

Taxonomies for Transactions and User Engagement in Mobile Games

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ABSTRACT

While monetization strategies become increasingly complex in mobile games, there is currently no standard vocabulary to describe different types of transactions. We present two taxonomies developed from studying 65 mobile games—a taxonomy of the types of transactions between game players and companies that transfer or create value for the gamer owner, and a taxonomy of methods companies use to drive engagement and retention with mobile games. We also introduce the concept of a transaction value map to illustrate how these taxonomies can be applied to characterize the transfer of value from cash into the game state. Transaction types were mapped to four major areas: real world value exchange, transaction methods, in-game resources, and in-game purpose. This work provides means for discussing transaction types which helps improve our theorized understanding of monetization strategies in games. In addition, it can be adopted in game marketplace to better inform the players.

Keywords

mobile games, microtransactions, monetization

INTRODUCTION

Since the advent of smartphones, the mobile gaming market has grown to exceed 150 billion dollars as of 2019 (Wijman 2018), with more than 2.4 billion estimated players globally (Carpenter 2019), and continues to grow. Recent work at the convergence of game design and marketing highlights the changing nature of mobile game monetization strategies (Alomari et al. 2016; Fields and Cotton 2011; Nieborg 2015), with particular attention to types of *microtransactions*, a form of in-app purchase that allows players to make small cash payments for in-game digital goods (Lescop and Lescop 2014). Gainsbury et al. define microtransactions as “small purchases for additional or bonus virtual content” (2014, 202). This business evolution is credited with providing a platform for mobile game developers to monetize their product and create content, while expanding industry employment and salaries and maintaining profitability (Davidovici-Nora 2014). Many of these new practices have come under scrutiny from psychologists, scholars, and regulators for being intentionally manipulative (Kimppa et al. 2016), inconsistent, opaque about the value delivered per

transaction (Torbet 2019), and promoting a form of addiction similar to gambling (Zendle and Cairns 2018).

The business landscape supporting mobile gaming has increased in complexity over the past 10 years, with the rise of many types of transactions between players and developers, and multiple new channels for various forms of value exchange. In the earliest phase of mobile game distribution, the business model was a traditional “Pay to Play” (P2P) model, a simple transaction where a customer makes a game purchase at a set cost, and then owns the game (Fields and Cotton 2011). In the current mobile game market, this is also referred to as a “premium” game or premium model (Alomari et al. 2016). As the mobile game market began to grow alongside mobile device use, the “Free to Play” model (F2P) has come to dominate the mobile game space. In this model, companies provide free mobile game downloads to players, who can then elect to make microtransactions for additional in-game content (Foxell 2015). Additionally, other forms of value exchange are increasingly occurring, such as using in-game advertisements (Wong and Hiew 2005), awarding in-game goods for posting about the game in social media, and in-app purchasing of game merchandise (as opposed to in-game items). The nature of the modern F2P mobile game market incentivizes continual play and frequent engagement by players to encourage more microtransactions, maintain visibility of a game via social marketing, and promote and maintain daily active users to support advertising value, resulting in many new types of transactions.

However, currently there is no standard for describing the different types of microtransactions or the actual value that players acquire via in-app purchases. In online app stores, players can see whether a certain game has an in-app purchase element and the list of items with the price for each item that they could purchase. However, simply knowing the names of the items available for purchase does not provide a lot of information to players, especially before they start playing the game. For instance, players are able to see that in the game *SWORD ART ONLINE: Memory Defrag*, players can pay for various types of Memory Diamonds (Figure 1), but it is not at all clear what these items do.

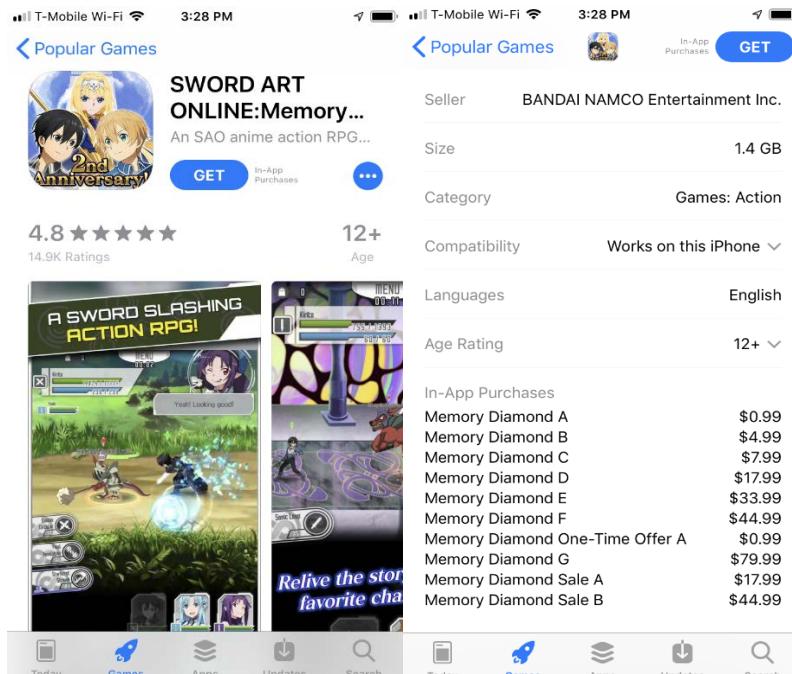


Figure 1: A screenshot of the game *SWORD ART ONLINE: Memory Defrag* in the Google Play Store.

