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# ARM HEURISTICS FOR F2P MOBILE GAMES

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# ARM HEURISTICS FOR F2P MOBILE GAMES

Tese apresentada ao Programa de Pós-Graduação em Design da Universidade Federal de Pernambuco, como requisito parcial para a obtenção do título de Doutor em Design.

**Área de concentração**: Planejamento e Contextualização de Artefatos.

**Orientador**: Profº. Dr. André M. M. Neves.

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## RESUMO

A nossa pesquisa trata do desenvolvimento de um conjunto de heurísticas ARM (aquisição, retenção e monetização), além de um framework ARM, para jogos F2P (free-to-play) em dispositivos móveis, para apoiar o design de jogos. Devido ao constante crescimento do mercado de jogos F2P nas plataformas móveis, as técnicas relacionadas ao seu design vêm gradualmente se desenvolvendo. No entanto, em nossa pesquisa, não conseguimos identificar um conjunto estruturado de heurísticas ARM relacionados a este mercado específico, apesar de termos encontrado algumas melhores práticas, ou diretrizes, relatadas em outros trabalhos, porém de forma não estruturada. Então, para desenvolvermos o nosso conjunto de heurísticas, primeiramente identificamos os elementos ARM relacionados aos jogos F2P para dispositivos móveis. Para isso, iniciamos o desenvolvimento de um framework ARM, que estruturalmente suportasse as categorias, subcategorias, e elementos envolvidos. Com o nosso framework desenvolvido, possuindo 59 elementos, o utilizamos como referência para a formação da primeira versão do nosso conjunto de heurísticas. Então, através da revisão da literatura, e questionário aplicado à 42 profissionais da área, no final da nossa pesquisa obtivemos um conjunto de 28 heurísticas para jogos F2P em dispositivos móveis. Segundo os resultados do questionário realizado, em média, os profissionais da indústria de jogos para dispositivos móveis F2P concordam com todas as heurísticas do nosso conjunto final.



Palavras-chave: ARM. Free-to-play. Heurísticas. Dispositivos móveis.

**ABSTRACT**

Our research is about the development of a set of ARM (acquisition, retention, and monetization) heuristics, as well as an ARM Framework, for F2P (free-to-play) mobile games, to support the game design practice. Thanks to the constant mobile F2P game market growth, the game design techniques related to these kinds of games have been gradually developing. However, in our research, we could not identify a structured set of ARM heuristics related to this specific market, although we have found some best practices, or guidelines, reported in other works, but in a non-structured way. Therefore, to be able to define our set of heuristics, first, we identified what the ARM elements related to F2P mobile games are. To do that, we started the development of an ARM framework structured to support the categories, subcategories, and elements involved. With our developed framework, possessing 59 elements, we used it as a reference to build the first version of our set of heuristics. Then, through literature review and a questionnaire applied to 42 game industry professionals, at the end of our research we had a set of 28 heuristics for F2P mobile games. According to the results from the applied questionnaire, on average, the professionals of the mobile F2P game area agreed with all the heuristics of our final set.

Keywords: ARM. Free-to-play. Heuristics. Mobile.

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## LISTA DE ABREVIATURAS E SIGLAS

| | |
|---|---|
| AARRR | Acquisition, Activation, Retention, Revenue, and Referral |
| AD | Advrtisement |
| ARM | Acquisition, Retention, and Monetization |
| B2P | Buy-to-Play |
| CPA | Cost Per Acquisition |
| F2P | Free-to-Play |
| GDD | Game Design Document |
| HEP | Heuristic Evaluation for Playability |
| HUD | Heads-Up Display |
| IAP | In-App Purchases |
| ITSM | Information Technology Security Management |
| KPI | Key Performance Indicator |
| SNG | Social Network Game |
| SP | Security Practitioner |
| W3C | W3C World Wide Web Consortium |

**SUMÁRIO**

# 1. INTRODUCTION

## 1.1. RESEARCH PROBLEM

The video game market has grown significantly in the last few years. Complimenting that growth, the means to make games and to make money from them has been enhanced by new methods, techniques, and tools for developers. These tools, techniques, and methods, help overcome new challenges, minimize costs and maximize revenue.

Currently, the mobile game market stands out among its competitors. Wijman (2017) has predicted mobile games will have 51% of the total global gaming market revenue in 2020. In 2016, mobile games already had 39% of the market, against 31% for consoles and 30% for PCs. It is also important to know that, according to the game research data site Think Gaming (2018), 49 of the top 50 grossing Apple App Store games are free, and 50 of the top 50 grossing of Google Play games are also free.

To make profitable Free-to-Play (F2P) games it is important to understand elements that could help with acquiring new players, keep them playing, and drive them to monetize the game. The ARM (acquisition, retention, and monetization) framework is an important tool to help game makers understand elements, and relations between acquisition, retention and monetization stages, increasing the chances to make more profitable F2P games (FIELDS, COTTON, 2012; LOVELL, 2013; LUTON, 2013; THIBAULT, 2013).

Through the analysis of recent studies concerning ARM elements in F2P mobile games (APPEL, 2017; ASKELÖF, 2013; DAVIDOVICI-NORA, 2014; FIELDS, COTTON, 2012; KATKOFF, 2012; KONTAGENT, 2011; KUUSISTO , 2014; LOVELL, 2013; LUTON, 2013; NARINEN, 2014; NGUYEN, 2014; TAO, 2014; THIBAULT, 2013; WILLIAMS, 2012) we can see that industry professionals have been developing and maintaining more knowledge about these elements than academic researchers, and furthermore there are no formal ways to organize, list, and categorize these elements. Therefore, game market professionals do not have a specific and safe source to consult

the elements related to acquisition, retention, and monetization. Considering these arguments, is it possible an ARM framework helps game market professionals remember possible ARM elements when designing F2P mobile games?

Also, in this research, we did not find a specific set of tips, rules, or heuristics that could aid game market professionals to design ARM elements on F2P mobile games. This is an important issue for the design area itself because it could help related elements evolve and provide tools and means for the planning of new F2P mobile games. Nielsen (1993), talking about usability heuristics, defends that heuristics can be used as rules to evaluate some system through heuristic evaluation, whereby the goal is to identify problems in the system, so they can be attended to as part of an iterative design process.

Some authors, as Deterding et al. (2011), and Rajanen and Nissinen (2015), have been discussing the use of heuristics on game design practices, but they keep the research limited to the usability field. However, they present heuristics as something very related to game design practices.

## 1.2. MOTIVATION

The F2P mobile game industry has been growing and taking the larger share of the mobile game market. Currently, this market is always changing, through companies adapting their business models, and the emergence of new ways to acquire, retain and monetize, being validated. Consequently, there is the increase in the competition among these games, and the need to design and understand new methods and elements that came to be part of this context (DAVIDOVICI-NORA, 2014; LUTON, 2013; VALADARES, 2011). It requires a constant exploration of the problem space and creative inputs to define an initial solution. Then, we set out to investigate how is the state of the art of the elements related to the ARM framework in F2P mobile games, considering sources from academia and industry.

There are many elements related to the ARM framework in F2P mobile games. But, based on this research, they are not formally organized, and not schematically linked by categories, which could make it easier to understand the framework. However, Askelöf (2013) presents insights about how to categorize ARM elements in social network games, also presenting a set of subcategories for retention. Additionally, Narinen (2014) presents a way to subcategorize the retention in F2P mobile games, and Luton (2013) and Radoff (2011) show two ways to subcategorize the monetization. Thus, based on this research, considering the elements we found, we created a baseline framework for F2P mobile games. Next, we sharpened this framework, based on validation questionnaires with game market professionals. It presents a way to make the game designer's work easier, when planning mobile F2P ARM elements.

Furthermore, there are some established heuristics being used in the game area, as presented by Federoff (2002), Laitinen (2006), Desurvire, Caplan and Toth (2004), Korhonen and Koivisto (2006), and Schaffer (2008). But, not one of the researched sources presents a set of heuristics focused on helping the design of F2P mobile games. So, we also created a set of heuristics, based on the framework for F2P mobile games we had developed and an additional research. This set provides a way to make the game designer's work easier when planning mobile F2P ARM mechanics and techniques.

## 1.3. HYPOTHESIS

### 1.2.1. General Hypothesis

The set of proposed ARM heuristics for free-to-play mobile games is recognized as an effective guideline for the game design process of such games.

### 1.2.2. Specific Hypothesis

1. There are a set of mobile free-to-play game elements that are used to acquire, retain and monetize players;

2. This set of elements can be understood by the majority of experienced game designers, through a schematic framework (ARM Framework for free-to-play Mobile Games);
3. The schematic framework provides good coverage of ARM possibilities in F2P mobile games;
4. The use of heuristics has been helping making games;
5. There are a set of mobile free-to-play ARM heuristics that are used to acquire, retain and monetize through players;
6. A specific set of ARM heuristics is recognized for game market professionals as an effective guideline for the free-to-play mobile game design process.

## 1.4. RESEARCH OBJECTIVES

### 1.3.1. General Objective

This research aims to methodically define a set of ARM heuristics, focused on the design of free-to-play mobile games, recognized as an effective guideline by the game market professionals.

### 1.3.2. Specific Objectives

1. Identify and analyze the main characteristics of mobile free-to-play games;
2. Identify and analyze the main characteristics of ARM elements in mobile free-to-play games;
3. Introduce the main characteristics of mobile F2P game design and the bases of heuristics;
4. Introduce a framework for characterizing heuristics;
5. Analyze the use of heuristics on game design process;

6. To set up a baseline ARM framework for free-to-play mobile games based on the literature review, and evolve it, through a survey with game market professionals;
7. To set up a baseline set of ARM heuristics for free-to-play mobile games based on the developed ARM framework and the reviewed literature, and evolve it, through a survey with game market professionals.

## 1.5. JUSTIFICATION

The mobile game industry is a new and ever-changing area, where the designers need to adapt themselves to constant paradigm shifts. New business models came with new innovative ways to design and monetize on this market (DAVIDOVICI-NORA, 2014). The free-to-play business model has been dominating in the mobile game industry for the last years, where the total revenue generated by it surpassed paid games in 2011 on iOS (VALADARES, 2011).

To make more successful free-to-play mobile games, game market professionals need to understand the elements related to the ARM framework, and how to use them properly (LUTON, 2013). There are many ARM methods and elements, but not a formal and established way to facilitate the design of them into a free-to-play mobile game. To set up a group of ARM heuristics and elements, in this context, could make the game designer task easier.

A set of cognitive rules, or principles, designed to solve problems, also called heuristics, can help designers to identify what should be done to make something better (NIELSEN, 1993; 1995; REIMER, RIESKAMP, 2007).

Regarding the theme of Acquisition, Retention and Monetization in free-to-play mobile games, there is yet to be defined a way to properly understand related methods and elements, and utilize them to enhance game design practices. This is the point of departure for our research. Our approach to do so will be through the definition of an

ARM framework for free-to-play mobile games, and subsequently the establishment of a set of ARM heuristics for free-to-play mobile games.

