

An Empirical Taxonomy of Monetized Random Reward Mechanisms in Games

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ABSTRACT

In this paper, we propose a comprehensive and empirically grounded taxonomy of monetized random reward mechanisms (RRMs), which we created through an examination of over one hundred free-to-play and paid-to-play games released in the US, Germany, and Japan. RRM have recently gained increased attention within game studies. However, few attempts have been made to clarify the structure and implementation of RRM and their cultural and societal influence. We offer an evidence-based classification of RRM, aiming to contribute to a wide range of related academic research activities and social debates and to facilitate cross-disciplinary discussion. Borrowing from recent literature, we deconstructed the way RRM are implemented in 108 games. We identified three major strategies and 40 types of implementation. In particular, this taxonomy covers the majority of RRM implemented in publicly available mobile games worldwide and will play an essential role in facilitating constructive discussions about RRM.

Keywords

Random reward mechanisms, loot boxes, gacha system, empirical taxonomy

INTRODUCTION

Microtransactions (MTX) in games are often used to provide revenue for developers. Duverge (2016) divides MTX into four types: 1) in-game currencies, 2) random chance purchases, 3) in-game items, and 4) expiration. In random chance purchases, colloquially known as “loot boxes” or “gacha,” players pay to receive randomly selected rewards of varying value and utility. Such random reward mechanisms (RRM, Nielsen and Grabarczyk 2018) are increasingly used by game developers as a means of monetization. By introducing randomness into a game, RRM can increase long-time player motivation (Grabarczyk 2018), leading to increases in overall session time and player retention (de Vries 2018).

However, monetized RRM are also frequently criticized for a supposed likeness to gambling (e.g. Drummond and Sauer 2018, Zendle and Cairns 2018, 2019).

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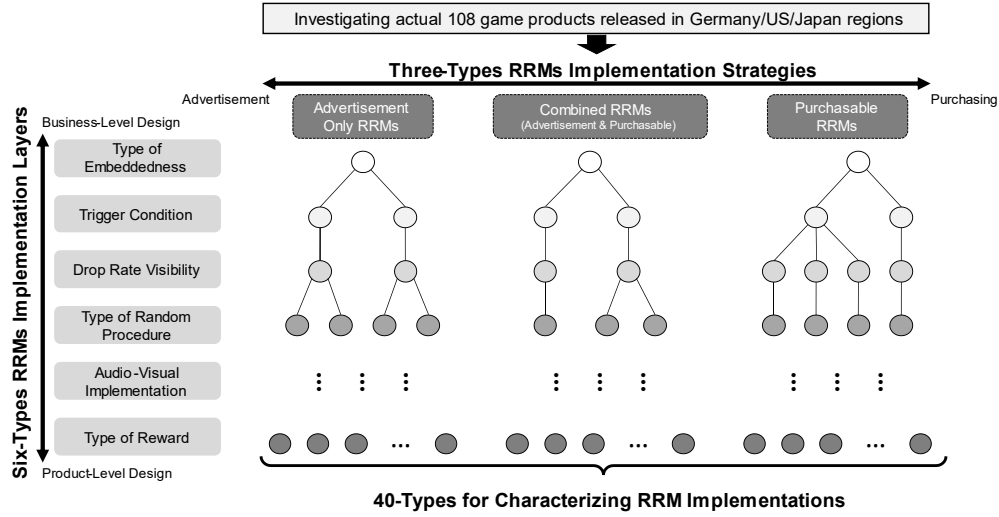


Figure 1: Overview of the proposed taxonomy

Legislative authorities in countries such as Belgium and the Netherlands (e.g. Belgium Gaming Commission 2018, Netherlands Gambling Authority 2018) have banned certain forms of RRM. This has forced game developers to either change their games or stop their services in these countries (Valentine 2019). The game industry is also under increased pressure to make RRM more transparent, for example through disclosing probabilities for receiving specific rewards (Entertainment Software Association 2019). Another frequent criticism of monetized RRM is that their implementation can lead to significant advantages of players spending higher amounts of money, commonly referred to as “pay-to-win.”

Current research into RRM tends to focus on their relation to gambling (e.g. Abarbanel 2018, Griffiths 2018, King et al. 2015, Macey and Hamari 2018). As Grabarczyk (2018, 6) notes, such ethical considerations are not directly linked to the elements of randomness introduced by RRM; instead, “ethics enters the picture only because of the involvement of real money transactions and not because of how the game plays with our reaction to randomness.” In a review of current research on F2P games, Alha (2019) notices the imbalanced state of research in this area and identifies four areas for further inquiry: 1) industry studies to understand the practice of F2P development, 2) qualitative studies to understand player experiences, 3) close readings to understand free-to-play game characteristics, and 4) studies to understand the meanings of free-to-play games in our culture, society, and politics. The same need exists for further research specifically into RRM. To create a common ground for further discussions on what constitutes RRM, how they influence the player’s experience, and how they are developed and possibly subject to legislative action, a first step lies in clarifying what exactly we are discussing when we talk about RRM, loot boxes, or gacha (an implementation of random rewards common in Japanese games). Current debates on these topics suffer from a lack of clear terminology and definitions that would provide a common ground for discussion.

Therefore in this paper, we propose a comprehensive and empirically grounded taxonomy of monetized random reward mechanisms created through the investigation of 108 free-to-play and paid-to-play games (see the list of Examined Games) released in Germany, the US, and Japan. Figure 1 shows a schematic overview of our taxonomy. Focusing on six central variables, we deconstructed the implementation of RRM and identified three major strategies and 40 categories of implementation. Our taxonomy covers the majority of RRM implemented in F2P games and is expected to

play an essential role in facilitating constructive discussions about RRM. By providing the foundation for an evidence-based classification of RRM, we aim to contribute to a wide range of related academic research and societal debates and to facilitate cross-disciplinary debate.