This work aims to address this issue and fill the two key gaps in the literature on mobile game practices. First, we present a detailed taxonomy of transaction types describing the nature and mechanisms of value exchange between game players and developers. Second, we also present a taxonomy of engagement promotion mechanisms, delineating techniques and methods game developers use to encourage more frequent engagement of their mobile games by players. In addition to these two taxonomies, the paper also presents an example of how to apply these taxonomies to map the value transfer in the game. This work will help provide means to the academic field and related mobile gaming spaces to address transactions and engagement using unified language.

RELEVANT WORK

Games and Transactions

Previous work on describing game transaction types has largely been done within the context of business and marketing research, as well as in mobile application and gaming industry white papers.

Some scholars have developed taxonomies that address the purpose of mobile applications, which contains limited discussion of types of mobile games (Nickerson et al. 2007; Scolari et al. 2012; Wong and Hiew 2005). In this body of work, authors classify and describe types of mobile applications, describing categories such as service, network, and device (Wong and Hiew 2005), different types of mobile entertainment applications (Nickerson et al. 2007), and broader categories of mobile applications (Scolari et al. 2012). This work represents early attempts to categorize and classify content type by function and purpose, but stops short of describing market structure. Scolari et al. note that by 2012 “application and content stores began to classify their products based on a mix of genre criteria (e.g. games)” (2012, 31), and that genres began to closely follow patterns of category management in merchandising.

With the rise of mobile gaming around 2010, the literature on mobile game monetization begins to address revenue generating mechanisms as increasingly complex and sophisticated, and begins to move towards describing games as more complex services. In 2011, Fields and Cotton discussed social game design monetization methods, looking at innovations by companies such as Popcap and Zynga, and their success with the emerging practice of microtransactions. They describe practices such as using social media to recruit new users, and the “double currency model,” providing players with an earnable in-game currency, and a second “difficult to get” premium currency that users can buy, which Tyni et al. (2011) point out is usually exclusive to paying customers and locks premium content.

In 2016, Alomari et al. published a study of mobile gaming trends and revenue models to identify effective transaction types, presenting a robust list of terms and definitions used in analyzing game revenue generation models. This list of transaction terms described was the largest reviewed, and includes such examples as “time skips,” “event offer,” and “unlock content.” Comparing this work with other literature demonstrates that there is no standard language for describing most of the terms. For example, they refer to “time skip” transactions, which Paavilainen et al. (2013) refer to as bypassing “appointment mechanics” (skipping turn timers), and “energy mechanics” (a time currency). What Alomari et al. (2016) call “soft currency,” Hamari and Lehdonvirta (2010) call “earned currency,” and Hsiao and Chen (2016) call “in-game currency.” In each case, there are multiple terms utilized to describe the same general concept.

Some special attention in the literature has been given to describing transactions of gambling and similar mechanics. Gainsbury et al. (2014) explored transaction models

within social media and online gambling games. They developed a hierarchical taxonomy for these games, dependent on several core criteria including “i) the requirement for monetary payment, ii) the role of chance and skill, iii) the game platform, and iv) the centrality of gambling to the theme” (Gainsbury et al. 2014, 199). In this work, they also address the presence of gambling elements as an element of games where it is not the central theme. For instance, in the Zynga game *CityVille*, they note the presence of a slot machine called Jackpot City where players can wager real credits earned or purchased with real money, used for in-game purchases.

Significant attention is now being given to a specific form of in-game gambling most commonly referred to as “loot boxes” (Macey and Hamari 2019). Under this mechanism, players pay real currency for a “box” containing a random item or items that can be used in game, with rarer contents being more valuable and useful in game. This represents a lucrative form of transaction for game developers, but many psychologists have drawn parallels to gambling and gambling addiction. Drummond and Sauer (2018) authored an article explicitly titled “Video game loot boxes are psychologically akin to gambling,” and behavioral addiction specialist Griffiths (2018) argues that loot boxes are akin to most legal definitions of gambling. From a classification perspective, Nielsen and Grabarczyk argue that “the term “loot box” and the phenomena it covers are not sufficiently precise for academic use” (2018, 1), and introduce the term “random reward mechanisms” (RRM), with in-game resources and rewards independently categorized as either “isolated” from real world economies or “embedded” within them, depending on whether they are linked to real or potential cash transactions.

Ball and Fordham (2018) wrote a brief describing how microtransactions have impacted mobile game design. They modify McLuhan’s (1964) maxim “the medium is the message,” referring to the tendency of people to focus exclusively on the content of a message, as opposed to the medium of the message, and apply it to mobile games. They argue “the introduction of modern microtransactions has had a fundamental impact on player relationships with video games as a medium” (Ball and Fordham, 2018, 2), and argue that a game’s content, such as genre or gameplay systems, blind users to the character of microtransactions and can be reduced to a delivery mechanism for microtransactions.

Previous Work on Game Engagement and Retention

The concept of mobile video games and engagement is complex, and this work engages three bodies of literature to fully frame discussion and develop terminology around what motivates players to begin and continue playing games. The media concept of video game *appeal factors* addresses the core motivations, uses, and gratifications users have for playing and enjoying a game. The psychological concept of *reinforcement and reward* addresses mental modes activated by gameplay on a neurological and psychological level. We define *engagement mechanisms* as design elements of mobile games created specifically to incentivize and motivate players to return to the game.