### 1.6. Summary of the Document

The second chapter stands as the theoretical background related to the acquisition, retention and monetization, categories, covering the ARM funnel, as well detailing and listing the related elements and their operation in the mobile F2P gaming context. Next, in the third chapter, we present the basis for the mobile F2P game design and heuristics, as well we introduce a framework for characterizing heuristics. We also cover the state-of-the-art game heuristics and display a set of ARM guidelines for F2P Mobile Games, based on the literature researched.

Next, in chapter four, we lay out methodological aspects of our research in order to present the steps taken towards our scientific contribution for Design as a scientific discipline. We specifically present a sequence of methods for our two studies: one for the definition of an ARM framework for F2P mobile games; and a second study focused on the building of a set of ARM heuristics for F2P mobile games.

In chapter five we present the operationalization and analyses related to the methods defined in chapter 4. Meaning that all procedures executed, partial and overall results, and analyses, from *defining an ARM framework for F2P mobile games* and *defining a set of ARM heuristics for F2P mobile games* are presented and discussed. Finally, on the last and sixth chapter, will give a summary of our research with its conclusions, contributions and possible future works.

## 2. ARM ELEMENTS IN F2P MOBILE GAMES

To make profitable Free-to-Play (F2P) games it is important to understand elements that could help acquire new players, keep them playing, and drive them to monetize the game. The ARM framework is an important tool to help game makers understand elements, and relations between the acquisition, retention and monetization stages, increasing the chances to make more profitable F2P games (FIELDS, COTTON, 2012; LOVELL, 2013; LUTON, 2013; THIBAULT, 2013).

This work aims to assemble common ARM F2P game elements in a unique framework, making it easy to understand what variables could be used to design acquisition, retention and monetization in such games. It can also stimulate more academic researches on subjects that are directly applied in the market.

In this chapter we are going to: introduce general aspects of the ARM Funnel applied on F2P mobile games; review the academic and professional literature regarding the *Acquisition*, *Retention*, and *Monetization* elements, applied on F2P mobile games; create a proposal for elements and architecture, based on research, to organize a baseline ARM framework for F2P mobile games.

We are developing this framework to have more parameters, as well to identify key elements, that have to be taken into account through the creation of our heuristics for F2P mobile games. Then, the finished version of this framework is going to be used as the basis for the design of these heuristics.

In the next section we are covering the ARM framework, and its mains aspects related to F2P mobile games.

### 2.1 ARM IN F2P MOBILE GAMES

The term ARM refers to an analytic framework, often used to describe a business model, in mobile game industry. As an acronym, it means Acquisition, Retention, and Monetization, and it could be useful as an aid to understanding the related business models and know how to design them. The acquisition is to attract new users to play the

game, the retention is about keeping users playing the game, and monetization is how the game makes revenue (KUUSISTO , 2014; TAO, 2014).

Dave Mcclure has developed a similar framework, named AARRR, acronym for Acquisition, Activation, Retention, Revenue, and Referral. The revenue is the same thing as Monetization, from the ARM framework. Activation is about the first experience of the user, and referral is if the user will tell others about the product (McClure, 2007).

Davidovici-Nora (2014) explains the differences between this framework (ARM) applied on B2P[1] (buy-to-play) and applied on F2P games. She details that, in B2P games, from the point of view of the consumer, the player first buys the game (Monetization), then discovers the gameplay (Acquisition), and finally enjoys (or not) the game and repeats gaming (Retention). In this context, the retention is at the end of the process and does not have a direct connection with the monetization stage. But, in F2P games, the architecture of the business model is more complex and can generate multiple interactions among stages and not only a one-to-one relationship.

In F2P games, the monetization stage is pushed to the end of the process, and now it is optional to pay. Games with F2P business model should put emphasis on experience before monetizing it, to accumulate a huge user base and make them engaged. Because the price to acquire the game is zero, the acquisition stage seems to be an easy and automatic stage in F2P model if compared with the B2P model (DAVIDOVICI-NORA, 2014). Also, it's necessary to considered other challenges to be overcome when using this business model.

Thibault (2013) describes Key Performance Indicator (KPI) as a set of indicators that constitute the basic structure for displaying the status of a game and its success in a simple way. These indicators are supposed to be calculated on a regular basis, to provide information about the evolution of the game throughout time. The author defines that, usually, KPIs of a typical F2P game are organized through a three-step plan, which is called the ARM funnel.

[1] Tradicional monetization model where the customer first needs to pay to have the whole access to the content (KUSHUKOV, 2017).

The following structure (figure 1), initially proposed by Kontagent (2011), shows the ARM funnel.

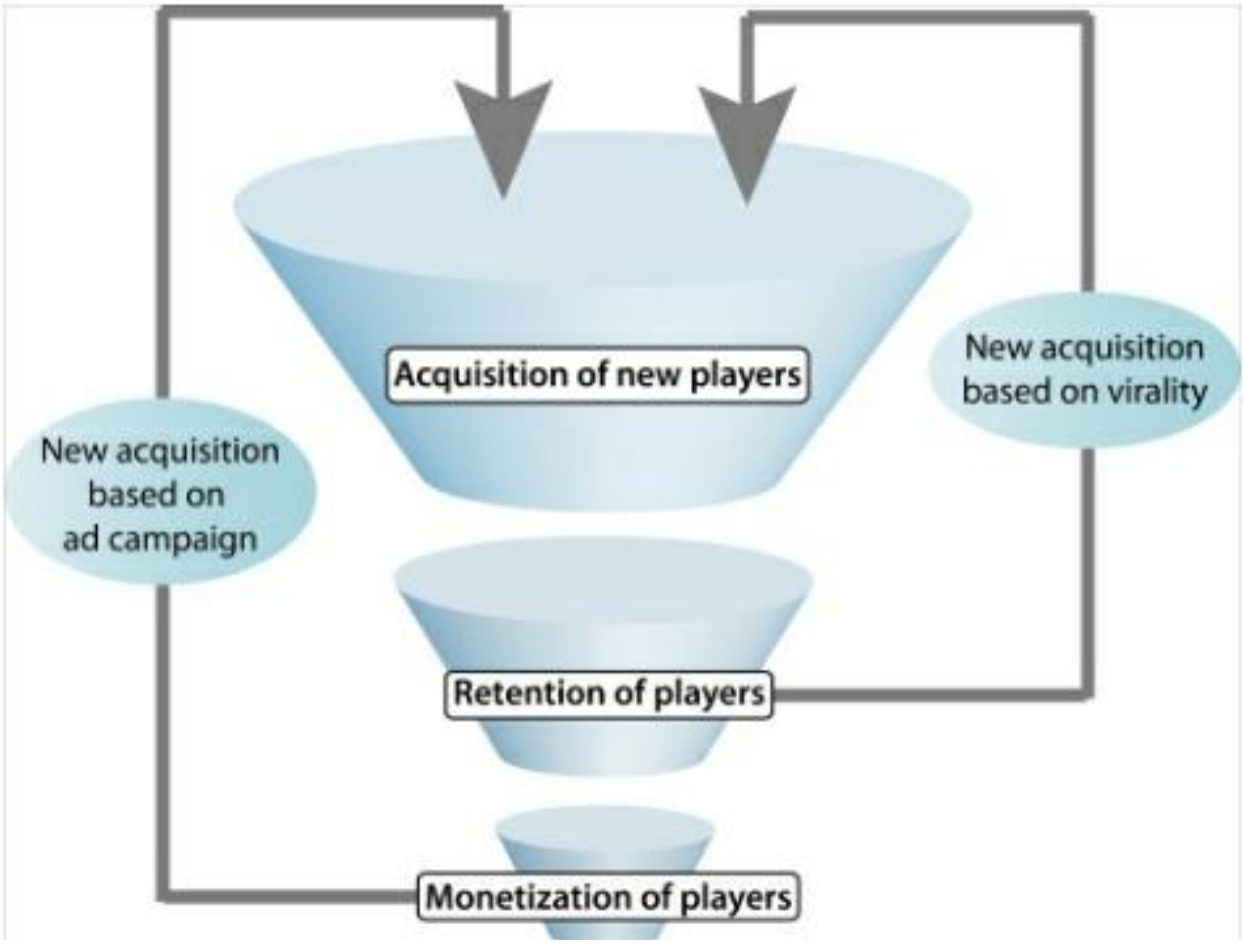


Figure 1. Illustration of the ARM funnel for video games (THIBAULT, 2013, p.21)

These three stages are strictly linear, they act more like a recurring cycle, and can be explained like that (Fields & Cotton, 2012):

- First, the game *Acquire* a large player base;
- Then it should Retain (*Retention*) these players, keeping enough of them coming back so that some of them will actually like your game enough to invest their money into it (*Monetizaton*);

- Some of the players you retain will spread the word about your game and make it viral. They will raise the brand awareness of your game and attract new players (*Acquire*);
- The profit you gain from *Monetization* can be invested again into acquiring more users (*advertising campaign*) to make the number of players even bigger;
- The cycle repeats.

Katkoff (2012a) explained an example (figure 2) that helps understand how these stages are all connected. In this example, the player starts building a house but in order to finish it the player needs some specific items. At this point, the player knows that getting these items require several play sessions and a lot of grinding[2] (*retention*). The player can skip the grinding simply by asking friends to gift these items (something that could generate new player *acquisition*). As a third option, the player can skip the grinding and the waiting for a friend's gifts to arrive and just pay to proceed (*monetization*).


Figure 2. Most common virality formula (KATKOFF, 2012a)

[2] The act to perform repetitive tasks to reach goals in video games.

For Davidovici-Nora (2014) all of ARM's stages and game development are continuously connected, giving feedback to the developer team through metrics monitoring, who can make changes in the game. As long as the game is profitable, its components need to evolve, following the needs identified by its developers to make the game adaptable to the market. The image below (figure 3) illustrates this relationship:

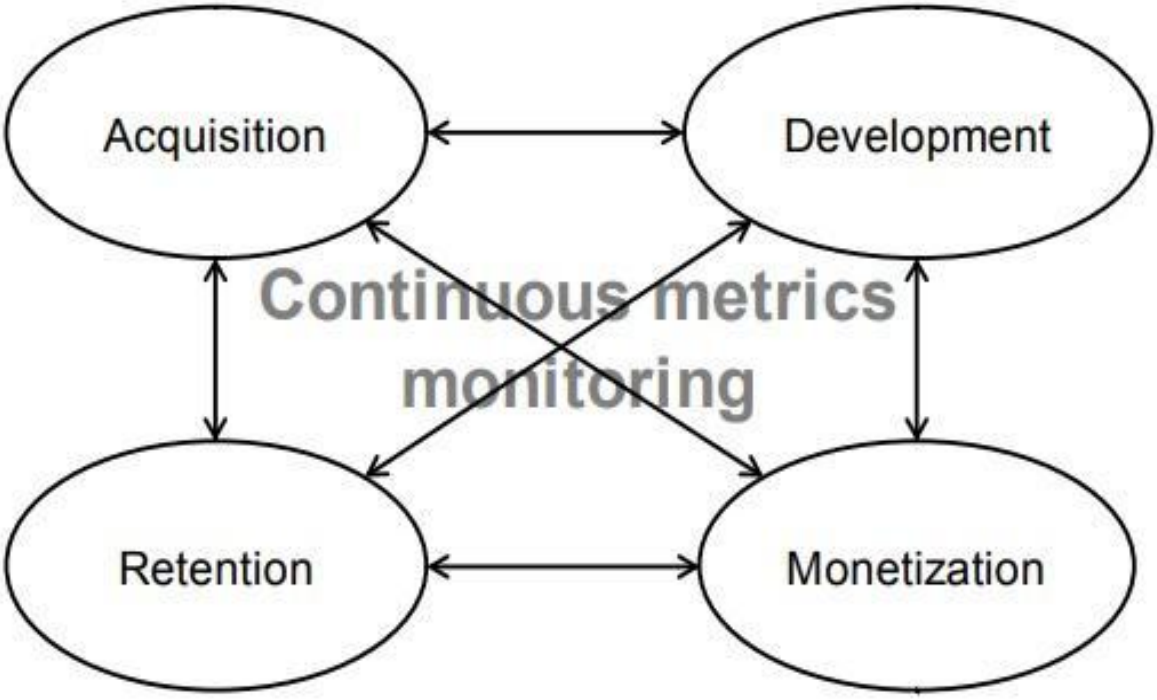


Figure 3. A-R-M-D Dynamics in F2P games (DAVIDOVICI-NORA, 2014)

We are going to explain each element of the ARM framework, applied to F2P mobile games, considering the specific aspects of each one and the relations among them.