BACKGROUND

Research on RRM has grown, in concert with their increasing use as a means of monetization. However the focus of inquiry has gradually changed throughout the years. In 2014 and 2015 RRM, in the form of so-called “gacha,” were first examined as an integral part of the monetization strategy for Japanese F2P mobile games (Shibuya et al. 2014, 2015). Koeder et al. (2017) and Koeder, Tanaka, and Sugai (2018) identify 10 types of gacha mechanics used in Japanese F2P games and explore how players and developers think about them. The term “gacha” originates from Japanese toy-capsule vending machines (“gachapon”), where an individual inserts money in the machine to receive a randomly selected toy. In Japanese F2P games, a virtual implementation of this mechanism is commonly used as a means of monetization. In essence, gacha constitute monetized RRM, similar to (but historically preceding) monetized loot boxes. Koeder et al. see gacha as a “Japanese” way of monetization and originally contrasted this chance-based system with Western models of monetization, where MTX are used to directly buy concrete rewards. While they agree that loot boxes are structurally similar to gacha (Koeder, Tanaka, and Sugai 2018, 11–12), they also differentiate between loot boxes and gacha based on their platform (PC and console vs. mobile phone), business model (pay-to-play vs. F2P), and the “metaphor” used (treasure chest vs. gacha machine).

More recently, in response to public debates, an increasing number of scholars have started to focus directly on RRM, specifically on whether and how they are related to gambling. Currently, there are three main directions of inquiry: 1) Research into how RRM are logically linked to gambling (Drummond and Sauer 2018, Nielsen and Grabarczyk 2018, Zendle et al. 2020), 2) research on how gambling behavior and RRM interlink, focusing on behavioral psychological questions (Brooks and Clark 2019, Macey and Hamari 2019, Zendle and Cairns 2018, Zendle et al. 2019), and 3) research examining RRM from a legal viewpoint (Griffiths 2018, King and Delfabbro 2019, Koeder, Tanaka, and Mitomo 2018, Moshirnia 2018).

The term “RRM” itself was introduced in 2018 (Nielsen and Grabarczyk 2018) as a more analytical alternative to the expression “loot box.” RRM are defined as “the implementation of random procedures used for selection and delivery of rewards in video games” (Nielsen and Grabarczyk 2018, 2). This process comprises three steps: 1) an eligibility condition that a player has to meet to trigger a reward, 2) a random procedure to select a reward, and 3) the reward provided to the player. They further develop a typology of RRM based on whether the eligibility condition or the reward is integrated into or isolated from the real world economy, i.e., whether it is possible to use real money to trigger a reward and if it is possible to sell the reward for real money. As we focus on monetized RRM, i.e., implementations where it is possible to trigger the random procedure by investing real money, it is necessary to examine how monetization of RRM works. De Medeiros Filho et al. (2019) make a distinction between two broad strategies for monetization in mobile F2P games, in-app purchases and advertising. Integrating the eligibility condition of RRM into the real-world economy is not necessarily linked to a player spending money but can also be achieved through a player spending time to watch advertisements in a game.

As Nielsen and Grabarczyk primarily focus on the relationship of RRM and gambling, they do not differentiate the concrete implementations of RRM further. Grabarczyk (2018) makes an important distinction between the ontological and

epistemological views of randomness in games, arguing that they should not be studied separately. He examines the contexts in which players are more likely to view randomness in a positive light and where they react to it negatively.

However, despite the current debates about RRM, there have been relatively few empirical attempts to analyze them. As more games use F2P business models, the implementation and presentation of RRM are becoming more complex. For example, a clear differentiation between gacha and loot box systems is still difficult and requires more than a comparison of associated business models. It is necessary to empirically analyze the concrete implementation of RRM in games, including but not limited to loot boxes or gacha, to provide a comprehensive overview. A first step herein lies in deconstructing the way RRM function within a game.

The way RRM are implemented in games is rapidly changing and growing more diverse and complex. Existing terminologies need to be reevaluated and readjusted to reflect these changes and to be widely understood. A comprehensive taxonomy of RRM is needed, incorporating the business model, game genre, monetization strategies, audio-visual and mechanical implementations of random procedures, and utility of rewards. Such a taxonomy makes it possible to provide a basis for discussions of how monetized random procedures are implemented in games. A taxonomy helps to clarify the scope of a field, provides a method to categorize and compare elements in it, and supports the identification of gaps in existing knowledge (Downey 2012). While we do not claim that the taxonomy proposed here is complete, we hope that it will be useful as a basis for further discussion.

METHOD

Overall Process

A taxonomy is “a classification of empirical entities” (Bailey 1994, 6). The first step toward creating a taxonomy lies in measuring the various aspects of empirical cases. The cases are then grouped based on overall similarity to form taxa (Bailey 1994, 9). Taxonomies usually take the form of tree-like diagrams showing relations among entities in a hierarchical structure (Doculabs 2007). In this paper, we conduct the initial three steps of forming a taxonomy (Whittaker and Breininger 2008): We determined the requirements defining the scope of the content to be included, identified the concepts by which to form it, and developed a draft taxonomy based on our data.

The variables used for this study are based on the operationalization of a more granular differentiation of the three-step process of eligibility condition, random procedure, and reward described by Nielsen and Grabarczyk (2018). For this study, we examined 108 games, 47 of which included RRM as a method of monetization (see the list of Examined Games). To create our taxonomy, we followed the steps detailed below (Bailey 1994, Whittaker and Breininger 2008):

1) Initial analysis: We examined how RRM are implemented in the top five ranked F2P and pay-to-play (P2P) mobile games in the US, Germany, and Japan, as well as in other selected popular games utilizing monetized RRM.

2) Codebook creation: Based on the initial analysis, we created a codebook for a diverse set of variables related to RRM implementation. In the taxonomy presented in this paper, we use six of these variables.