Previous scholarly work on appeal factors describes specific elements that draw players into various types of games. For example, Vorderer et al. (2004) determined “challenge” was a key appeal factor sought by many players, as were such appeals as “arousal,” “competition,” and “social interaction”. Lee et al. (2017) list and describe the factors “fantasy,” “creativity,” and “fellowship” among others, and also associate genres with particular appeal factors, citing, for example, the strong link between the role-playing game genre and the appeal factor “exploration.” As a result, appeal factors are typically supported by the core mechanics of a given game, and are a primary reason users are initially engaged by a game.

Appeal Factors. *Appeal factors* in media are defined by Lee et al. as “elements of media that draw people in by evoking certain emotional and intellectual experiences when a user interacts with the media” (2017, 127). The concept of appeal factors in media was adopted from the field of readers advisory in libraries and seeks to understand and describe categories of user desires in the service of recommending new media. The concept supports the idea that “people are attracted to certain types of materials for different reasons” (Lee et al. 2017, 127). A closely related term often used in media studies is “uses and gratifications” (Katz et al. 1973), which is the field of research that explores and describes specific uses consumers have for media and the gratifications they seek from them.

Reinforcement and Reward. The concept of *reinforcement and reward* is the psychological framework that describes how systems that reinforce and reward behaviors promote and sustain behaviors, such as continued gameplay in the context of this work. It is a concept discussed and used in numerous behavioral areas, from motivation for learning to motivations for video game engagement and video game addiction. Cash et al. state, “digital technology users experience multiple layers of reward when they use various computer applications” (2012, 293), which can contribute to addiction. Examples provided by Cash et al. specific to video games are social rewards, identification with a hero, and immersive graphics. They also point out that multiple rewards, when combined with stimulating content, intensify the reward experience.

Cash et al. (2012) and others (Chumbley and Griffiths 2006; King et al. 2010; King et al. 2011; Young 1996) also point out that many video games function on a *variable rate reinforcement schedule* (VRRS), which is associated with both gambling and video game addiction. A VRRS is a system of rewards that only intermittently delivers rewards to players, such as periodic rewards of uncommon and rare in-game items in the case of video games. King notes, “It is well known that variable ratio reinforcement produces the most consistent and steady responding and is the least susceptible to extinction … video games commonly feature fixed and variable schedules of reinforcement that can sustain a player’s motivation to play a video game for long periods because the next reward is “just around the corner””. (2010, 101).

Engagement Mechanisms. We define *engagement mechanisms* as “design elements of mobile game specifically created to redirect player attention to the game application.” Examples of this include games with daily log-in rewards to incentivize playing every day, “push notifications” triggered by the game application in the background that pop up on users’ devices to remind them to play, and time-limited rewards incentivizing immediate play.

This work tells the story of the current mobile gaming landscape at the intersection of current monetization strategies deployed by mobile game developers and the elements of game applications that drive engagement and retention. There is an increasingly complex interplay between these two sets of elements. Providing language to understand and describe them will help facilitate the communication of ideas about game design, marketing, and addiction for scholars, policymakers, counselors, families, and other stakeholders.

RESEARCH METHODS

To develop the taxonomy of game transaction types and the subsequent model relating categories of transactions, we created a purposive sample of 65 games popular on the Android and iOS mobile operating systems to study (accessible at: <https://tinyurl.com/TransactionEngagementTaxonomy>). We intended to select a range of games across mobile operating systems and game genres with the aim of observing the breadth of

transaction and engagement types. The sample was put together on October 15, 2018. The sample consisted of i) the top 20 grossing mobile games on both the Android and iOS platform, ii) the top 20 rated games on both the Android and iOS platform, iii) a selection of additional games to ensure a range of game genres were represented.

We enlisted the help of 22 students enrolled in a course at the University of Washington called “Metadata for Interactive Media” to play sample games and collect data about transactions and elements that promote engagement within the games. Each student was tasked with playing two or three mobile games daily, for a period of approximately one month, and collecting data on the transaction types within the game, as well as elements designed to drive engagement and retention and potentially addictive elements.

We employed a combination of inductive and deductive approaches for developing the terms in the taxonomy. We initially selected the commonly recorded themes in the student-collected game data, aiming to create a list of clearly defined terms that collectively can describe the variety of transactions and engagement elements in a comprehensive way, following the taxonomic coding process as prescribed in Saldaña (2009). Afterwards, we compared this list to the existing terms and concepts we found in prior literature in order to map the similar concepts and minimize the chance of missing relevant terms. We then proceeded with the evaluation phase, in which we asked students to apply the taxonomy to another sample of 20 online mobile games and catalog them in order to test the applicability of the taxonomy and revise it as needed. The taxonomies presented in this paper are the latest versions that have gone through the evaluation and revision process.

RESULTS

Taxonomy of Transaction Types

Table 1 shows the transaction taxonomy created from data collection and the sample of 65 games.