In the next section we are covering the acquisition category of the ARM framework and its elements.

## 2.2 ACQUISITION

In F2P games the acquisition stage takes place first since it is not necessary to buy the game to have it, so the monetization stage is deferred to later. Because of that, F2P games have to convince users to spend money after they have already made the acquisition decision. So, it is usually necessary to have a large number of players to make this model profitable (ALHA, et al., 2014; DAVIDOVICI-NORA, 2014; NGUYEN, 2014). For that reason, we might assume that the acquisition stage, in F2P games, does not have a direct correspondence on monetization stage, since the price is zero, and what makes the game profitable is not exactly about how many acquisitions its reaches.

However, when consumers enjoy a product, they are more open to spend their money on it. Therefore, acquiring a large base of players is the first crucial step to making money in a F2P model. Thus, since a game has acquired a substantial fan base, it can partly rely on the players` word-of-mouth via social networks in acquiring more players (ASKELÖF, 2013; NGUYEN, 2014).

A F2P model means there is no barrier to entry to test the game. However, because of the massive competition among free models, offering a free game is not enough to reach visibility. To acquire players, the developer should invest in expensive marketing costs or induce viral user acquisition. This way, it is possible that many new players massively test the game and get committed, but without enough paying players among them. Because of this risk, the growth of player base and monetization must be concomitant, otherwise costs (maintenance, server, marketing, etc.) to manage the user base could quickly exceed revenues (DAVIDOVICI-NORA, 2014; MOREL, 2012). When we talk about player acquisition, it’s important to consider how much it costs to recruit new users to play the game, compared to how much the average revenue of each player is respectively – this is one of the main elements to be considered when defining if a F2P game is successful or not (NARINEN, 2014).

Askelöf (2013) explains that, in the ARM model, user acquisition sources are classified as being either viral or non-viral. Viral user sources refer to new players which

have been generated by existing users. Whereas non-viral user sources are those that are not generated by existing users, including advertising, cross-promotion and offer walls.

Based on this research a selection of elements were indicated by professionals and academic researchers as directly related with acquisition in F2P games. Based on Askelöf's (2013) explanation, acquisition was divided in two main subcategories; *Viral* and *Non-Viral*. The selected categories and subcategories are not excludents, so an element could represent more than one of these categories. The selected subcategories are organized below:

- **Viral**
    - **Invitation Mechanics**: There are a lot of mechanics to incentivize users to invite their friends to try the game, where normally, for every invited person that installs the game (sometimes it is not necessary to install the game), the player will be rewarded by some gifts in the game. This is a way to reward users, for sharing the game, with some form of free content. This technique is often used by game designers as an incentive for users to invite their friends, increasing the virality. Also, there are some mechanics that encourage players to ask for help to reach some objective faster, which could attract new players, as well help *retention*. Some common examples of invitation rewards are: *Boosts*, *power-ups* and *gacha tickets* (ASKELÖF, 2013; KATKOFF, 2012a; MOREL, 2012; PAAVILAINEN, et al., 2017);
    - **Timeline Social Features Sharing**: Social features like leaderboards and achievements players can share on their timeline. It can also increase user *retention* and growth (ASKELÖF, 2013; MAIBERG, 2013; PAAVILAINEN, et al., 2017);
    - **Word of Mouth**: Here we will assume these are natural invitations by the players without using actions (mechanics) on the game. If there is an engaging game and it brings good experience, it should make more

players tell their friends about it (ASKELÖF, 2013; KUUSISTO, 2014; NARINEN, 2014; WILLIAMS, 2012);

- **Chart Position in Market Places**: Better chart position in market places will provide more visibility, then it will help a game to gain more installs (KUUSISTO, 2014);

- **Non-Viral**

  - **Natural Organic Installs**: We have decided to use this term to represent organic installs that are not influenced by the engagement of other players or cross-promotions, like the pure store exposure - without considering charts - or the trending news when a new version of a game is launched in the store (KANIEL, 2012). Some authors present all organic installs as viral (KHALIL, 2016; WILLIAMS, 2012), but we decide not to do that, because viral is always about players bring more players, in the definition we are using;

  - **Cross-promotions (with other games or Apps)**: Some companies provide the ability to cross-promote a game with others in their network, allowing them to reach large audiences at a relatively inexpensive cost basis by advertising on their networks. Another example of cross-promotion is to redirect players between other games of the same company. This way, all games of the company can get a better chance of exposure (ASKELÖF, 2013; LUTON, 2013; MOREL, 2012; WILLIAMS, 2012);

  - **Offer Walls**: Through Offer Walls, the players can earn in-game currency by performing certain tasks. Examples of such tasks are installing an app or game. However, since the player is often only interested in getting the reward and not in using the offer they signed up for, players obtained through this method tend to leave quickly. Offer Walls are a common method for *monetizing* users, but can also be used for player acquisition,

by giving offers to players of competitor games (ASKELÖF, 2013; MOREL, 2012);

- **Off Game/App Advertising**: In this element we are not considering advertisement that occurs through other games or apps. Instead we are looking at advertisements on platforms such as websites or social networks, banners on online stores, or e-mail campaigns (ASKELÖF, 2013; KANIEL, 2012; KHALIL, 2016; MOREL, 2012; NGUYEN, 2014).

In the next section we are covering the retention category of the ARM framework, and its elements.

## 2.3 RETENTION

The second level of the ARM funnel is known as retention. For Thibault (2013) this category is about how to keep players involved in the game and what should be done to retain them on a mid-term and long-term basis.

Basically, retention is a measure of how many players keep playing the game after their initial play session. Since resources have been spent to acquire players, it is important to keep them engaged. Then, retention is directly linked to player engagement. Retention methods are based on basic psychological concepts, and well-selected game mechanics should anticipate the player behavior and feed their motivation and engagement (NARINEN, 2014). In a similar way, Luton (2013) explains, as related to retention, that the number of players who are retained over a given time period in a game, indicates how sticky the game is, or how effective it is at keeping players playing.

When we talk about the retention stage in F2P games, we can point a very important difference from games traditionally sold as a package paid for up front (B2P, or buy-to-play, model). According to Askelöf (2013), in B2P games the developer's revenue is not affected by how long players keep playing the game. Since these players have paid roughly the same amount for the game, how long they keep playing will not

affect the developer's revenue, at least in the short term. However, In F2P games, there is no initial fee and revenue depends on keeping active players engaged and spending money on in-game content, or interacting with advertisements. Therefore, the retention aspect is very important when it comes to *monetization* in F2P games.

Askelöf (2013) presents three categories of game mechanics and dynamics used to make the player engage in *Social Network Games* (SNG[3]s):

- **Progress Systems**: It is about the common mechanics used in SNGs to manage progress, and how this progress is communicated to the player;
- **Social Aspects**: These are mechanics that support social interactions, allowing players to interact with each other;
- **Time-Based Limitations**: A set of techniques and game dynamics used in SNG to control the length of game sessions.

Narinen (2014) presents another way to categorize player retention methods, used in F2P mobile games:

- **Core Retention Methods**: These are retention methods that affect the immediate engagement of the player through the mechanics, and gameplay elements, and they are closely tied within the core loop and progression of the game;
- **Advanced Retention Methods**: They act as an extension of the core retention methods. That is the second layer of player retention, and it uses elements such social interaction, social competition, and new content release;
- **Additional Retention Methods**: These methods do not require a strong tie to the core loop. They are often added on top of the core retention and advanced retention methods and can be applied loosely on any game.

[3] Social Network Games (SNGs) are "a type of digital games which utilize a social graph to generate and connect users" (ASKELÖF, 2013, p. 17). Examples of SNGs are *Farm Ville 2* and *Mafia Wars*.

These methods are push notifications; daily login rewards; limited time events.

Based on this research we have selected a set of elements, indicated by professionals and academic researchers, as directly related to retention in F2P games. They were divided into three subcategories, following the same division proposed by Askelöf (2013) for SNGs. We have decided to use the following subcategories since they are self-explanatory and fit better with the elements found in this research. We also change the name of the subcategory *Time-Based Limitations* to *Space and Time-Based Limitations*, to bear the *Location Triggers* element. The selected categories and subcategories are not exclusionary, so an element could represent more than one of these subcategories:

- **Progress Systems**
    - **Achievements**: Often referred to as badges, achievements provide the feeling of reaching a goal, rewarding players who fulfill the required conditions (ASKELÖF, 2013; KATKOFF, 2012b; LOVELL, 2013; MAIBERG, 2013; THIBAULT, 2013);
    - **Points**: The point systems are essential to any gamified system. Players can collect them to reach some task, challenge, better competition position, in-game richness, or more. The following divisions were found in the literature: experience points; redeemable points (or game coins); skill points; karma points; reputation points; reputation points; progress points (or levelling up) (ASKELÖF, 2013; KUUSISTO, 2014; LOVELL, 2013);
    - **Leaderboards**: A *leaderboard*, sometimes called *scoreboard*, is a competitive return trigger, and its purpose is to make comparisons between players (ASKELÖF, 2013; LOVELL, 2013; LUTON, 2013; NGUYEN, 2014). In our framework this element is part of the progress system subcategory, as well as social aspects

subcategory, because it is about how the player is progressing in relation to others;

- **Levels**: It is an indication of how far the progress of a player in the game is. It is not just about challenge progression, but also about new places and challenges to explore. The addition of new levels, after the release, can extend the lifespan of the game (ASKELÖF, 2013; DAVIDOVICI-NORA, 2014; LUTON, 2013; NARINEN, 2014). To complete some level, or reach another one, it's possible that some players spend money to reach that faster, helping *monetization*;

- **Tutorial**: *Tutorial,* sometimes called *onboarding*, is the practice of guiding and teaching players in some moments of the game when they need to do something new (ASKELÖF, 2013; LUTON, 2013; NARINEN, 2014);

- **Objective**: An objective is a task, mission, quest or challenge to the player completes in the game. By giving the player an objective, depth and meaning can be added to the game, creating variety in the gameplay and adding constant rewards. It is important to always keep the players pursuing new challenges (ASKELÖF, 2013; KUUSISTO, 2014; SALEN, ZIMMERMAN, 2004). In the pursuit to complete some challenges it is possible that some players spend money to finish them faster, helping *monetization*;

- **Social Aspects**

  - **Leaderboards**: Leaderboards are an important social element to keep players competing against each other, while expose their ranking position. Leaderboards can also help monetization if the player is willing to pay to surpass other players easier and faster (ASKELÖF, 2013; LOVELL, 2013; LUTON, 2013; NGUYEN, 2014).