3) Main analysis: A greater variety of F2P and P2P games was examined based on the variables generated in Step 2. Games were chosen based on their popularity (app store

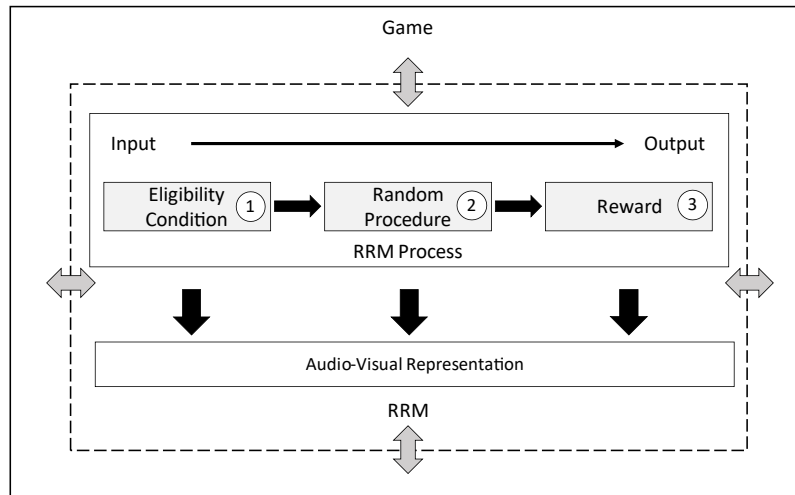


Figure 2: Schematic of random reward mechanisms

rankings and console/PC charts in September 2019). We also included games that have played a part in debates on possible legislative action on loot boxes. After the selection of the games, two researchers have purchased or downloaded the games on their respective platforms utilizing iOS and Android mobile devices, a PlayStation 4 and a PC. The games were played from their beginning, until no further RRM type could be identified. The duration for playing each game varied, depending on factors such as whether the full range of game mechanics are available from the beginning, or unlocked over time, but a total of at least 30 minutes was spent playing each game, with some being played for more than three hours to account for different implementations of RRMs, unlocked over time. To account for factors such as daily or weekly events, the number of free trials and how duplicate items are handled, we spread the time spent playing a game out over at least one week. We supplemented the data gathered through play with the official drop rates provided by the developer or publisher (as far as available) and the use of online resources (such as official game websites and fan-based websites) analyzing the games. We have utilized online communication tools and shared a task sheet online, in order to check and share information regarding the progress of the research.

4) Classification: RRM implementations were sorted into categories based on similarities in the selected variables.

5) Forming taxa: Lastly, we classified and labeled the types of RRM implementation we found and sorted them based on their place within the process of an RRM.

Variables

To create the taxonomy, we first aimed to operationalize each procedural step of an RRM (Figure 2), based on the ontological model of eligibility condition, random procedure, and reward of Nielsen and Grabarczyk (2018). To do so, we incorporated previous research on random procedures (Koeder et al. 2017, Toto 2016) and differentiated between the RRM as a mechanism and its audio-visual representation as displayed to the player (Mäyrä 2008, 18). We also gathered data on the context, i.e., the game, in which an RRM is implemented, as well as information on a game's reception by players.

Accordingly, the variables we arrived at can broadly be sorted into five groups: 1) variables to operationalize the eligibility condition, 2) variables to operationalize the random procedure, 3) variables to operationalize the reward, 4) contextual

information, and 5) information on player reception. General information gathered consists of the concrete game in which an RRM is implemented, the year it was published, and its platform, genre, and business model (i.e., F2P or P2P). Data on player reception include the number of reviews of the game on Google's Play Store, the iOS App Store, Steam, etc., as well as the concrete score.

Variables to describe the eligibility condition are related to whether and how the eligibility condition is embedded in the real world economy (Nielsen and Grabarczyk 2018), for example, whether it is possible to fulfill the condition through a direct purchase with real money or whether it is necessary to first purchase in-game currency, how expensive it is, or how long the player needs to watch advertisements to trigger it. We also consider whether periodic free trials or events are available and how long it takes to fulfill the eligibility condition without using real money. This allows us to examine to a certain extent how great the incentive is for a player to use real money to trigger an RRM. With respect to the random procedure, we take into account the concrete procedure and algorithm used for rarity management. We categorize these based on concepts established in prior research (Koeder et al. 2017, Toto 2016). We also examine if it is possible for players to view drop rates (the chances for receiving a specific reward) before triggering an RRM (i.e., open) or not (i.e., closed) and how many rewards are generated. For the reward, we created variables to describe the concrete content, the utility of the reward to the player, and whether duplicates are possible and how they are handled. Lastly, we also differentiated between different audio-visual implementations of RRM, for example whether they are represented as "opening a loot box" or as "drawing a gacha."

The taxonomy presented in this paper is based on six layers: 1) How the RRM is embedded into the real-world economy, 2) the concrete condition to trigger the RRM, 3) whether players can see the probability for receiving a specific reward or class of reward (open vs. closed "drop rates"), 4) what type of random procedure is used, i.e., whether probabilities are held constant or change, 5) the audio-visual implementation, and 6) the type of reward earned. This allows us to create a taxonomy closely aligned to an RRM's process from eligibility condition to reward. We hope that this attempt will provide a basis for further debate and initiate fruitful inquiries into this topic. However, a more differentiated taxonomy using the remaining variables described above is planned. The results of this study are limited by the following constraints. First, because of the limited time scope, we are not able to see changes over time regarding drop rates, events or time limited implementations of RRM. Second, we did not examine the relation between time and currency needed to trigger an RRM. Third, it is possible that additional late-game additions of further RRM systems are not reflected in this taxonomy and that we do not accurately depict the benefits provided by rewards. For example, it is possible that duplicate items can present additional benefits in later stages of a game. However, to control such variables, we included online resources such as official game websites and fan-based websites to gather additional information on how RRM are implemented in the analyzed games.

RESULTS

In total, we examined 108 games (F2P: 69; P2P: 39). Of those, monetized RRM were implemented in 47 (F2P: 41; P2P: 6). In nine of the games we found more than one type of RRM implementation, with three games incorporating three distinct types of RRM, for a total of 59 RRM analyzed. In deconstructing the RRM based on the six variables presented above, we identified three broad strategies and 40 distinct types of monetized RRM.