	Term	Definition
Currency	Real Currency	Legal cash
	In-game Currency	In-game digital currency (Related Term (RT): Virtual Currency)
	Premium Currency	A rare and exclusive form of in-game currency (RT: Exclusive Currency, Rare Currency)
Transaction Types	Direct Monetization	Company receives direct cash payments
	- Subscription	Pay a periodic fee for bonus or exclusive content
	- Ad Removal	Pay real money to avoid ads
	- Real Currency Gambling	Gamble with real money
	Indirect Monetization	Company receives indirect financial benefit

- Viewing Ads (Required)	Ads appear on screen, and sometimes between levels	
- Viewing Ads (Optional)	Ads players can elect to watch for in-game goods	
- Virtual Currency Gambling	Players gamble with virtual currency	
- Acquisition	Players use social media and other systems to recruit new players	
Resources	Direct Gameplay Advantage	Resources that convey benefits in the game system mechanics
	- Powerups	Resource that provides time limited benefits (RT: Buffs)
	- Permanent Boost	Resource that conveys a permanent advantage to the player's game state
	Limited Content	Exclusive, premium game features not available to all players (RT: Exclusive Content)
	Remove Time Related Barriers	Reducing or removing limitations to time played, or turn timers (RT: Appointment Mechanics, Energy Mechanics, Turn Timers)
	Customization	Cosmetic objects for character avatars or environments (RT: Skins)
	Inventory Capacity	Ability to store more in-game resources (RT: Bag Space)
	Random Goods	A resource generating random in-game goods (RT: Loot Boxes)
	More Items	Acquiring more materials, weapons, or other items used in-game
Marketing Methods	Game as Ad	The game is also an ad for merchandise
	Merchandise Store	Merchandise store integrated into game application
	Limited Time Offer	Time limited sale, or time limited availability of rare game goods
	Special Events	Time limited events featuring temporary thematic game content (RT: Special Occasions)

Table 1: Taxonomy of transaction types in mobile games.

Premium/Pay to Play (P2P). In this model, players pay a set price for a game and own the rights to play the game. A completed game is a fixed product offered a fixed price, e.g., *Dragon Quest* (Square Enix 1986), which costs \$2.99 USD in both the Apple and Google Play stores.

Paymium. In this model, players pay a set cost for a game, purchasing the right to play all core content in a game. However, “paymium” games also provide opportunities for additional microtransactions for additional content, which is the function that distinguishes paymium from premium. For instance, *Kingdom Rush: Origins* (Ironhide

Game Studio 2014) has an initial premium purchase price of \$2.99, allowing players to play the entire game. However, players can also purchase in-game currency or items.

Free to Play (F2P). The free to play game model provides players with a large amount of content for free. Examples include *PewPew* (Jean-François Geyelin 2009) and *GameStart Pixel Battle* (Eliphant 2015). These games cost nothing, and also do not feature in game advertising or microtransactions.

Freemium. This pay model is a form of F2P game where players also have opportunities to buy premium content. Examples include *Pokémon Go* (Niantic 2016), and *Final Fantasy Brave Exvius* (Square Enix 2015). Each game is free to play, but provide a robust market to purchase and spend in-game currency.

Subscription. Some mobile games provide customers the opportunity to pay a subscription fee. For example, *Animal Jam: Play Wild* (National Geographic 2015), and *King of Thieves* (ZeptoLab 2018) are free to play; however, by paying a monthly subscription fee, players receive additional gameplay benefits. In *Animal Jam*, subscribers can form and join “packs”, a sort of in-game guild, and receive a form of in-game currency each month they subscribe. Subscribers to *King of Thieves* can take “turns” in the game more frequently.

Currency. Currency describes real and virtual monetary units that are used to purchase game content and in-game goods.

Real Currency. Real currency describes monetary units used in the real world, such as U.S. dollars, Japanese yen, or Euros. This currency can be used to purchase games, game content, or in-game goods directly, or can be used to purchase virtual currency in the game.

In-game Currency. In-game currency describes virtual monetary units that function as a resource within the game and can be used to purchase in-game goods and resources. Examples include “gold pieces” and “elixer,” in-game currencies in *Clash of Clans* (Supercell 2012), and “bells” in *Animal Crossing: Pocket Camp* (Nintendo 2017). The defining characteristic of this type of currency is that it is earned and used within the game system. In-game currency may sometimes be available for purchase via real currency as with *Clash of Clans*, while in other games it is not, as with *Animal Crossing: Pocket Camp*.

Premium In-Game Currency. This form of virtual currency can be purchased with real money, though sometimes it can be earned in limited amounts within the game. Premium currency is differentiated from other in-game currency, as it is rare, difficult or impossible to earn in-game, and typically designed to be purchased by players for extra content or exclusive advantages. For instance, *Clash of Clans* (Supercell 2012) uses premium currency of “gems.”

Transaction Types. Transaction types in games in the sample came in two forms, described in game-marketing literature as direct monetization and indirect monetization. There is a robust premium game market on the Apple App store and Google Play Store, though most games in these markets rely on other types of transaction for value exchange between the consumer and the company.

Direct Monetization. Direct monetization is the exchange of cash for digital goods. It is the exchange of real-world currency by a player to directly purchase in-game resources, game content, or other game benefits. The following terms fall under the category of *direct monetization*.

Direct Purchase. Uses real-world currency to directly purchase game-related digital goods such as currency, resources, items, new content, or special features. Purchasing gems in *Clash of Clans* (Supercell 2012) is an example.

Subscription. Payments for subscriptions are a form of direct transaction, as with *King of Thieves* (ZeptoLab 2018) (currently \$5 per month), for exclusive rewards and items.

Ad Removal. Payments to remove advertisements are a form and purpose for direct purchase. For example, players can pay money to remove the in-game ads from *Word Link* (Worzzle Games 2017).

Gambling with Real Currency. Some games, frequently but not exclusively casino games, allow players to gamble with cash indirectly. Net gain by the developer represents a direct transfer of cash from players to the company. An example is the Supernova family of mobile casino games.