As explained before, this element is part of the progress system subcategory, as well as social aspects subcategory;

- **Sharing of Achievements**: Achievements are a progress systems element but sharing them is a social aspect tool that allows competitive and exposure interactions. Sharing achievements on the player's social profile timeline can also help in *acquiring* more players (ASKELÖF, 2013; KATKOFF, 2012b; MAIBERG, 2013; THIBAULT, 2013);

- **Socializing:** Also known as goal change, this element refers to the player's willingness to play with other friends or teammates, making their goal socializing. A large base of players, giving a sense of community, can help to keep users coming back to the game (FUKADA, 2011, apud ASKELÖF, 2013; NGUYEN, 2014);

- **Help Request:** Using the *invitation mechanics*, to complete some task or goal in the game, the player can ask for help from their friends. This system encourages players to bring new players (*acquisition*) in and keep existing players coming back to the game. (ASKELÖF, 2013; KATKOFF, 2012a; LUTON, 2013; MOREL, 2012; PAAVILAINEN, et al., 2017);

- **Gifting**: That is the ability to spontaneously give gifts to others, who are notified, and are then encouraged to join (*acquisition*) or come back to the game to return the favor. Reciprocity strengthens the social ties between the players, reminds them to keep playing (LUTON, 2013; PAAVILAINEN, et al., 2017; RADOFF, 2011);

- **Challenges**: Similar to a help request but acts in a competitive way. Players can invite others to compete with them (LUTON, 2013);

- **Competition Sense**: It is any other kind of situation where players are competing against the machine, against themselves and against others (RADOFF, 2011; SALEN, ZIMMERMAN, 2004). We have named this element competition sense to differ it from other elements that also are based on competition, such as *challenges* or *leaderboards*;

- **Cooperation Sense**: It is any other kind of situation where players interact with each other in a noncompetitive way. Like the social commitment, it is based on the sense that commitment makes players return to complete some waiting action for another player or help their guild with some their specific abilities. The willingness to cooperate is the base of this element (LUTON, 2013; RADOFF, 2011; SALEN, ZIMMERMAN, 2004). This element was named *cooperation sense* to differ it from other elements that are also based on cooperation, such as *gifting* or *help request*;

- **Space and Time-Based Limitations**

  - **Energy System**: These are common techniques used to limit the length of player sessions. Each action the player takes consumes energy, and as the player's energy drains to zero, they need to wait until their energy bar is restored before they can continue. Some players do not have enough patience to wait, or they need to be very fast to reach some goal and prefer buying more energy to avoid the reload time (ASKELÖF, 2013; KATKOFF, 2012b; LUTON, 2013). This element can also help the *monetization*;

  - **Time to Complete**: Also known as *construction time*, it's about the time taken to build some object, learn a new ability, or complete any other waiting bar that allows new resources in the game, forcing the player to wait or spend money to avoid it (ASKELÖF,

2013; NARINEN, 2014; LUTON, 2013). As explained previously, this element can also help the *monetization*;

- **Cooldown**: It is a time limit on how often certain actions can be used in game. (ASKELÖF, 2013);
- **Reward for Replay**: Also known as *incentivize appointment*, or *reward retention*, refers to mechanisms that reward the player for returning to the game, and it also, in some cases, motivates them to keep returning, for a period of time, to obtain better rewards (ASKELÖF, 2013; LUTON, 2013; NARINEN, 2014; NGUYEN, 2014);
- **Punishment for Absence**: It is, in some way, the opposite of the *reward for replay* element. The player receives some penalty for not returning to the game for some specific period of time (ASKELÖF, 2013);
- **Limited-Time Events**: Also known as *limited time campaigns*, these are seasonal events that offer something special for a short period, like an exclusive quest that rewards players with a very rare item (ASKELÖF, 2013; LUTON, 2013);
- **Come Back Message**: Also known as *nudge triggers*, it is considered one of the weakest return triggers. These are messages that remind the player about the game when they have not played the game for some time (LUTON, 2013; NGUYEN, 2014);
- **Location Triggers**: It is when the game provides rewards for players playing in some specific places (LUTON, 2013).

In the next section we are covering the monetization category of the ARM framework, and its elements.

## 2.4 MONETIZATION

Narinen (2014) explains that, in F2P games, monetization is the act of selling optional services and virtual resources to the players inside the game. The player can buy these resources with real money, which usually includes things like cosmetic changes, virtual items, and virtual currencies. Because of the free nature of F2P games, only a small percentage of players will spend money on the games. Morel (2012) argues that it is necessary to be prepared to spend money to acquire users, since 2-6% of F2P players pay for something. Speaking about free social mobile games Nguyen (2014) says the two most notable ways to monetize them are selling advertising and selling virtual items.

The F2P model lets players play the game without paying, but constant incentives are given to the user to invest money to further improve their gaming experience. By spending money in the game, the player could boost their abilities, advance quicker, and overcome time limitations. About this issue, selling virtual items is consider the main method of monetization in F2P games. That way, instead of requiring players to pay to keep playing the game, F2P games prefer to rely on specific game mechanics to incentivize players to naturally spend money in the game (ASKELÖF, 2013).

Luton (2013) says that the process of generating revenue in F2P games is more complex, because the game itself is an integral part of the monetization, therefore the design is directly linked with the business. In this monetization model, everyone can play for free forever, and those who, want can spend money repeatedly.

At the beginning of the free model, free games used just advertisement to monetize. Then, the model evolved and started to offer microtransactions, where the access remains free, but revenues come from the sale of in-game items using real money. Today, for the developers, advertising can generate significant revenue but only for the top-selling games. But advertising also can be a complementary source of revenue for the F2P model if it is embedded in the gameplay (DAVIDOVICI-NORA, 2014).

In figure 4 are verified revenue results from the first quarter of 2017, in five of the biggest mobile game studios, where the dark blue bar represents revenue from In-app Purchases (IAP) and the light blue bar represents revenue from Advertising (BOXALL, 2017). In all cases, monetization by IAP's generates more revenue than monetization by advertising.


Figure 4. Comparison between revenue from IAP and Advertising (BOXALL, 2017)

Appels at al. (2017), talking about free apps, explains that such products rely on revenues from two sources: *paying consumers*, and *paying advertisers*. For Luton (2013) the ways to monetize F2P games are:

- **In-app Purchases (IAP)**: Also known as microtransactions, they are purchases made by a player to acquire virtual goods or virtual currencies, items or usable resources in a game;

- **Advertising**: Provides ads by third-party suppliers that pay publishers on the number of impressions (interactions or exhibitions);
- **Product placement**: It is the practice of inserting a real product in a game and reinforcing the product's positive image among players by their association. It can also be considered a subtler way of advertising;
- **Merchandise**: That is the selling of physical goods associated with the game;
- **Store Cards**: These are physical cards with a code that can be redeemed for credits to be spent in the game. This item can be seen as an alternative to IAPs.

Talking about in-app purchases, Radoff (2011) categorizes virtual goods into seven different types, as described below: Gifts; Boosts and Power-ups; Personalization and Creativity; Play Accelerators; Collectibles; Expansions; Trans-media Content.

Based on this research a selection of elements was proposed by professionals and academic researchers, as directly related to monetization in F2P games. They were also divided into three subcategories, following the division proposed by Luton (2013), and making some adaptations. Store cards were inserted into IPA subcategory since it is another way to monetize by in-app purchases. Furthermore, product placement was inserted into the advertising subcategory, because it is just a subtler way of advertising. These changes were made to make the monetization structure simpler, avoiding unnecessary categories. The selected categories and subcategories are not exclusionary, so an element could represent more than one of these categories. The subcategories are listed below:

- **In-app Purchases**
    - **Virtual Currencies:** These are virtual money that allow players buy things in the game. We have basically two types of them: *hard currency*, and *soft currency*. The hard currency is rewarded on a finite number of or low frequency of actions (such as reaching a

level), and it is commonly purchased. Whereas a soft currency is infinitely rewarded through the core loop and commonly earned in large quantities from grind, but it can also be purchased. Normally, hard currencies are more used for more premium functions (ASKELÖF, 2013; KUUSISTO, 2014; LUTON, 2013);

- **Content**: It consists of extra content to explore the game, as maps, levels, new abilities, characters, or similar that give players more things to do (LUTON, 2013; RADOFF, 2011);
- **Play Accelerators**: Also known as *convenience*, that is one of the more common F2P monetization mechanics. It consists of the purchase of anything that allows players to skip ahead, providing them with something that normally would need time and dedication to reach. Examples of convenience include selling energy, or instant completion of buildings to shorten waiting time (LUTON, 2013; RADOFF, 2011);
- **Competitive Advantage**: That is anything that provides players with any competitive advantage against the game or other players. Some examples of competitive advantage are boots and power-ups (LUTON, 2013; RADOFF, 2011);
- **Customization**: It is about how the game lets the players customize their avatar or the game's world, creating and making changes just for vanity or expression reasons, or changes that could also make difference in gameplay (ASKELÖF, 2013; DAVIDOVICI-NORA, 2014; KUUSISTO, 2014; LUTON, 2013; NGUYEN, 2014; RADOFF, 2011);
- **Collectibles**: These items belong to a set of items and exist only to be collected (RADOFF, 2011);

- **Gifts**: Gifts can help player-to-player interaction, but sometimes can also be acquired for *hard currency* (LUTON, 2013; PAAVILAINEN, et al., 2017; RADOFF, 2011);
- **Store Cards**: As explained before, these are physical cards with codes that can be redeemed for credits to be spent in the game;

- **Advertising**
  - **Banner Ads**: It is a thin strip that is usually shown at the top or bottom of the screen (LUTON, 2013);
  - **Interstitial Ads**: These are ads that appear between the transition of two screens and are usually full screen. They monetize better than banner ads (LUTON, 2013);
  - **Video Ads**: Video ads are one of the most effective ads, but often the most intrusive (LUTON, 2013);
  - **Offer Walls**: As a monetize method offer walls make money through actions that players need to do, such as installing another game or signing up for a service. This is a common method for monetizing users. It rewards players with some limited in-game resources and publishers with monetization (ASKELÖF, 2013; LUTON, 2013; MOREL, 2012);
  - **Affiliate Linking**: It is a link to a store, which tracks the player and pays out a percentage of sales made. For example, the ad takes the player from the game to a store, and if they make some purchase in that store it monetizes for the game (LUTON, 2013);
  - **Product Placement:** As explained, that is the use of real products inside the game, as a way to advertise;

- **Merchandise:** As explained, it is the act of selling physical goods associated with the game.

