015) argue that RRMs fulfill the conditions for gambling if “[...] purchases to participate are made rather than being given free spins or keys, or earning them through skillful gameplay).”

¹⁹ This is the reason provided by the Gambling Compliance office of New Zealand’s Department of Internal Affairs for not treating loot boxes as gambling (Cross 2017b). The same reason was used by (Kuchera 2017b) to declare the RRMs used in *PlayerUnknown’s Battlegrounds* as gambling.

²⁰ This reason was presented by Entertainment Software Rating Board in an e-mail to the popular gaming site Kotaku (Schreier 2017).

²¹ Or very complicated. A good example of consumers’ attempt at establishing the price of a game using RRMs can be found at (Kamper 2017).

²² Hence the name “pay-to-win”. It implies that in order to win in a given game one has to simply purchase more than the competitors. Note, that similar problems arise in the context of card games (as the player who is able to buy any card increases their odds of winning).

²³ A less important reason we ignore this difference is that the difference between mechanics and aesthetics cannot be presented as clearly as the distinction implies. For example - the clothing one can buy in the popular game *PlayerUnknown’s Battlegrounds* seem to be purely aesthetic. And yet, it is hard to argue, that any modification that changes the visibility of the player affects their odds at winning. After all, this is how camouflage works.

²⁴ All examples in the table assume that the games are not played using exploits.