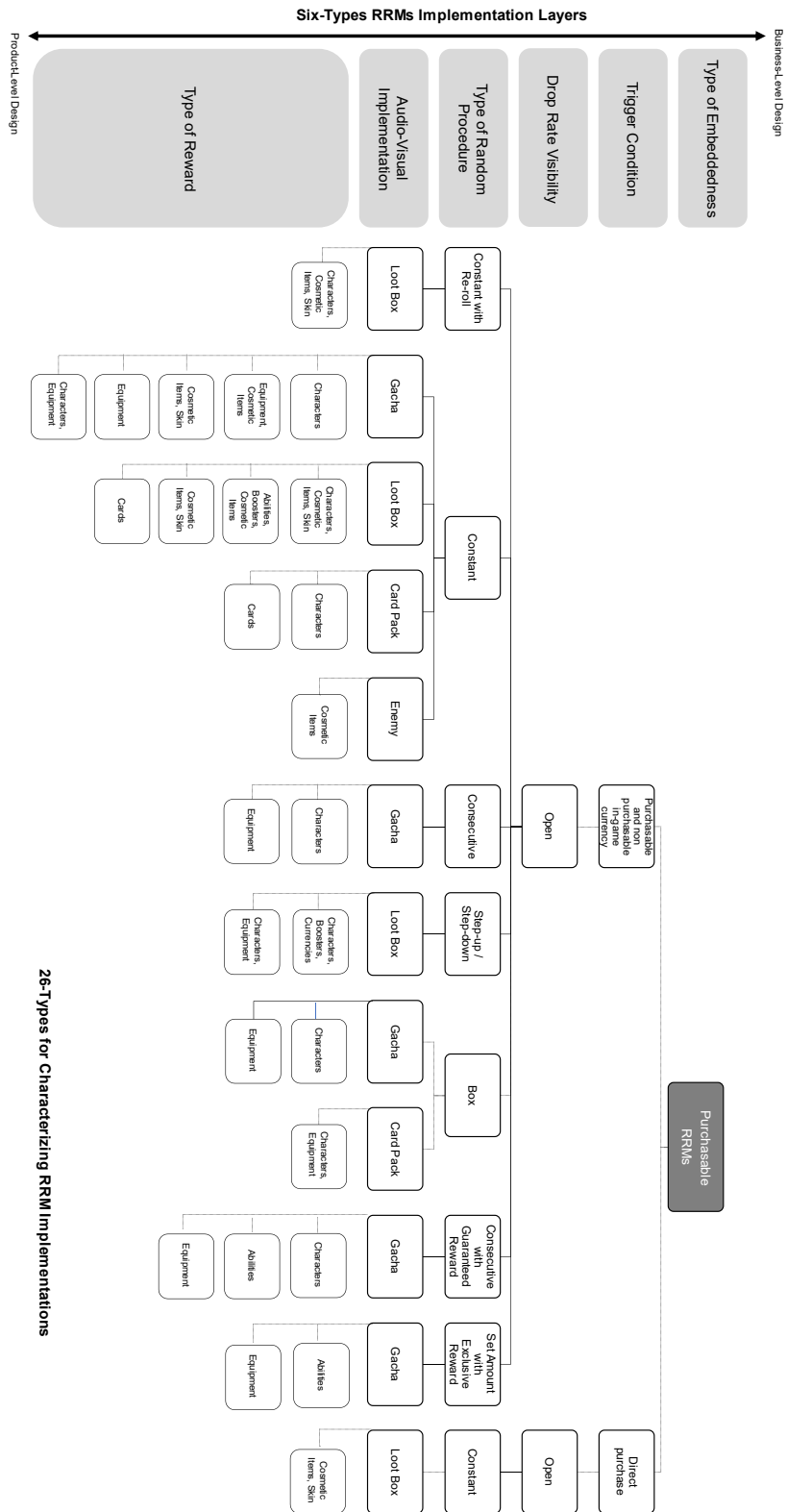


Figure 3: Taxa of purchasable RRM

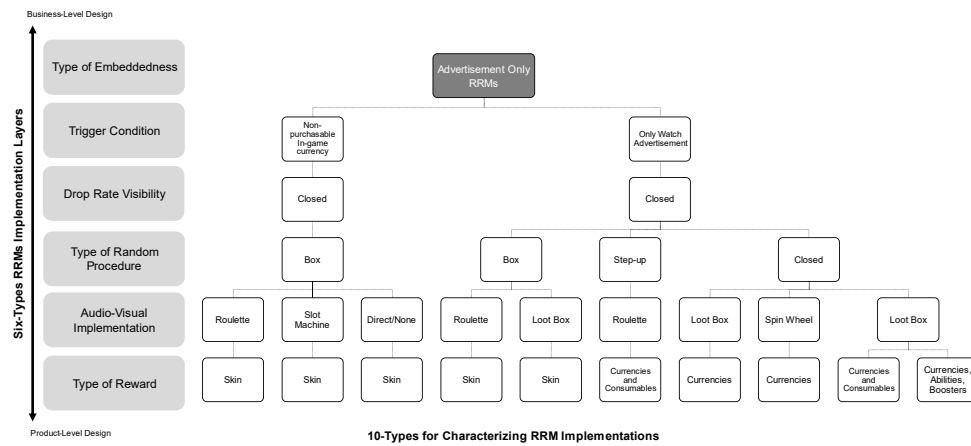


Figure 4: Taxa of advertisement only RRM

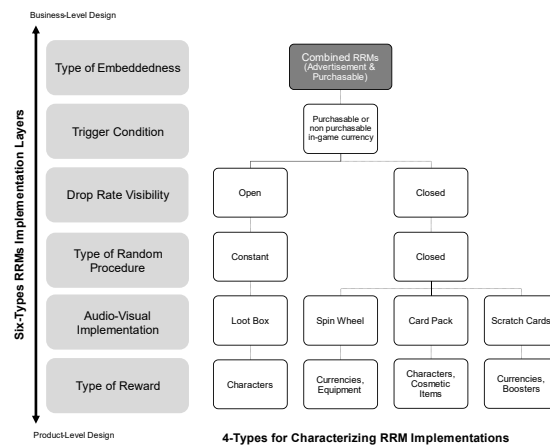


Figure 5: Taxa of combined RRM

For 37 (63 percent) of the 59 RRM examined it was possible to trigger the RRM with real money (see Figure 3). In *Counter Strike: Global Offensive* (Hidden Path Entertainment and Valve Corporation 2012) and *PlayerUnknown's Battlegrounds* (PUBG Corporation 2017), it was possible to directly use real money to trigger an RRM and also to sell the received reward. However, far more common is the strategy of first purchasing a form of in-game currency and using it to trigger an RRM. In that case, the currency mostly takes the form of either jewels or crystals (commonly used in contrast to coins, earnable in-game), where a set amount of the currency is necessary to trigger an RRM, or else draw tickets, where it is often possible to trigger an RRM with a ticket. Depending on the game, players can also receive such currencies through in-game progression or as a log-in bonus. In some cases, loot boxes are obtained through in-game progression and a key purchased with real money is required to trigger the RRM.