In the next chapter we present a proposal of a framework to organize ARM on F2P mobile games.

## 2.5 Baseline ARM Framework for F2P Mobile Games

Based on the subcategories and elements discovered in this research, we propose a basic organization of elements and methods related to the ARM framework in F2P mobile games, a baseline framework, as follows.

**Acquisition**

- **Viral** (Invitation Mechanics; Timeline Social Features Sharing; Word of Mouth; Chart Position in Market Places);
- **Non-Viral** (Natural Organic Installs; Cross-promotions; Offer Walls; Off Game/App Advertising);

**Retention**

- **Progress Systems** (Achievements; Points; Leaderboards; Levels; Tutorial; Objective);
- **Social Aspects** (Leaderboards; Sharing of Achievements; Socializing; Help Request; Gifting; Challenges; Competition Sense; Cooperation Sense);
- **Space and Time-Based Limitations** (Energy System; Time to Complete; Cooldown; Reward for Replay; Punishment for Absence; Limited-Time Events; Come Back Message; Location Triggers);

**Monetization**

- **In-app Purchases** (Virtual Currencies; Content; Play Accelerators; Competitive Advantage; Customization; Collectibles; Gifts; Store Cards);
- **Advertising** (Banner Ads; Interstitial Ads; Video Ads; Offer Walls; Affiliate Linking; Product Placement);
- **Merchandise**.

To better explain what we are proposing, the first version of our ARM framework for F2P mobile games, the baseline framework, detailed in this chapter, is displayed in subsection 5.1.1.

In this section we have organized a baseline framework for F2P mobile games, assembling a set of forty-five elements, eight subcategories, and three main categories. These elements were put together through research focused on professional and academic literature. We believe this framework can be very useful for free-to-play game design and game production professionals, as well as researches related to this subject. The listed, and organized, specific applicable elements could make the selection of F2P solutions easier or faster.

However, we continued to develop the framework during this research, to make it even better, validating and modifying its structure and elements, as well as its labels, as presented in chapter 4 and 5. Furthermore, the resultant framework will be used to aid the definition of heuristics for F2P mobile games.

# 3. HEURISTICS IN GAME DESIGN FOR F2P MOBILE GAMES

As the game industry keeps on developing, new research emerges, enabling, among other things, understanding and improving the processes involved, as well as maximizing the quality of the final product. In this process, game design and its practices come to help the game creation, what usually, among other functions, must take care of subjects related to the interactions, rules, and mechanics in the games (MEDEIROS FILHO et al., 2013). Designing interactions, rules and mechanics is a direct way to design ARM on F2P mobile games, since many ARM elements happen through these components.

## 3.1 MOBILE F2P GAME DESIGN

Schuytema (2008) explains that the design of a game should be planned by a game design team, as a way to guide the game development from the start to the end, and then he shortly defines game design as a blueprint of a game. A good application of game design should help to save money, time, and also guide the creation of better game solutions, through a planned approach.

For Schell (2011) the game design is the act of making decisions in order to define what a specific game should be. In another way to explain that, Novak (2010) says that the game design is the area focused on providing problem solutions to design functional systems, to define the way to play, the levels, the interfaces, and interactions of the game.

In this context it is important to explain and define the role of the game designer, the professional directly related to the game design area. The game designer is a professional responsible for developing what a game should be, what its rules are, mechanics, dynamics, concepts, interactions, the game world, and anything more related to the gameplay and concept content. This professional possesses the objective to create and develop these related contents through specific practices, such as: documentation, creating wireframes, flowcharts, diagrams, tables, and other related

approaches that could aid the communication and creation of the process involved (MEDEIROS FILHO, 2016; NOVAK, 2010; RABIN, 2012; SCHELL, 2011; SCHUYTEMA, 2008).

For Schell (2011), the game designer should create an ideal experience for the user (the player). This experience would be influenced by elements such as the interaction process, which uses the interface as a means of acting; or the art inside the game, which transmits aesthetic content that should tell the player more about what is happen in the game world. Then, considering that digital games are composed of many sources of information, such as narrative, rules, mechanics, aesthetics, and much other content, a game designer should be able to properly assemble these elements into something that makes sense and construct a good experience for the gamer.

It is also important to emphasize that the organization of the game development (the creation of the game), through the documentation process, can bring great value. A very decisive step, and one that should not be overlooked, is the production of the game design document. This document represents the culmination of the creative efforts of many teams involved in the development of the game. It details the entire scope of the game, specifying its characteristics for the team. The Game Design Document (GDD) should describe all the pieces that should come together to form the game, in a clear way. One of the main objectives of this document is to make clear the functioning of the mechanics and elements of the game (RHODES, 2008).

Considering that, it is important to understand the game design practices as a way to develop and identify specific design solutions for mobile F2P games since this knowledge area is responsible for defining the structure of the game. Then, the game designer, as the professional directly linked to this practice, and other similar professionals, should be very important as a support to identify and evaluate possible elements and related practices.

It should be explained that some related areas, such as game production, could be related to decisions about the proposal, scope, and elements, of the project. Novak (2010) describes a game producer as a professional that is, among other tasks,

responsible for the quality of the game, managing the proposal and prototype, and doing researches, aiming to get the best results.

### 3.1.1 F2P Game Design

Sometimes the terms *freemium* and *free-to-play* are used interchangeably (when in a video game context) (ALHA, et al., 2014). But, for clarity, in this work, we are using the term *free-to-play* and its abbreviation *F2P*, when referring to freemium video games.

F2P has become a popular revenue model in the video games industry. A F2P game can be acquired and played free of charge while players are encouraged to buy virtual goods, or see some advertising, during the gameplay. Utilized on multiple platforms such as gaming consoles, computers, and mobile, the F2P model has been present in many different genres (ALHA, et al., 2014).

Talking about the game design literature for F2P games, Paavilainen (2016) analyses that, although there are some books focused on the free-to-play game industry, there is very little academic research done into F2P game design from the game market professionals' perspective.

Since F2P business model has some specific characteristics, compared with the traditional model, the design of F2P games should also have some specific ways to deal with the planning of related games.

One of the most explored design approaches on F2P games is the concept of core loop. Luton (2013) explains *core loop* as a sequence of actions that are repeated over and over through the main way in which a player interacts with the game. Understanding the core loops is especially important in F2P games because of their interaction with each system that builds engagement. Considering one of the ways to organize the core loop, analyzing it at a high level, we have the wait core loop (figure 5), where the *action* stage is an activity done by the player in order to acquire a reward, a *reward* is something the player receives and can allow them to spend on upgrades, the *upgrade* is commonly responsible for modifying the parameters of the action, and the *wait* is the time necessary to wait before getting a reward.

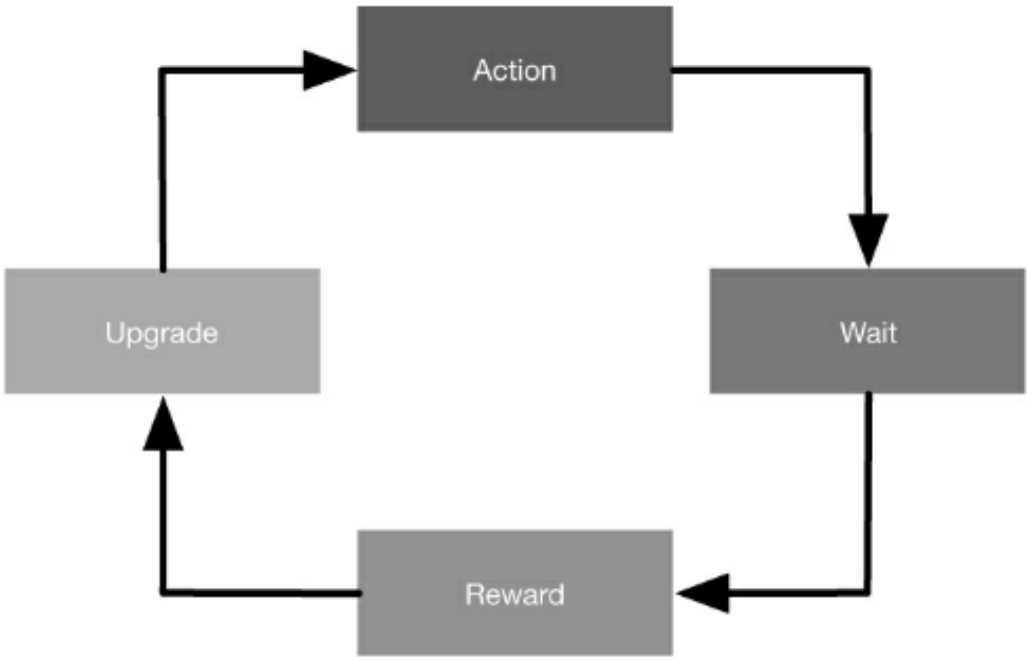


Figure 5. Wait Core Loop (LUTON, 2013)

Luton (2013) also explains the need for creating reasons for players to return to a game, through mechanics that, in some way, benefit the players when they return. This is presented in the *return loop* (figure 6). Compared with the presented *wait core loop*, the *return loop* takes out the *wait* stage, considerers remaining elements as a unique stage, called *session*, and adds three more stages. The *leave* stage is the moment where the player finishes the session, *return trigger* is the mechanism used to lure players to return to the game, while *return* is the act itself to return to play the game.

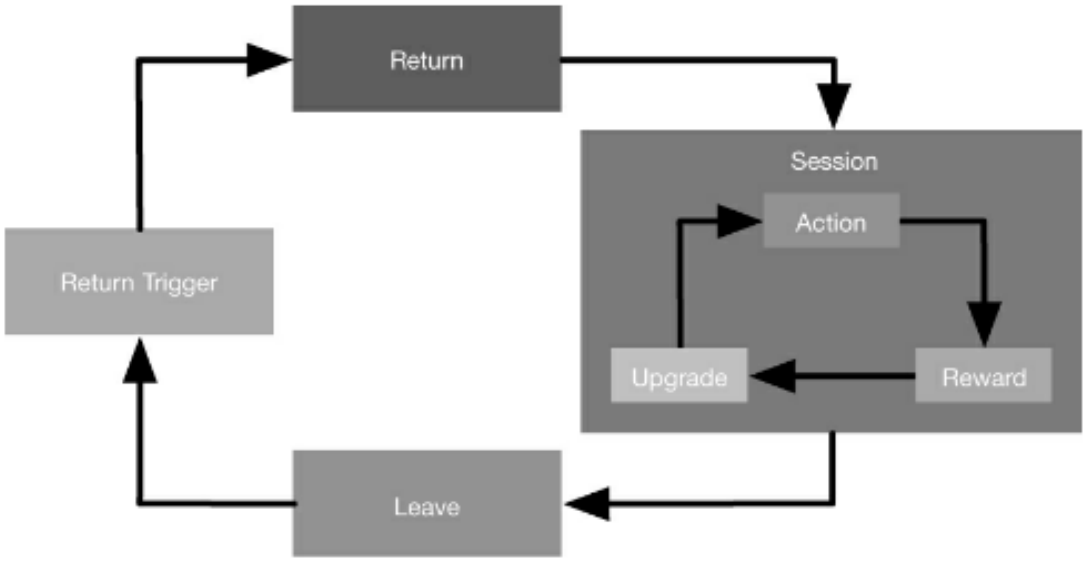


Figure 6. Return Loop (LUTON, 2013)

These loops present a typical routine design for F2P games, that can help to better understand the ARM elements and heuristics developed in this work since they display opportunities often explored in the F2P games market.