Indirect Monetization. Indirect monetization involves players engaging in value exchange with the game developer without the exchange of real-world currency. This involves a player providing a benefit to the developer in terms of marketing, advertising, or player recruitment in exchange for gameplay, in-game resources, or other benefits. The following terms are transaction types under the category of *indirect transactions*.

Viewing Ads (Required). The game developer earns revenue via advertisement that players are required to periodically view. The value exchange is in this transaction comes in the form of ad views, which the game developer is paid for by advertising companies. For example, *Bloons Adventure Time TD* (Ninja Kiwi 2018) requires players to watch ads between levels.

Viewing Ads (Optional). Game players choose to watch optional ads in exchange for some game benefit. In all respects the value exchange is identical to the required viewing of ads, except that the player is given a choice. An example is *Lazy Cats* (Kongragate 2011), in which players can elect to watch in-game video ads for coins.

Gambling with Virtual Currency. Some games allow players to gamble with cash indirectly, by allowing players to purchase in-game currency and gamble with it. A net loss of virtual currency may promote additional gameplay to make up losses. An example is gambling with “coins” in *Slotomania* (Playtika 2011).

Acquisition. A final form of transaction of value to game developers is assisting with acquisition of new users. Acquisition describes the process of acquiring new players to a mobile game. Advertising is a primary method used by game developers to gain new players via social media such as Facebook and Twitter, as well as through ad purchasing platforms such as Google Ads (Wong and Hiew 2005). According to an industry report by Pratskevich for the marketing firm Liftoff, in 2018 it cost \$2.18 to acquire a user. In 2018, it also cost an average of \$5.10 to get a user to register for a game, and \$101.58 to get a user to make an in-app purchase, a process completed by only 2.9 percent of players of each game. So player recruitment and retention are an expensive process, and there is value in utilizing an existing player base to attract new players. It is important to note that even non-paying users add to the value of a game (Hamari and Järvinen 2011; Paavilainen et al. 2013) and “[increase] virality and the value of the service, creating a positive network effect” (Paavilainen et al. 2013, 797)

To acquire new users, mobile games often feature options for players to assist with acquisition in exchange for in-game goods. Typically this involves providing an in-app

tool to allow players to post about the game or their game progress on social media, a tool for players to “like” a game on social media, or a mechanism to send recruitment emails to friends and family. For completing these actions, players are rewarded with in-game goods. For instance, *Toy Blast* (Peak Games 2019) prompts users to link their game to Facebook in exchange for free lives (extra turns).

Resources. This category describes the various resources players acquire with transactions.

Gameplay Advantage. A direct game state advantage, which comes in the form of powerups or permanent boosts.

- *Temporary Powerup.* A time-limited boost to help a player, such as purchasing and using a Horn of Heroism in *Kingdom Rush: Origins* (Ironhide Game Studio 2014), which gives a player temporary invulnerability.
- *Permanent Boost.* A permanent boost to the game state, for instance, by buying more powerful weapons in *A Girl Adrift* (AbyssRium 2017).

Access Limited Content. Exclusive content available to players, such as paying the premium currency of diamonds in *Love Nikki Dress Up Queen* (Nikki Games 2017) to buy exclusive clothes.

Remove Time-Related Barrier. Items that remove a game turn limitation, such as purchasing an “energy refill” in *Tomb of the Mask* (Playgendary 2016), which otherwise refills slowly.

Customization. Decorative items or features for characters or environments to personalize them, such as the ability to purchase items to customize ponds in *Zen Koi 2* (LandShark Games 2017).

Inventory Capacity. More space to store virtual objects, such as spending coins to increase bag size in *Pokémon Go* (Niantic 2016).

Random Goods. A package with a random item or items (i.e., loot boxes), such as using “dragon stones” to purchase random characters in *Dragonball Z: Dokkan Battle* (BANDAI NAMCO Entertainment 2015).

More Items. In-game item resources available for purchase, such as craft materials in *Animal Crossing: Pocket Camp* (Nintendo 2017).

Taxonomy of User Engagement Types

The taxonomy of game elements designed to promote engagement and continued use of games was developed with three key concepts in mind while analyzing games in the sample. These include the construct of video game *appeal factors* (Lee et al. 2017), the principle of *reinforcement-reward* structures (Cash et al. 2012), and a concept we now call *engagement mechanisms*—elements of mobile game design created with the explicit purpose of motivating players to keep returning to the application. These concepts are not categorical in nature, as elements in the engagement taxonomy may intersect with more than one of these facets, but they form the underlying gratification, psychological, and design bases of understanding how game elements are utilized with intent to engage and retain players.

Term	Definition
Collecting	Game system provides collections to complete, promotes completionism
Content Updates	New content is released often and repeatedly to keep players engaged
Customizability	Ability to modify game elements based on individual preferences
Ease of Play	Game is made very easy to play, often with one hand or one finger
Exciting Visual Scheme	Bright and colorful graphics used to incentivize elongated gameplay
Interesting Sound Effects	Pleasing ambient game music and in-game sounds
Leaderboards	A board that shows names and scores, ranking the leaders in a competition
Leveling Up	Measurable progress of game characters or other elements
Log-in Rewards	Provides a daily or periodic in-game reward for logging in and playing
Notifications	Push notifications are sent to the player to remind them to play
Relaxing	Low stress game design without pressure to perform
Social Features	Can add friends in game, ask for assistance in gameplay, communicate about the game, or interact/view other players' game states, often for incentives
Special Events	Time-limited occasions offering access to unique themed content that is typically not available to the players
Surprise Elements	Unpredictable levels, rewards, or game mechanics

Table 2: Taxonomy of user engagement elements in mobile games.