18 RRM (31 percent) were integrated into the real-world economy by requiring players to watch advertisements to trigger an RRM (see Figure 4). Although no real money is used by the player, the RRM is still used as a means of monetization by the developer. Of those 18 RRM, watching ads was the only way to trigger an RRM in 11 implementations, while in the remaining 7 cases, RRM are triggered with (non-purchasable) in-game currencies. These are received through progression within the game, but bonuses, such as receiving a triple amount, are provided by watching ads.

In 4 of the 59 implementations (7 percent) it was possible to trigger RRM both with purchasable in-game currencies and through watching ads (see Figure 5). This combined strategy is used in four F2P mobile games. Players are able to obtain in-game currencies through in-game progression and can multiply the amount of coins gained by watching advertisements or purchase in-game currency using real money.

Drop Rate Visibility and Types of Random Procedure

Once the eligibility condition is fulfilled by one of the conditions described above, the random procedure is triggered. The concrete algorithm for the procedure can either be communicated to the player, by providing information on how high the chances are of receiving a specific reward or class of rewards (open), or can be hidden (closed). This appears to be dependent on the eligibility condition, as all 18 implementations using an ads-based eligibility condition do not openly disclose such drop rates, while all other implementations of RRM can be considered open.

It is hard to make conjectures about the random procedure in games where drop rates are not disclosed. As we describe in more detail below, however, most use an audio-visual implementation like roulette or a spin wheel that at least suggests even chances for all rewards. For other implementations, a great variety of procedures was observed. Based on typologies by Koeder, Tanaka, and Sugai (2018) and Toto (2016), we sorted the mechanisms employed in the random procedures into several categories. Where the observed implementations did not fit into existing categories, we developed new ones:

*Closed:*¹ Drop rates are not disclosed, but often equal drop rates are implied through the visual implementation of a roulette wheel, etc. This was only observed in ad-based implementations of RRM. Whether the actual algorithm conforms to the visually implied drop rates is not certain.

Constant: A random procedure where drop rates for items remain constant and do not change depending on factors such as already received rewards, repeated triggering of rewards, or triggering in bulk.

Consecutive: The chances of receiving a rare reward are increased if the player triggers a set amount of RRM through a bulk purchase (e.g., a package deal for ten consecutive RRM). This can be accompanied by a discount for the bulk purchase.

Consecutive with Guaranteed Reward: Like the consecutive type, players purchase RRM in bulk. They are guaranteed a rare reward on their last RRM.

Box: Possible rewards are drawn from a conceptual “box.” When a specific reward is received, it is “taken” from the box. It is not possible to receive the same reward again, so long as rewards are drawn from the same “box.”

Step-up/Step-down: In random procedures using a step-up mechanic, the chances for receiving a rare reward increase with each time an RRM is triggered. This can be accompanied by a step-down mechanic, to adjust rarity to improve player experience. For example, in *Brawl Stars* (Supercell 2019), the probability for receiving a rare reward increases for each RRM (step-up) if players do not receive a new reward. However, once a rare reward has been received, the chance of receiving another decreases (step-down).

Set Amount with Exclusive Reward: After the player triggers a set amount of RRM (e.g., 100) he receives (or can choose) an exclusive reward that cannot be received through the normal RRM system.

Redraw: This mechanism allows players to re-draw (or re-roll) their reward a limited number of times if they receive an unfavorable reward. However, if a re-draw is carried out, it is then impossible to return to the previous reward.

Audio Visual Implementations

The way the random procedure and rewards are represented audio-visually within the games also displays great variety. The strongest divide is observed here between Western and East Asian games. In Western games, RRM s are predominantly presented as treasure chests or gift boxes (i.e., loot boxes), card packs, or gambling devices, such as a roulette or spinning wheel. In the games from developers based in East Asia, more diverse and elaborate audio-visual effects are used. In general, we identified the following types:

Roulette: This implementation is reminiscent of traditional roulette table. The random procedure is represented by spinning a virtual ball or cursor, and the obtained reward only becomes visible after it is selected by the random procedure.

Spin Wheel: Different from the roulette, the virtual rewards are already visible on the screen. After the player triggers the eligibility condition, the virtual wheel spins and stops automatically. The player earns the reward for where the picker lands.

Slot Machine: The reward is selected through a virtual slot machine, which rotates and lands on the item automatically after triggering the procedure.

Scratch Cards: Players can choose one of several scratch cards. After they select one, they can scratch the six fields of the card to receive the reward displayed in at least three of the six fields.

Loot Box: We use the term “loot box” for all audio-visual implementations where a chest, box, or crate is used to represent the RRM. The box is often opened with a finger tap by the player. In some cases it is necessary to purchase a separate key to open a loot box with real money. In one case, purchasable in-game currency could be used to open a loot box instantly, whereas a set amount of time would be needed otherwise.

Card Packs: The player opens a virtual card pack, which generally contains between one to ten cards.

Enemy: As is common in non-monetized RRM s, an enemy is defeated to trigger an RRM. We observed one instance where an in-game purchase with real money is necessary to be able to meet a specific type of enemy within the game. Defeating the enemy yields a randomly selected item that can then be exchanged against specific rewards.

Gacha: In this paper, we use the term *Gacha* to refer to a broad range of elaborate audio-visual implementations of RRM s that do not fit into the categories above. This includes implementations based on toy-capsule vending machines, “summoning circles,” crystals, and feeding a dragon. Common to this diverse set of audio-visual representations is the elaborate nature of the visual design used to represent the RRM, the comparatively long duration of the RRM representation (up to 20 seconds), and similarities in received rewards. In most cases, *Gacha* implementations are also linked to a single reward per RRM.

Rewards

The last variable we consider in this taxonomy is the type of reward that is received as a result. In total, we found nine different rewards, categorized based on their influence and effects on the game.

In-Game Currency: Different types of in-game currency are rewarded to the player. This can include virtual coins used to purchase items in-game or currency used to trigger further RRM. We also include “lives” necessary to continue playing in this category.

Consumables: We define consumables as virtual items that directly assist the player in the game by providing a new ability or way to overcome an obstacle that can only be used once. Examples are a shield to strengthen the defense of a character, thunderbolts to speed up characters, or “bombs” and “rockets” used to clear tiles from a puzzle game.