Talking about the approach adopted, Paavilainen (2016) explains that there is a difference between generic and F2P game design. Generic approaches are suitable for many kinds of games while F2P specific approaches are suitable for more specific games categories. Based on it, and an interview realized in his research, he explains that some F2P design paradigms were emphasized as very important:

- **Fair Play;**
- **Equality between paying and non-paying players**
- **Scalable game design;**
- **Constant production of new content for the players;**
- **Capability to achieve everything by playing (at least in theory);**
- **The preference of a loose economy instead of a tight one.**

As a way to define some specific design aspects of F2P games, Luban (2011) details the main characteristics a game designer working in this kind of game must be very aware of:

- **Provide immediate satisfaction:** While a purchased game creates a bond with the player, because the money invested, making them not abandon the game if their first impression is disappointing, at the first moment free games don't have this special bonding. Therefore, the game designer should plan ways to provide immediate satisfaction to the players in order to engage them;

- **Design for a (very) long duration of play:** In F2P games, the longer the player plays a game, the higher the chances they will purchase items. Therefore, the game designer should plan a game that makes the player play often, for brief periods of time and for months, in order to keep new content being delivered, and increasing the chances of monetizing with them;

- **Design for new audiences:** Many F2P games reach a varied audience, composed, among others, of children, women and older players. It is necessary to understand their interests, behaviors, and gaming habits in order to create an experience that fits well;

- **Immediate Accessibility:** In F2P games, the acquisition of new players is very important, in order to retain and monetize through them. So, you should make your game very easy to access so that you don't lose players before they are engaged;

- **The game should be launched as directly as possible:** The more steps a player needs to follow to start the game, the higher the chances of losing them. This is one of the reasons social games (like Facebook games) are so successful. It is not necessary to register, to download or to install anything. To start a game, the player just needs to click a link. However,

there are exceptions to this rule, related to some specific type of games, where there is little competition;

- **Take the player by the hand:** It is common that F2P games guide the player's first steps by forcing them to discover basic actions and by limiting their access to advanced functions. This prevents players from getting lost among many unknown functions that will force them to make blind choices. More complex actions should be made available gradually, as the player makes progress in the game.

Since F2P game design focuses on creating games that are able to make money after the acquisition and the retention of the players (through In-app Purchases, Advertising and Merchandise), F2P game designers should be aware of related issues such as: How to incorporate purchase intent; how to make players bring other players (viralization); how to keep players actively engaged in the game (DRAGANOV, 2014; LUTON, 2013).

Draganov (2014) also proposes a way the game designer can divide the player lifecycle into the game, in order to reach a better comprehension of the player's behavior and keep them playing the game. They are:

- **The Hook:** It can be defined as the moment when players decide that the game they are playing definitely deserves their attention, and then they are ready to spend more time in order to properly discover more about the content of the game, such as its mechanics and story;
- **The Habit:** That is about transforming the players' interest for a game into a habit, through the design of goals, sessions, rewards, economy, and specific retention mechanics;
- **The Hobby:** That is about how to make players regularly spend much longer periods of time inside the game, so that the habit of playing the game turns into a hobby and their impediments to spending money or to sacrificing real-world responsibilities are turn off.

In the F2P games context, players that spent no money on the game, and are not engaged in it, can easy switch over to another free-to-play game, if they are not satisfied with the game they just downloaded. Considering this, it is very common for F2P games to be launched incomplete, and the developers keep creating new content after the launch of the game, based on statistics and metrics, in order to keep players engaged (LUBAN, 2011).

It is important to understand that, these characteristics for F2P game design, presented in this subsection, to some degree have been addressed in chapter 2 (about ARM elements in F2P mobile games), because they are directly related to many elements linked to acquire, retain and monetize through players. The next subsection will review the main concepts of mobile game design.

### 3.1.2 Mobile Game Design

When creating design solutions for any platform it is very important to understand the limitations and possibilities of the platform itself. The mobile platform has special requirements imposed by the market, file space, accessibility, processing power, interface, and more, that make it unique and demands the need for creating specific solutions. (FLING, 2009). Because of that, game designers should be aware of the characteristics of mobile, when designing a game for this platform.

Talking about mobile game design, Mitchell (2012) warns that game designers should be aware of screen size and processing power limitations. Therefore, designers have to find a way to provide solutions to deal with such limitations.

Games designed specifically for the mobile devices rule the top grossing charts over the console and PC ports, on the mobile platform, and an important factor in this success is mobile specific design. It is necessary to consider the limitations of the mobile platform, to create better interactions. Joseph Kim, a mobile game philosopher, and designer wrote a Gamasutra article about games utilizing simplicity over complexity while taking into account the limitations of the platform. He explains that this kind of

game seems to rule over the games which do not utilize mobile-specific design, and suggests a progressive level of complexity for different game platforms when thinking about the many features involved, such as the user interface, user flows, controls, gameplay, resource, loops and mechanics (figure 7) (KIM, 2013; Narinen, 2014).


Figure 7. Complexity of Design by Platform (KIM, 2014)

There are characteristics, other than hardware limitations, that can make designing mobile games different than designing games for other platforms. Some such characteristics are developed throughout this work because they are intrinsically connected with the ARM context.

Narinen (2014), for example, talking about mobile game design, explains the need to design mobile games that allow users to do something meaningful (in the game) with a small amount of time, enabling players to play a game match even if they are in a hurry. The author says that this practice is highly beneficial, since the player can pick games with good accessibility over others when their time is limited.

Covering more elements, Scolastici and Nolte (2013) explain that the differences between mobile and other game platforms, such as *personal computer* and *consoles*,

are significant, covering aspects from hardware capabilities to control schemes, to fruition, business models, and pricing policies. We delve deeper into these categories and subcategories below:

- **Hardware Limitations:** When a game is designed for mobile devices, it should be ready to run on several different device configurations. We can check the specific variations, that came from hardware limitations, below;
    - **Screen Size:** The screen on most of the mobile platforms is very limited. This issue presents two problems: how to show the required information for the gameplay, and how to make that information identifiable;
    - **Game Controls:** When virtual buttons can encumber the gameplay area, touch-screen allows different ways to create interaction;
    - **Audio Output:** Audio on mobile devices cannot feature stereo sound. So, audio for mobile games should be treated as a secondary feature, and it is better not to design games that heavily rely on audio for the gameplay;
    - **File Size:** There are limitations to the size a mobile game (or app) can have, and air downloads are even more limited. It is necessary to optimize and find solutions to the technical issues posed by mobile devices' memory limits;
    - **Processing Power:** As the processing power of mobile devices can vary according with each specific model, it is necessary to make the system requirements as low as possible, to target a broader audience;
- **Mobile Design Constraints:** It is about the circumstances in which players play mobile games. Below we can check the related subcategories;
    - **Play Time:** In the mobile platform, the average amount of time that can be spent playing the game is limited. The player should have a satisfying play experience (accomplishing a task within the context of the game) in three minutes or less;

    - **Game Depth:** Because of the simple mechanics they are built around, among other reasons, it is common that mobile games tend to not have much longevity, when compared to hardcore *console* and *pc* titles;
    - **Mobile Environment:** Mobile games are often played outdoors, in crowded, noisy, "shifting" or "scuffling" environments. These factors must be considered while designing a mobile game;
    - **Smartphones:** It is necessary to design mobile games that can handle unexpected events, which may occur while playing on a phone, such as incoming calls and messages, automatic updates, and automatic power management utilities that activate alarms;
    - **Single Player versus Multiplayer:** To design a multiplayer game for mobile devices, it is necessary to consider the commonly short play session, in mobile games;
- **The Mobile Market:** To design successful mobile games it is important to understand its reference market;
- **Mobile Gamers:** There are some statistics about gamers' preferences on mobile games, that tell us that solitary, endless, and social turn-based games have high retention value upon gamers, while strategy games is the most often accessed game genre. It is important to understand these trends to create games that better fit the players;
- **Business Models:** These are the ways the game can make money;
    - **Premium**: That was the predominant business model in the beginning years of the mobile digital market stores. It means that users are charged an amount of money to download a game;
    - **Freemium:** In this model the game is given away, for free, in order to make money through IAP of virtual goods. That is the dominant business model today;
    - **Ad Supported:** There are several kinds of in-game advertising to be displayed in the game. They offer a way to monetize through the majority of users who usually don't spend money on the game,

giving non-paying players the opportunity to earn free game content by cross-promoting third parties' apps;

- **Hybrid:** It is a mix of two or more of the presented business models, to reach better results on monetizing.

It is important to understand that some of the characteristics of game design for mobile games presented in this subsection were worked on in chapter 2, ARM elements in F2P mobile games, because they are directly related to many elements linked to acquiring, retaining and monetizing players.

Although some elements presented in this subsection don't create a direct connection with the ARM aspects we discussed (such as hardware constraints, for example), these elements are part of a whole context of meaningful mobile game design principles. It should help to understand how the elements more connected to the ARM aspects (such as business model and Mobile Design Constraints) are positioned among others, considering the whole context. The next section will review the main concepts of heuristics and its base applications.

## 3.2 HEURISTICS

Heuristics is a commonly used term in human-computer interaction related areas, but it is also possible to use it in any other area. In this subchapter, we will explain the definition of heuristics, cover some of their applications, and describe a framework for characterizing them.

### 3.2.1 Definition

Heuristics is a such popular term used in the usability and interface design field. Nielsen (1995) defines heuristics as general principles for user interface design, or interaction design, and explained that they are more in the nature of rules of thumb, than specific usability guidelines.

Heuristics could be used as a set of rules to be checked, with the intention to reach more assertive decisions about what you are working on. For Nielsen (1993; 1995) heuristic evaluation is a very common approach to inspection. A group of evaluators inspect the interface design based on a set of usability heuristics and can identify what should be done to make it better.

In a straight way, Desurvire, Caplan and Toth (2004, p.1) defines heuristics as "design guidelines which serve as a useful evaluation tool for both product designers and usability professionals".

As a more general way, the *Vocabulary.com Dictionary*[4] explains that "A heuristic is a rule or method that helps you solve problems faster than you would if you did all the computing". As a similar way to understand heuristics, Reimer and Rieskamp (2007) defines it as a repertoire of cognitive strategies designed to solve particular tasks.

### 3.2.2 Application

Despite the fact that the formal use of heuristics is quite popular in human–computer interaction area, a large number of researches have been done about the application of its concept on other non-related areas. For example, Lau and Redlawsk (2001), inside a political context, explore the assumption that cognitive heuristics improve the decision-making abilities of everyday voters. In another example, Park et al. (2000) analyses heuristics from a psychology approach, outlining the influence of happy and sad states on sensitivity and bias in stereotyping.

In a more generic way, a problem solving practice can be understood as a heuristic, divided into five steps (CARSON, 2007; KRULIK, RUDNICK, 1987):

- **Read:** It is when the problem is identified;
- **Explore:** It is when one looks for patterns or attempts to determine the concept or principle related within the problem;

[4] Available at: <https://www.vocabulary.com/dictionary/heuristic> accessed on December 21st, 2017.