For instance, “relaxing,” “leveling up,” and “leaderboards” intersect with the appeal factors “mood,” “accomplishment,” and “competition” (Lee et al. 2017). Surprise elements and exciting visual schemes and sounds represent layers of reward (Cash et al. 2012), and the taxonomy reflects other psychological and mental states invoked during data collection such as FOMO (fear of missing out), invoked urgency, and instant gratification, observed in content updates and special events. We identified notifications and log-in rewards as engagement mechanisms designed specifically to promote engagement in the game.

The most significant challenge in creating these taxonomies was articulating the intended effect of the use of in-game currency and resources. For instance, “removing time-related barrier” encompasses specific temporal mechanics. In some games, each action costs a certain amount of “energy,” which is regenerated at a fixed rate. Some games allow players to take a certain action only at a set time interval. Some games allow only a fixed number of turns per day. Various transactions are available to remove the barrier (instantly refresh energy, instantly reset activity timers, or pay for infinite turns). In each case, the outcome of the transaction is independent of the game mechanic—value is exchanged and expended to remove a time barrier to play. Similar discussions took place for other terms (e.g., “customization,” “inventory capacity”) in

which the team worked to achieve consensus in categorizing a class of characteristics or outcomes under the same concept. Some of this ambiguity is reflected in the literature (e.g., “appointment mechanics,” “energy mechanics,” and “time skips” referring to the same general idea).

APPLICATION OF THE TAXONOMIES: VALUE MAPPING

One basic use of these taxonomies would be to apply them in mobile game stores so that players can better understand what kinds of values they can obtain via in-app purchases to help them make informed decisions about accessing the game. In addition, value transfer within a mobile game application can be mapped in a form of modified value stream map (VSM) (Nash and Poling 2011) using our taxonomies. VSM is a technique used in manufacturing and service sectors and lean management to understand the flow of information and goods and enterprise in creating a product or providing a service. Here we modify this concept to understand the flow of value surrounding a game and refer to it as a *transaction value map*. We present an example value map (Figure 2) using the transaction taxonomy using *A Girl Adrift* (DAERISOFT 2017) to illustrate the paths of indirect value generation, transfer of value from real-world currency from outside of the game application to forms of in-game currency, and ultimately to in-game resources and digital goods.

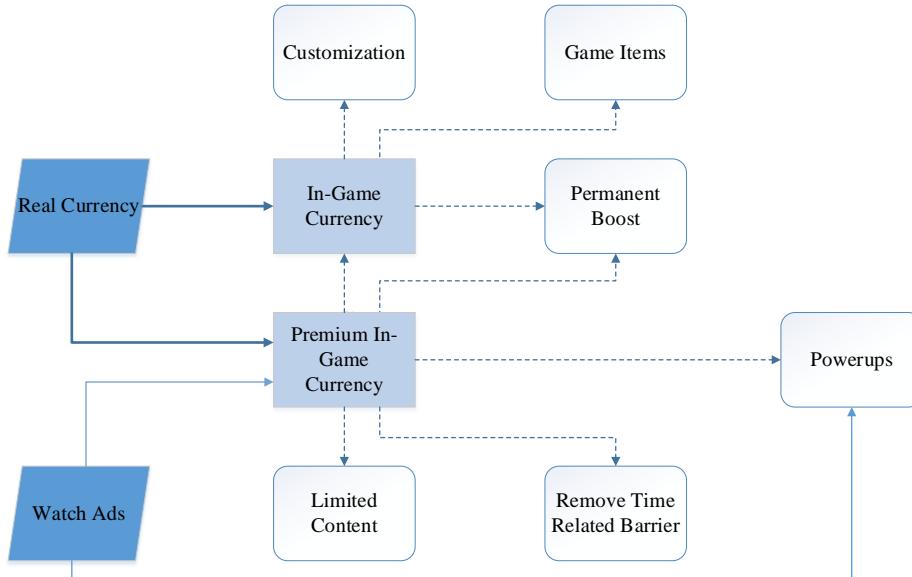


Figure 2: A value map representing the value transaction structure of *A Girl Adrift* (DAERISOFT 2017) based on the transaction taxonomy.

In this transaction value map, indirect transactions with the company are indicated with a solid line, direct transactions with the company are indicated by solid bold lines, and transactions entirely within the game system are represented by dashed lines. In *A Girl Adrift* (DAERISOFT 2017), players can engage in direct transactions by spending real currency to buy in-game or premium in-game currency, and can voluntarily watch ads (an indirect transaction) to acquire premium in-game currency or powerups. In turn, in-game currency can be spent on customization options, in-game items, or permanent boosts to the characters equipment. The premium in-game currency can be converted to in-game currency or used for permanent boosts and powerups. Additionally, the premium currency is the only way to buy some limited content in the game and remove certain time-related barriers.

Transaction value maps like this can help players understand the monetization system of a game at a glance, and help consumers, caregivers, and other stakeholders understand what is involved in a specific mobile game. Value transfer maps help illustrate at least two key issues with microtransactions in games. First, they make clear the non-linear nature of value transformation taking place, and relate the multiple forms of exchange, currencies, and resources that convert to one another with varying costs. Second, they immediately illustrate aspects of games locked behind transactions, which is not always immediately apparent in the early stages of playing a new game. Plotting costs and exchange rates on a game value transfer map would also provide specific measures and increase understanding of what a player gets for what they expend, in real or virtual currency. These could potentially be adopted by researchers who study financial aspects of video games or organizations such as Common Sense Media which provides detailed information about games that can help parents and teachers evaluate and select games.