Boosters: Boosters amplify the effect of an item or the abilities of a character for a limited amount of time. They can also extend players’ playtime or turns.

Skins: Skins are cosmetic rewards used to change the appearance of characters or items (e.g., balls or weapons) in the game without affecting gameplay. This was the most widely used reward, present in all three categories of RRM examined.

Cosmetic Items: We differentiate between skins, used to change the appearance of characters or objects in the game, and cosmetic items. Cosmetic items include accessories for characters, banners, emotes, voice lines, or victory poses. Like skins, they generally do not affect actual gameplay.

Abilities: This reward provides players with new skills, spells, or attacks for in-game characters. They are often represented visually through cards or medals.

Equipment: This ranges from weapons in shooting games to furniture or clothes in some simulation games. In general, we define equipment as items that effect gameplay and are permanently usable.

Characters: Characters can be heroes, monsters, or soccer players. Receiving a new character makes it possible to utilize this character within the game, for example in battle. As stats or abilities differ between characters, they are fundamentally different from cosmetic items or skins. In many games using the audio-visual *Gacha* implementation, receiving and managing characters is a main focus of the game.

Cards: Mostly found in virtual trading card games, cards are necessary to play the game and to acquire a greater degree of strategic flexibility. Some strategy games use cards to represent certain rewards, such as resources.

Taxa

By examining the variables described above, we identified three different groups of RRM (Figures 3–5) based on the monetization strategy, i.e., the type of embeddedness, used. These branch out to 5 taxa based on the concrete trigger condition, 6 by including the drop rate visibility, 14 on the layer of the random procedure, 25 on the layer of the random procedure, and 40 on the last layer, including the type of rewards (Table 1).

Layer	Number of Taxa
Type of Embeddedness	3
Trigger Condition	5
Drop Rate Visibility	6
Type of Random Procedure	14
Audi-Visual Implementation	25
Type of Reward	40

Table 1: Number of taxa for each layer of our taxonomy

RRMs that are triggered by watching advertisements or through non-purchasable in-game currencies related to an advertisement model do not disclose the chances for receiving a specific reward (i.e., they are “closed”). Their audio-visual implementation is either based on a gambling theme, such as *Spin Wheels*, *Slot Machines*, or *Roulettes* (11 of 18 RRM), or as a *Loot Box* (7 of 18). The former visually implies a specific chance to receive a specific reward. For example, in the case of a *Roulette* or *Spin Wheel*, the player assumes that the chance to receive a reward is equally high for all fields displayed. As the algorithm used for generating a reward is closed, however, it is not certain if that is true. In the case of implementation as a *Loot Box*, this kind of visual cue is not provided, potentially leading to different expectations by the player. All cases where non-purchasable in-game currency is used to trigger an RRM lead to *Skins* as a reward without the possibility of duplicates. For cases where the RRM was triggered directly by watching advertisements, rewards also included in-game currencies and consumables (8 of 18).

Out of the four cases where a combination of advertisements and purchasable in-game currency is used to trigger the RRM, one case openly displayed the concrete chances for receiving a specific reward. This was done through a *Constant* procedure, implemented as a *Loot Box*, with *Characters* as reward. The remaining three cases were *Closed*: Using a *Spin Wheel*, *Scratch Card*, or *Card Pack* as audio-visual implementation. Rewards included *In-Game Currencies*, *Equipment*, and, in the case of the *Card Pack*, *Characters*. A distinction was often made between RRM triggered by advertisements and RRM triggered through purchasable in-game currency. RRM using in-game currency provided rarer rewards than those triggered by watching advertisements.

The most diverse taxa of our taxonomy are found in the RRM purchasable by real money but without incorporating advertisements; 26 of the 40 distinct types of RRM were found here. All random procedures within these taxa were open. One taxon consists of two games in which it is possible to trigger RRM directly through a purchase with real money. This was implemented as an open procedure using *Loot Boxes*. Rewards were *Cosmetic Items* and *Skins*. Both games were PC shooter games. For the remaining 25 types, RRM are triggered by purchasable in-game currency. Of 36 RRM implemented in these 25 distinct types, 21 use a constant random procedure, 2 are *Consecutive*, 4 are *Consecutive with Guaranteed Rewards*, 2 use a *Step-up* mechanic, 3 a *Box* mechanic, 3 use the *Set Amount with Exclusive Reward* model, and 1 allowed *Re-Rolls*. Overall, 26 of the 39 RRM are implemented as *Gacha*, the rest as *Loot Boxes* or *Card Packs*. For *Gacha*, the most common rewards are *Characters*, but *Equipment*, *Cosmetic Items*, or *Abilities* are also potential rewards. In many cases, duplicate rewards are possible, and such duplicates can either be exchanged for in-game currency or are used to strengthen *Characters*, *Equipment*, or *Abilities*.

DISCUSSION

As Nielsen and Grabarczyk (2018) correctly note the central difference between RRM_s integrated into the real-world economy and such that are not, focusing on the three constitutive elements of RRM_s: eligibility condition, random procedure and reward, our findings examine more closely how RRM_s are linked to the real-world economy, either by use of purchasable in-game currency, advertisements or both. We also observe differences in RRM implementation, that are closely linked to the way they are integrated into the real-world economy. In doing so, we contribute towards a better understanding of how RRM_s are implemented within games and how they function as a method of monetization. RRM_s integrated into an advertisement-based system are generally closed, visually implemented in the form of gambling themes, and provide either *Skins* or *In-Game Currencies* as a reward. In contrast, all implementations where RRM_s can solely be triggered through purchasable in-game currency are open, and none uses traditional gambling devices in its audio-visual implementation. They are, however, more varied in the types of rewards available.

Monetized RRM_s are implemented in games in various ways. One factor that influences the concrete implementation lies arguably in how a specific RRM is integrated into and connected to the overall game. In the games examined that use an advertisement-based strategy of monetization, RRM_s generally provided slight benefits to the player, such as *In-Game Currencies* or *Consumables* that enable faster progression, or cosmetic changes through *Skins*. However, the RRM_s were not central to the game. In contrast, in many games using purchasable in-game currencies, especially those visually implemented as *Gacha*, the RRM was of greater import to the overall game. In games such as *Fire Emblem Heroes* (Intelligent Systems 2017), the RRM is a central mechanic of the game, as it generates the eponymous *Characters* (e.g., heroes) that players need to progress in the game. For many players, their main goal might even lie in collecting these *Characters* instead of progressing through the game's story campaign or battling other players. In such cases, RRM_s function as an integral part of the progression system of a game, providing players with increased incentives to use real money to progress more quickly (Askelöf 2013, de Medeiros Filho et al. 2019).