- **Select a Strategy:** It is where someone draws a conclusion or makes a hypothesis about how to solve the problem based on what they found in the first and second steps;
- **Solve the Problem**: Once the method has been selected it is applied to the problem;
- **Review and Extend**: The feedback from the applied method is verified, and it is looking for variations of the problem.

Understanding problem solving as a set of heuristics, as presented above, it is possible to perceive that it is divided into five steps. Following this understanding of a heuristic, we can say that it is possible to create heuristics where each one of them are divided into parts or steps.

Jakob Nielsen, one of the most well-known usability specialists in USA, has developed a very popular set of heuristics for usability, known as the *10 Usability Heuristics*, or *10 Usability Heuristics for User Interface Design*. These heuristics should help developers to design interfaces that provide a better communication between the user and the system. The 10 usability heuristics of Nielsen are presented below (NIELSEN, 1993; 1995; CYBIS, et al., 2015):

- **Visibility of system status:** The system should provide an appropriate feedback, informing the user what is going on;
- **Match between system and the real world:** The system should use words, phrases, and concepts familiar to the user, rather than system-oriented terms. The use of real-world conventions can make information appear in a natural and logical order;
- **User control and freedom:** Users often choose system functions by mistake and they will need an easy way to leave the unwanted state, without having to go through an extended dialogue. It is necessary to support undo and redo functions;
- **Consistency and standards:** Users should not have doubts if different words, situations, or actions mean the same thing. It is a good idea to

follow platform conventions, and keep identical elements meaning the same thing;

- **Error prevention:** Even better than just having good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they take an action they may regret. This heuristic is about operation error, not system errors (like system bugs);
- **Recognition rather than recall:** It is a good idea to minimize the memory load of the user by making objects, actions, and options visible. The elements of the system should efficiently transmit their semantic, and the instructions for use of the system should be visible or easily retrievable when appropriate;
- **Flexibility and efficiency of use:** The system should provide a speedup on interaction for expert users, but keep catering to both, inexperienced and experienced users;
- **Aesthetic and minimalist design:** The dialogues of the system (images, text, or anything used to communicate) should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes for attention with the relevant units of information and diminishes their relative visibility;
- **Help users recognize, diagnose, and recover from errors:** Error messages should be able to help the user face the problem, clearly identifying it, and constructively suggesting a solution;
- **Help and documentation:** Even though it is better if the system is able to be easily used without documentation, it may be necessary to provide help and documentation. This information should be easy to search, focused on the task of the user, list concrete steps to be carried out, and not be too large.

Understanding the way that the presented set of heuristics are organized, and how it can provide best practices to be used on specific situations, can help to create a

new set of heuristics, designed to help game market professionals during the ARM design of F2P mobile games.

Therefore, in this work we are using the idea of heuristics as a set of rules, to more easily and clearly deal with some specific tasks. We will investigate the best practices identified and approved by experienced game market professionals and academic researchers, to propose a set of elements and heuristics to deal with ARM (acquisition, retention, and monetization) elements in F2P mobile games.

### 3.2.3 A Framework for Characterizing Heuristics

Some methods for building heuristics are developed prior to the study related to the creation of the related set of heuristics, and others are intuitively developed during the same study related to the creation of a specific set of heuristics. Jaferia et al. (2008; 2014), for example, have created, without a specific study, the following process during their research, to build heuristics for evaluating information technology security management (ITSM) tools:

1. Research and understand the characteristics of ITSM tools that help IT security practitioners (SPs) perform activities more efficiently, through related works and interview with professionals;
2. Filter and identify, in the interviews and research results, specific elements that can support possible guidelines that could be used to create the heuristics needed;
3. Categorize the resulted guidelines;
4. Review and adapt the guidelines;
5. Consolidate and abstract the guidelines into heuristics, which are more general, concise, easy to understand, and open to interpretation.

In the same way, Federoff (2002) has built a set of heuristics and usability guidelines for the creation and evaluation of fun in video games. In this study, she combined the data collected and literature reviewed to suggest that instituting more formal usability evaluation processes could be helpful to the game development process. Then, through the simple combination of data collected by interviews and

observation, and the literature review, she constructed a standard list of game heuristics for use by the game development community.

In another similar example, this time in the game area, Pinelle et al. (2008) introduced a new set of heuristics to help carry out usability inspections in both early and functional game prototypes. In their process, they developed these heuristics by analyzing PC game reviews from a popular gaming website, and the review set covered 108 different games and included 18 from each of 6 major game genres. Then, they also analyzed the reviews and identified twelve common classes of usability problems seen in games. As a result, they have developed ten usability heuristics based on the problem categories, and describe how common game usability problems can be avoided. A preliminary evaluation of the built heuristics suggests that they can help identify game-specific usability problems that can easily be overlooked otherwise.

Probably, this kind of approach, not using a validated specific method, happens because of the nature of the heuristics. As Reimer and Rieskamp (2007) explained, heuristics are a set of cognitive strategies.

But, it is important to consider that, in this work we are using a specific framework as a guideline, to better define, and organize, the set of heuristics we are building, as it is presented later in this research.

De Jong and Van Der Geest (2000) proposed a framework, in order to categorize web heuristics, that consists of four main categories: The first one deals with what kind of information is covered by the heuristics, that is, which aspects of Web site quality the heuristics focus on; the second one is about the validity of the heuristics, that is, what do we know about their background and justification; the third one concerns the presentation format, how the heuristics are presented to the web designer; and the fourth, and last category, deals with the definition of the way the created heuristics are going to be used in practice.

Here, we are presenting this framework considering it will be applied to aid the build of a set of ARM F2P mobile game heuristics. Then, we are adapting its usage,

from a framework to support digital products, to a framework that can support digital mobile games.

In the first category of the framework proposed by Jong and Van Der Geest (2000), called **Information Covered by The Heuristics**, they explained that a good way to start is asking what the set of heuristics is all about. Then, they listed two types of elements do be considered, that can aid in properly answering this question:

- **Specificity**: It is about what kind of Web sites and site characteristics the heuristics will be applied to. There are three ways to categorize heuristics, based on their specificity level:
    - Heuristics may be designed for **general** use, thus suggesting that they are a suitable tool for all kinds of Web sites and site characteristics;
    - Heuristics can be **genre-specific**, focusing on a particular type of Web sites, such as a digital store or a product information site;
    - Heuristics can be **feature-specific**, focusing on certain site characteristics such as navigation, icons, and layout, or even accessibility for people with disabilities.
- **Exhaustiveness**: After classifying the degree of specificity, it should be identified to what extent the heuristics can be expected to cover everything of interest. Heuristics may range from a wide selection of items, representing at least the most important aspects of the domain, to a more or less arbitrary selection of items. Then, to reduce the arbitrariness, two main ways were identified:
    - If the heuristics are based on **empirical** research, there may be a rationale in the underlying empirical data. For example, if a frequently found set of problems are identified, heuristics focused on resolving most of them could be created;
    - Another strategy is the use of a **systematic** approach. Heuristics can be designed to systematically cover every aspect of a website from a certain perspective. In the case of *genre-specific* heuristics,

they may be created based on a set of usage scenarios; in the case of *feature-specific* heuristics, overall concepts may be systematically broken down into a set of lower-level criteria.

De Jong and Van Der Geest (2000), detailing the second category of their framework for analyzing the characteristics of web heuristics, called **Validity of The Heuristics**, explain that the use of heuristics may look very impressive when they are presented to the practitioner. But designers should not select heuristics just based on the first impression. Four questions may help to judge the validity of some set of heuristics. That is, the extent to which they can be expected to contribute to the effective design, as presented below:

1. **Foundations**: This refers to the kind of support offered for the various heuristic items so that the heuristics can be distinguished on the basis of their foundations;
    a. **Standards-Based Heuristics**: These heuristics are based on official, agreed-on rules for Web design, and compliance with them may provide some specific certification. Standards-based heuristics are valid by definition, although agreed-on rules do not necessarily have a strong relationship to the usability and effectiveness of products. An example of this type of heuristic is the Web Content Accessibility Guidelines by W3C (1999), that encourage webmasters to mention the level of conformance to the standards;
    b. **Theory-Based Heuristics**: This category of heuristics comes from general, well-known, and accepted theories. Many of these theories might be adapted from other relevant areas, as human-computer interaction, text comprehension, rhetoric, or visual design. One of the few examples of theory-based heuristics is the Cognitive Engineering Principles by Gerhardt-Powals (1996), focusing on “cognitive friendly” user interfaces, that seem applicable to the World Wide Web;
    c. **Research-Based Heuristics**: These heuristics are based on specific research focused to test the usability and effectiveness of

digital products. Is it possible to understand it as the aggregated results of a series of usability tests — as Nielsen (1993) did for his 10 Usability Heuristics for User Interface Design — or the results of experimental research, comparing the effects of design variations. Evans (2000) explains the difficult process of translating the results of empirical research into a specific set of heuristics. Many of the Web design heuristics come from research with more or less similar communication products—for example, multimedia, hypertext, and user interfaces;

   d. **Practitioners' Heuristics**: These types of heuristics refer to guidelines that do not come from standards, theory, or research, but instead reflect the views and experiences of professional designers or the directions given in handbooks on Web design. So, this type of heuristics is totally based on the professional designers' experience;

2. **Novelty Value**: This is the way in which heuristics evoke and expand the design knowledge of the practitioner using them.
   a. **High**: Heuristics may have high novelty value, drawing attention to new and surprising insights on design. These appear to be more appropriate for experienced designers, who have internalized the basics of their practices;
   b. **Low**: On the other hand, heuristics also may have low novelty value, primarily giving an overview of the existing body of knowledge regarding design;
3. **Room for Interpretation**: It is to what extent the benefits of heuristics depend on the idiosyncratic intuitions, insights, and experiences of the individuals who use them. Considering this, heuristics can be mechanistic or expert-mediated;
   a. **Mechanistic**: Some heuristics are more or less mechanistic, and different users are most likely to have the same conclusions. Some of these heuristics can even be applied automatically;

   b. **Expert-mediated**: Many heuristics are expert-mediated, where they are meant to focus designers' attention on certain aspects, but they cannot guarantee at all that different professionals will come to the same conclusions about these aspects;
4. **Validation Research**: The validation studies should demonstrate the benefits of the use of heuristics for professional designers. The most convincing proof of benefit would be seen when a study demonstrates that a product designed with a set of heuristics is better than one designed without heuristics;
   a. **Available**: There is research that demonstrates, in some way, the effectiveness of the heuristic;
   b. **Unavailable**: There is no research that demonstrates, in some way, the effectiveness of the heuristic.