APPLICATION OF THE TAXONOMIES: VALUE MAPPING

The taxonomies developed in this work serve as a basis for discussion into how such information might be utilized to describe and compare the relative in-game value achieved for a given transaction. They also describe elements that engage players, themselves typically connected to transactions, which is useful to users, game designers, marketers, and scholars who want to understand these transaction and engagement structures, and those in domains concerned with game behaviors such as psychologists and policy makers. The taxonomies can also be used in synthesis with formal analysis of gameplay, a method of understanding the play structure and paths in a game, with transaction points and engagement elements in the design, to further understanding of how gameplay specifically intersects with these elements.

Currently, there is neither a quantitative or qualitative way to characterize the net in-game value achieved within these transactions, nor a way to compare games in terms of how much content or progress is gained per transaction. This work could serve as a next step to explore a more thorough process of mapping value through a game. For instance, given the breadth of content available from absolute beginning to total completion of a mobile game, or “level cap,” game value transfer maps could serve as a starting point to develop a mechanism by which each dollar invested can be expressed as a percentage of total game progress. There may be qualitative ways to describe the benefits gained from game transactions using these taxonomies, including a way to map these structures and express relative “cost-effectiveness” of progress in games compared to one another.

Future work can also use these taxonomies to inform creation of mechanisms to describe the relative level of disclosure, probability, or deception a game company uses in its systems. For instance, with systems that have random rewards such as loot boxes, the probabilities of receiving rewards can be mapped and disclosed. This work will also be useful for those in the field of psychology or game addiction to better understand the relationship between engagement mechanisms and in-game transaction methods that intersect with those engagement mechanisms.

BIBLIOGRAPHY

AbyssRium. 2017. *A Girl Adrift*.

Alomari, K. M., Soomro, T. R., and Shaalan, K. 2016. “Mobile Gaming Trends and Revenue Models.” In *International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems*, 671–83. Springer, Cham.

- Ball, C., and Fordham, J. 2018. "Monetization is the Message: A Historical Examination of Video Game Microtransactions." In *Proceedings of the 2018 DiGRA International Conference: The Game Is The Message*.
- BANDAI NAMCO Entertainment. 2015. *Dragonball Z: Dokkan Battle*.
- Carpenter, N. "More Than 2.4 Billion People Will Play Mobile Games This Year, According To Analyst." *Forbes*, March 6, 2019. <https://www.forbes.com/sites/nicolecarpenter/2019/03/06/more-than-2-4-billion-people-will-play-mobile-games-this-year-according-to-analyst/#6227cc1f5d0e>.
- Cash, H., Rae, C. D., Steel, A. H., and Winkler, A. 2012. "Internet Addiction: A Brief Summary of Research and Practice." *Current Psychiatry Reviews*. 8(4), 292–98.
- Chumbley, J., and Griffiths, M. 2006. "Affect and the Computer Game Player: The Effect of Gender, Personality, and Game Reinforcement Structure on Affective Responses to Computer Game Play." *CyberPsychology and Behavior*. 9(3), 308–316.
- DAERISOFT. 2017. *A Girl Adrift*.
- Davidovici-Nora, M. 2014. "Paid and Free Digital Business Models Innovations in the Video Game Industry." *Digiworld Economic Journal* (94), 83.
- Drummond, A., and Sauer, J. D. 2018. "Video Game Loot Boxes Are Psychologically Akin to Gambling." *Nature Human Behaviour*. 2(8), 530.
- Eliphant. 2015. *GameStart Pixel Battle*.
- Fields, T., and Cotton, B. 2011. *Social Game Design: Monetization Methods and Mechanics*. Boca Raton, FL, USA: CRC Press.
- Foxell, N. 2015. "Mobile Game Monetization." Bachelor's thesis. University of Jyväskylä. <https://jyx.jyu.fi/handle/123456789/47994?show=full>.
- Gainsbury, S. M., Hing, N., Delfabbro, P. H., and King, D. L. 2014. "A Taxonomy of Gambling and Casino Games via Social Media and Online Technologies." *International Gambling Studies*. 14(2), 196–213.
- Geyelin, J. 2009. *PewPew*.
- Griffiths, M. D. 2018. "Is the Buying of Loot Boxes in Video Games a Form of Gambling or Gaming?" *Gaming Law Review*. 22(1), 52–54.
- Hamari, J., and Järvinen, A. 2011. "Building Customer Relationship through Game Mechanics in Social Games." In *Business, Technological, and Social Dimensions of Computer Games: Multidisciplinary Developments*, 348–65. IGI Global.
- Hamari, J., and Lehdonvirta, V. 2010. "Game Design as Marketing: How Game Mechanics Create Demand for Virtual Goods." *International Journal of Business Science and Applied Management*. 5(1), 14–29.
- Hsiao, K., and Chen, C. 2016. "What Drives In-App Purchase Intention for Mobile Games? An Examination of Perceived Values and Loyalty." *Electronic Commerce Research and Applications*. 16, 18–29.
- Ironhide Game Studio. 2014. *Kingdom Rush: Origins*.
- Katz, E., Blumler, J. G., and Gurevitch, M. 1973. "Uses and gratifications research." *Public Opinion Quarterly*. 37(4), 509–23.
- Kimppa, K. K., Heimo, O. I., and Harviainen, J. T. 2016. First Dose Is Always Freemium. *ACM SIGCAS Computers and Society*. 45(3), 132–37.