RRM_s are strategically implemented, increasingly also in P2P games, to facilitate certain playful experiences in the game and to monetize players. As our taxonomy shows, RRM_s take many forms and can differ greatly in various ways. Considering current debates over monetized RRM_s with regards to gambling, concerning problematic spending habits by minors (Juniper Research 2018), or as facilitators of "pay-to-win" models, it is necessary to take stock of the many forms RRM_s can take. This research can form the basis for discussing best practices of RRM implementation with the goal of creating systems that satisfy legal demands, are transparent to users, are not seen as unfair or exploitative, and positively influence player experience by introducing elements of randomness. For example, although platform holders such as Apple Inc. require developers to openly display the odds of receiving specific rewards (LeFebvre 2017), we have found that not all the examined games follow these rules. This is especially problematic for cases in which real money can be used to trigger an RRM, as the non-disclosure of the concrete random procedure makes it harder for players to determine approximately how much money they might need to spend to receive a specific reward. Thus, an exploitative system may result (King et al. 2019). The disclosure of odds would greatly add to the transparency of RRM_s with minimal burden to developers (Moshirnia 2018).

Our taxonomy is based on a critical examination of RRM_s as a distinct system within the greater game system. This is necessary to reach a deeper understanding of what constitutes RRM_s and how they are implemented. However, RRM_s are of course

interlinked with the game in which they are implemented. In order to provide a more comprehensive analysis, the examination of more variables in relation to RRM is necessary. This includes the nature of a game, such as its genre, to a certain extent determines the implementation of RRM. The relationship between RRM and the games in which they are implemented is a possible venue for further studies. Furthermore, as with all games, RRM gain significance because players interact with them. A next step toward a deeper understanding of RRM lies in examining how players experience different implementations of RRM. This could for example be done based on an examination of the costs and benefits RRM provide players, costs in the form of money or time used, and benefits in the form of the concrete value of the gained rewards.

The nature of rewards (Phillips et al. 2018), their utility to the player, and the possibility and treatment of duplicates (cf. Brückner et al. 2019) are possible areas for further research in this regard. Regional and cultural differences in game production appear to affect the implementation of RRM as well. Particularly, we observed differences in how RRM are visually implemented between the East Asian and Western games in the sample. Further clarifying these differences and the broader structural factors that shape them is an intended next step in our study.

CONCLUSION

In this paper, we presented a taxonomy of monetized RRM based on the analysis of 59 RRM found within a sample of 47 popular F2P and P2P games. We identified 40 distinct forms of RRM implementation that differ with respect to 1) how they are embedded in the real-world economy, 2) how the eligibility condition is triggered, 3) whether the odds for receiving a reward are openly displayed, 4) how rewards are selected, 5) how the RRM is audio-visually represented in the game, and 6) what kinds of rewards are granted. The most salient difference was apparent between implementations using purchasable in-game currency to trigger RRM and those where monetization was achieved by displaying advertisements. RRM as a method of monetization are still evolving, despite (or partially stimulated by) current critical legal and public discourses. This taxonomy is a foundational step to better understand RRM that have been the focus of current debates. Our aim was to provide a basis for and stimulate further discussion of the nature of RRM in order to facilitate a more constructive discourse among all parties involved. In this paper, we focus solely on RRM used as a method for monetization. In part this is done in light of recent debates indicating a lack of a clear definition of RRM, as we hope to address this deficiency with our taxonomy. However, in general it also appears highly relevant to take a closer look at the branch of RRM we omit here, those not used as a means of monetization. A closer examination of such mechanisms could also serve to provide new perspectives on the study of monetized RRM.

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ArenaNet. 2012. *Guild Wars 2*. NCSoft.

Bandai Namco, Sora Ltd., and Nintendo. 2018. *Super Smash Bros. Ultimate*. Nintendo.

Baton. 2019. *The Limit Shiritori Mobile*. Baton.

Blizzard North. 2002. *Diablo II*. Blizzard Entertainment.

Blizzard Entertainment. 2015. *Heroes of the Storm*. Blizzard Entertainment.

Blizzard Entertainment. 2016. *Overwatch*. Blizzard Entertainment.

Blizzard Entertainment. 2018. *Hearthstone*. Blizzard Entertainment.

Blizzard North. 2012. *Diablo III*. Blizzard Entertainment.

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Capcom. 2018. *Monster Hunter: World*. Capcom.

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CD Projekt RED. 2015. *The Witcher 3: Wild Hunt*. CD Projekt RED.

CD Projekt RED. 2019. *Gwent: The Witcher Card Game*. CD Projekt RED.

Coda Platform Limited. 2019. *Rope Rescue - Unique Puzzle*. Coda Platform Limited.

Commseed Corporation. 2014. *Pachisuro Monster Hunter*. Commseed Corporation.

Delightworks. 2017. *Fate/Grand Order*. Aniplex.

DeNA. 2019. *Pokemon Master*. DeNA.

DMM Games. 2016. *Human Fall Flat*. DMM Games.

DMM Games. 2018. *Alice Closet*. DMM Games.

Dual Cat. 2019. *Stop Them All*. Dual Cat.

EA Dice. 2017. *Star Wars Battlefront II*. Electronic Arts.

EA Vancouver, and EA Romania. 2018. *FIFA 19*. EA Sports.

Epic Games. 2017. *Fortnite*. Epic Games, Warner Bros. Interactive Entertainment.

Firecraft Studios. 2017. *Matchington Mansion*. Baklava Entertainment Societe Anonyme.

Foddy, B. 2017. *Getting Over It*. Humble Bundle.

Geisha Tokyo Inc. 2019. *Traffic Run*. Geisha Tokyo Inc.

Giants Software GmbH. 2017. *Farming Simulator 18*. Giants Software GmbH.

Gismart. 2019. *Cool Goal!* Gismart.