- King, D., Delfabbro, P., and Griffiths, M. 2010. "Video Game Structural Characteristics: A New Psychological Taxonomy." *International Journal of Mental Health and Addiction*. 8(1), 90–106.
- King, D. L., Delfabbro, P. H., and Griffiths, M. D. 2011. "The Role of Structural Characteristics in Problematic Video Game Play: An Empirical Study." *International Journal of Mental Health and Addiction*. 9(3), 320–33.
- Kongrage. 2011. *Lazy Cats*.
- LandShark Games. 2017. *Zen Koi 2*.
- Lee, J. H., Clarke, R. I., Cho, H., and Windleharth, T. 2017. "Understanding Appeals of Video Games for Readers' Advisory and Recommendation." *Reference and User Services Quarterly*. 57(2), 127–39.
- Lescop, D., and Lescop, E. 2014. "Exploring Mobile Gaming Revenues: The Price Tag of Impatience, Stress and Release." *Digiworld Economic Journal*. (94), 103.
- Macey, J., Hamari, J. 2019. "eSports, Skins and Loot Boxes: Participants, Practices and Problematic Behaviour Associated with Emergent Forms of Gambling." *New Media and Society*. 21(1), 20–41.
- McLuhan, M. 1964. *Understanding Media: The Extensions of Man*. New York, NY, USA: McGraw-Hill.
- Nash, M. A., and Poling, S. R. 2011. *Mapping the Total Value Stream: A Comprehensive Guide for Production and Transactional Processes*. New York, NY, USA: Productivity Press.
- National Geographic. 2015. *Animal Jam: Play Wild*.
- Niantic. 2016. *Pokémon Go*.
- Nickerson, R., Varshney, U., Muntermann, J., and Isaac, H. 2007. "Towards A Taxonomy of Mobile Applications." In *AMCIS 2007 Proceedings*, 338.
- Nieborg, D. B. 2015. "Crushing Candy: The Free-to-Play Game in Its Connective Commodity Form." *Social Media + Society*. 1(2).
- Nielsen, L., and Grabarczyk, P. 2018. "Are Loot Boxes Gambling? Random reward mechanisms in video games." In *Proceedings of the 2018 DiGRA International Conference: The Game Is The Message*.
- Nikki Games. 2017. *Love Nikki Dress Up Queen*.
- Ninja Kiwi. 2018. *Bloons Adventure Time TD*.
- Nintendo. 2017. *Animal Crossing: Pocket Camp*.
- Paavilainen, J., Hamari, J., Stenros, J., and Kinnunen, J. 2013. "Social Network Games: Players' Perspectives." *Simulation and Gaming*. 44(6), 794–820.
- Peak Games. 2019. *Toy Blast*.
- Playgendar. 2016. *Tomb of the Mask*.
- Playtika. 2011. *Slotomania*.
- Pratskevich, A. "Mobile App Engagement Index: User Acquisition Trends and Benchmarks." *Liftoff*, October 31, 2018. <https://liftoff.io/blog/index-report-2018/>.
- Saldaña, J. 2009. *The Coding Manual for Qualitative Researchers*. London, England: SAGE Publications.

- Scolari, C. A., Aguado, J. M., and Feijóo, C. 2012. “Mobile Media: Towards A Definition and Taxonomy of Contents and Applications.” *International Journal of Interactive Mobile Technologies*. 6(2).
- Square Enix. 1986. *Dragon Quest*.
- Square Enix. 2015. *Final Fantasy Brave Exvius*.
- Supercell. 2012. *Clash of Clans*.
- Torbet, G. “UK Officials Call for Loot Boxes to Be Regulated Like Gambling.” *Engadget*, September 12, 2019. <https://www.engadget.com/2019/09/12/uk-government-loot-boxes-regulation/>.
- Tyni, H., Sotamaa, O., and Toivonen, S. 2011. “Howdy Pardner!: On Free-to-Play, Sociability and Rhythm Design in FrontierVille.” In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 22–29, ACM.
- Vorderer, P., Klimmt, C., and Ritterfeld, U. 2004. “Enjoyment: At the Heart of Media Entertainment.” *Communication Theory*. 14(4), 388–408.
- Wijman, T. “Mobile Revenues Account for More than 50% of the Global Games Market as It Reaches \$137.9 Billion in 2018.” *Newzoo*, April 30, 2018. <https://newzoo.com/insights/articles/global-games-market-reaches-137-9-billion-in-2018-mobile-games-take-half/>.
- Wong, C. C., and Hiew, P. L. 2005. “Mobile Entertainment: Review and Redefine.” In *International Conference on Mobile Business*, 187–92, IEEE.
- Worzzle Games. 2017. *Word Link*.
- Young, K. S. 1996. Internet Addiction: The Emergence of a New Clinical Disorder. Paper presented at the *105th annual meeting of the American Psychological Association*, Toronto, Canada, 15 August.
- Zendle, D., and Cairns, P. 2018. “Video Game Loot Boxes Are Linked to Problem Gambling: Results of a Large-Scale Survey.” *PloS ONE*. 13(11).
- ZeptoLab. 2018. *King of Thieves*.