Global Gear K.K. 2019. *Escape Game Kimi Okuru Hi*. Global Gear K.K.

Good Job Games. 2019a. *Color Fill 3D*. Good Job Games.

Good Job Games. 2019b. *Color Saw 3D*. Good Job Games.

Good Job Games. 2019c. *Fun Race 3D*. Good Job Games.

GungHo Online Entertainment. 2012. *Puzzle and Dragons*. GungHo Online Entertainment, Inc.

Habby. 2019. *Penguin's Isle*. Habby Ote Ltd.

Imagineer Co. Ltd. 2018. *Atsumete Rilakkuma*. Imagineer Co. Ltd.

Intelligent Systems. 2017. *Fire Emblem Heroes*. Nintendo.

King. 2012. *Candy Crush Saga*. King.com Limited.

Kwalee. 2019a. *Clean up 3D*. Kwalee Ltd.

Kwalee. 2019b. *Perfect Paint*. Kwalee Ltd.

Line Corporation. 2019. *LINE: Pixar Tower*. Line Corporation.

Lion Studios. 2019a. *Happy Glass*. Lion Studios.

Lion Studios. 2019b. *Mr. Bullet Spy Puzzle*. Lion Studios.

Lion Studios. 2019c. *Puzzle Fuzzle*. Lion Studios.

Mask LLC. 2018a. *Time of Nazotoki*. Mask LLC.

Mask LLC. 2018b. *Uwaki Sare Onnna*. Mask LLC.

Masomo Limited. 2019. *Head Ball 2*. Masomo Limited.

McCarthy, A. 2009. *Doodle Jump*. Lima Sky.

Mixi. 2013. *Monster Strike*. Mixi.

Mojang. 2011. *Minecraft*. Mojang, Microsoft Studios, Sony Computer Entertainment.

Motion Twin. 2019. *Dead Cells*. Motion Twin.

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Naya Games. 2019. *Words of Wonders*. Naya Games.

Ndemic Creations. 2012. *Plague Inc*. Ndemic Creations.

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Neople. 2016. *Dungeon Fighter Online*. Neople.

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Ninja Kiwi. 2011. *Bloons Td5*. Ninja Kiwi.

Ninja Kiwi. 2018. *Bloons Td6*. Ninja Kiwi.

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Nintendo EPD, and NDCube. 2017. *Animal Crossing*. Nintendo.

Peak Games. 2017. *Toon Blast*. Peak Games.

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Playgendary. 2019. *Polysphere - Art of Puzzle*. Playgendary GmbH.

Playrix. 2019a. *Gardenscapes*. Playrix, Plarium.

Playrix. 2019b. *Homescapes*. Playrix.

Popcore GmbH. 2019. *Sandwich!* Popcore GmbH.

Psyonix. 2016. *Rocket League*. Psyonix.

PUBG Corporation. 2017. *Playerunknown's Battlegrounds*. PUBG Corporation.

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Rayark Games. 2013. *Deemo*. Rayark Games.

Re-Logic. 2013. *Terraria*. 505 Games.

Respawn Entertainment. 2019. *Star Wars Jedi: Fallen Order*. Electronic Arts.

Riot Games. 2009. *League of Legends*. Riot Games.

Robert Topala. 2013. *Geometry Dash*. RobTop Games.

Rockstar North. 2004. *Grand Theft Auto: San Andreas*. Rockstar Games.

Rockstar North. 2012. *Grand Theft Auto: Vicecity*. Rockstar Games.

Rockstar North. 2013. *Grand Theft Auto V*. Rockstar Games.

Rockstar Studios. 2018. *Red Dead Redemption 2*. Rockstar Games.

Rollic Games. 2019. *Pickers 3d*. Rollic Games.

Rui Guo. 2018. *Swish Up*. Rui Guo.

Salameh, P. 2014. *Pou*. Paul Salameh.

SayGames. 2019a. *Hoop Stars*. SayGames.

SayGames. 2019b. *Perfect Slices*. SayGames.

SayGames. 2019c. *Sand Balls*. SayGames.

Smilegate. 2009. *Crossfire*. Tencent Games.

Solo X. 2019. *Archery Go - Bow&Arrow King*. Solo X Technology Limited.

Square Enix. 2014. *Dragon Quest V: Hand of the Heavenly Bride*. Square Enix.

Square Enix. 2015. *Mobius Final Fantasy*. Square Enix.

Square Enix. 2016. *Kingdom Hearts 1.5 + 2.5 Remix*. Square Enix.

Square Enix. 2017a. *Dissidia Final Fantasy Opera Omnia*. Square Enix.

Square Enix. 2017b. *Kingdom Hearts Union X*. Square Enix.

Supercell. 2016. *Clash Royale*. Supercell.

Supercell. 2019. *Brawl Stars*. Supercell.

Timi Studio Group. 2019. *Honour of Kings*. Tencent Games.

Treyarch. 2018. *Call of Duty: Black Ops III*. Activision.

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Ubisoft. 2015. *Tom Clancy's Rainbow Six Siege*. Ubisoft.

Valve Corporation. 2012. *Counter-Strike: Global Offensive*. Sierra Studios, Valve Corporation.

Voodoo. 2019a. *Aquapark.IO*. Voodoo.

Voodoo. 2019b. *Crazy Kick!* Voodoo.

Voodoo. 2019c. *Flip Dunk*. Voodoo.

Warner Bros. International. 2013. *Heads Up!* Warner Bros. International.

Wuhan Dobest Information Technology. 2018. *Number Puzzle*. Wuhan Dobest Information Technology.

Yang Li. 2019. *Bricks Ball Crusher*. Yang Li.

Yojoy. 2019. *Idle Gym - Fitness Simulation*. Yomob International.

ZigZaGame Inc. 2019. *Evertale*. ZigZaGame Inc.

Zuuks Games. 2019. *Bus Simulator: Ultimate*. Zuuks Games.

ENDNOTES

1 Throughout this paper we signify these categories with capital letters and italics.

2 Two authors of this paper hold concurrent positions at Cygames Research of Cygames Inc. In order to avoid any biases associated with the company, game titles published and/or developed by Cygames Inc., were not considered as relevant resources for the analysis of this paper. Hereby we clarify that the results, discussion and conclusion are not affected from the games of the company.

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