In the third category of the framework proposed by Jong and Van Der Geest (2000), called **Presentation Format of The Heuristics**, it explained their presentation format, at the level of both the whole set and the individual items. Then, it is explained that, talking about the presentation format, heuristics are presented in many different categories, defined by structure, formulation, type of answers, and level, as presented below:

- **Structure**: That is about the way that a set of heuristics are organized, either randomly or meaningfully;
  - **Randomly ordered**: The arbitrary selection may provide a set of heuristics that seem to be ordered randomly, making them difficult to understand;
  - **Meaningfully structured**: A meaningful structure should help a designer to view a product from an overall perspective and to identify not so obvious issues. Topics that are not exactly covered by one of the heuristic items can be detected all the same if the designer comprehends the specific intention of the set of heuristics. A meaningful structure is also important if practitioners are required to internalize the heuristics. Dividing heuristics into sections is a

fruitful way of creating a meaningful structure, that makes more sense to those who will use it;

- **Formulation of Items**: This is the way the heuristics are presented as a sentence structure;
    - **Instructions**: These are instructions that ask practitioners, or heuristic users, to do some specific action. For example: “Use color and highlighting sparingly”;
    - **Questions**: These are questions that should help practitioners, or heuristic users, to identify specific issues. For example: “Is the contrast between the background and the foreground high?”;
    - **Requirements**: These are requirements that advise or guide, practitioners, or heuristic users. For example: “The system should always keep users informed about what is going on, through appropriate feedback within a reasonable time”.
- **Types of Answers**: These are the possible ways to answer heuristics that are presented as questions;
    - **Open**: These are heuristics that can be answered as in an open question. For example: “Who are the important users?”;
    - **Closed**: Closed items are often worded in a “yes / no / n/a” format and laid out as a checklist. For example: “Are multimedia, animation and graphics used only when necessary?”;
- **Level of Heuristics**: This element deals with the level of detail, and applicability, that a heuristic presents itself with to the practitioner or user;
    - **High-level**: These heuristics, which have wide applicability, present designers with a problem area, for which they must find a solution. For example: “Make sure the graphic used, and accompanying text matches the kinds of activities you want viewers to do with them” (DETWEILER, OMANSON, 1996);
    - **Low-level**: Low-level heuristics present designers with specific design guidelines rather than with the problems they are intended

to solve. For example: “Use short sentences” (HACKOS, STEVEN, 1997).

De Jong and Van Der Geest (2000), explaining the fourth category of their framework for analyzing the characteristics of web heuristics, called **Use of The Heuristics**, detailing that it is about the way heuristics are used or are meant to be used. The usability of heuristics is a very important factor that should have a considerable influence on the way heuristics are designed and presented. Successful use of heuristics can be properly verified only if they are applied to real use situations. Below, the subcategories and elements related to this category are presented:

- **Phase in The Design Process**: The first issue of the context of use is the phase in the design process in which the heuristics are meant to be employed;
    - **Planning-oriented**: These are heuristics that are used to generate global or specific requirements during the actual design and production of a solution. Planning-oriented heuristics should facilitate designers in switching between two activities that are hard to combine: consulting the heuristics and actually building the solution;
    - **Evaluation-oriented**: These are heuristics for evaluating and improving a draft or an existing solution. Evaluation-oriented heuristics can be used for assessing and improving the quality of the product, from early designs and paper prototypes to products that are already done. These heuristics may be more elaborate, and may even take the form of a long checklist;
- **Focus of Support**: This subcategory is about the target of the heuristic’s focus: *process-oriented* or *product-oriented*;
    - **Process-oriented**: These heuristics combine a number of process recommendations, concerning the planning phase, the testing, and the maintenance of a product. Especially in the case of planning-oriented heuristics, process guidelines may be a fruitful way to support designers;

    - **Product-oriented**: these heuristics contained characteristics of effective and user-friendly solutions;
- **Function in The Design Process**: This category is about the way a heuristic acts, as part of the design process;
    - **Troubleshooting**: They are meant to support the detection and diagnosis of problem areas in a product or solution;
    - **Verifying**: These heuristics may be used to certify whether products or product characteristics accomplish an explicit or implicit criterion;
    - **Idea-generating**: Heuristics may also have an idea-generating function. In addition to aiding designers identify the problems users may have, the heuristics can also present designers with possible design options and solutions they were not aware of.
- **Assumptions About Actual Use**: This subcategory is about how the coverage and application of the heuristic can be reinforced on the product, through an internal or external representation;
    - **Internal representation**: Some heuristics may be designed for internal representation: They need to be internalized by the designer before application. The number of heuristic items must be small, in order to be remembered, or, if larger, the heuristics must be well structured;
    - **External representation**: Given the number of different items contained in them, most heuristics seem to be designed for external representation: They may be used as a checklist during the evaluation activities. In large checklists, applying all the heuristic items to the entire contents of a product seems almost unfeasible. In this case, each item requires an evaluator to check the entire system. The complexity of such evaluation tasks, moving through an entire product and moving through an entire checklist, can be expected to have a negative effect on the usability of heuristics in practice.

A schematic overview of the presented framework for analyzing the characteristics of web heuristics, proposed by De Jong and Van Der Geest (2000), is displayed in figure 8.

| | |
|---|---|
| **Information covered by the heuristics** | |
| **Specificity** | General<br>Genre-specific<br>Feature-specific |
| **Exhaustiveness** | Exhaustive ↔ Arbitrary |
| **Validity of the heuristics** | |
| **Foundations** | Standards<br>Theory<br>Research<br>Practitioners |
| **Novelty value** | High ↔ Low |
| **Room for interpretation** | Mechanistic ↔ Expert-mediated |
| **Validation research** | Available ↔ Unavailable |
| **Presentation format of the heuristics** | |
| **Structure** | Randomly ordered ↔ Meaningfully structured |
| **Formulation of items** | Instructions<br>Questions<br>Requirements |
| **Type of answers** | Open ↔ Closed |
| **Level of items** | High-level<br>Low-level |
| **Use of the heuristics** | |
| **Phase in the design process** | Planning-oriented<br>Evaluation-oriented |
| **Focus of support** | Process-oriented<br>Product-oriented |
| **Function in the design process** | Troubleshooting<br>Verifying<br>Idea-generating |
| **Assumptions about actual use** | Internal representation<br>External representation |

Figure 8. Framework for analyzing the characteristics of web heuristics (DE JONG, VAN DER GEEST, 2000)

Therefore, the presented framework has been used to aid the build and organization of our set of heuristics for ARM F2P mobile game design. Even though this framework was originally used to cover web heuristics, it can also cover ARM heuristics for F2P mobile games, if the concepts are abstracted.

## 3.3 STATE OF THE ART

There are some works related to heuristics focused on the game design area and, in this section, we are covering some of them.

Schaffers (2008) details that just recently heuristic evaluation was brought to digital games area. They explain that heuristics designed for non-game interfaces (as web, apps, or systems) may be not so efficient, because the experience-oriented nature of games changes some of what usability looks for, as compared to task-oriented interfaces. They also conclude that usability heuristics, created specifically to focus on the game area, should be more efficient in finding usability problems. In a similar way, Korhonen and Koivisto (2006, p.9), say that “When evaluating games, traditional usability heuristics lack comprehension and cannot be directly applied”.

As explained before, Pinelle et al. (2008) have introduced a set of heuristics focused on help identify usability problems in early and functional game prototypes. As a result of that work, they have developed ten usability heuristics that can help identify game-specific usability problems. The set of the 10 proposed heuristics is presented below:

1. **Provide consistent responses to the user’s actions**: Games should respond to users’ actions in a predictable way;
2. **Allow users to customize video and audio settings, difficulty and game speed**: The system should allow players to customize a range of settings so that the game accommodates their individual needs;
3. **Provide predictable and reasonable behavior for computer-controlled units**: Computer controlled units should behave in a predictable way, and users should not be forced to perform extra commands to correct faulty artificial intelligence;
4. **Provide unobstructed views that are appropriate for the user’s current actions**: The game should provide views that allow the user to have a clear, unobstructed view of the area, and of all visual information that is related to the location;

5. **Allow users to skip non-playable and frequently repeated content**: Games should allow users to skip non-playable content so that it does not interfere with gameplay;
6. **Provide intuitive and customizable input mappings**: Games should allow users to remap the input settings, should support standard input devices, and should provide shortcuts for expert players;
7. **Provide controls that are easy to manage, and that have an appropriate level of sensitivity and responsiveness**: The game should respond to input in a way that mirrors the real world and should respond to controls in a timeframe that is suitable for gameplay requirements;
8. **Provide users with information on game status**: Users should be provided with enough information, to allow them to make proper decisions while playing the game;
9. **Provide instructions, training, and help**: Users should have access to the complete documentation on the game, including how to interpret visual representations and how to interact with game elements. Furthermore, in some cases, users should be provided with interactive training to guide them through the basics;
10. **Provide visual representations that are easy to interpret and that minimize the need for micromanagement**: Visual representations should be designed in a way that they are easy to understand so that they minimize clutter and occlusion, and so that users can differentiate important elements from irrelevant ones. Furthermore, representations should be designed to minimize the need for micromanagement, where users are forced to interactively search through the representation to find what they need.

It is important to say that there are even more specific researches about the use of heuristics in the game area, considering aspects more related to the game design, such as gameplay and mechanics, and not just limited to the usability field. Schaffer (2008), presents a comparison of various lists of heuristics, that comes from research on applying heuristics to games. In this comparison, the author provides a description, and the room for improvement for each set presented. These sets of heuristics

(presented in table 1) cover aspects like usability, mechanics, gameplay, interface, story, mobility and general.

| **Heuristics** | **Description** | **Room of Improvement** |
|---|---|---|
| Sauli Laitinen's application of Nielsen's original heuristics | Used Nielsen's 10 heuristics<br>Found more problems than evaluation with no heuristics | Not tailored specifically to games<br>Could have more specificity |
| Melissa Federoff | 40 heuristics<br>3 categories: Game interface, Game mechanics, and game play<br>First set of heuristics for games<br>Very useful and appropriate for games | Could have more specificity<br>Sometimes hard to judge until postmortem |
| Heuristic Evaluation for Playability (HEP) b Desurvire, Caplan and Toth | 43 heuristics<br>4 categories: Game Play, Game Story, Mechanics, And Usability<br>Building on and improving Federoff's heuristics | Could have more specificity<br>Sometimes hard to judge until postmortem |
| Nokia's heuristics by Korhonen and Koivisto | 29 heuristics<br>3 categories: game usability, mobility, game play | Could have more specificity |
| Schaffer's heuristics white paper | 29 heuristics<br>3 categories: General, graphical user interface, and gameplay<br>Greater specificity<br>Examples to help understanding | Fairly rough and incomplete<br>Some heuristics don't apply to some games |

Table 1. Heuristics from Research on Applying Heuristics to Games (SCHAFFER, 2008)

As detailed below, we presented all these sets of heuristics (covered by Table 1), and others we have researched and considered important to this study.

Laitinen (2006) did a research study whether usability expert evaluation and testing, using Nielsen's heuristics, are suitable for game development. In this study, a game under development was first evaluated and then tested. Then, game developers were asked to rate the findings and give other feedback about the methods used and the results obtained. It was found that the usability expert evaluation and testing have provided both novel and useful data for the game development area. Based on these

and the other results it was argued that the usability expert evaluation and testing have considerable validity addressing the game development.

In a more expanded way to organize heuristics for games, Korhonen and Koivisto (2006) introduce a set of playability heuristics specifically designed for evaluating mobile games at Nokia. They explain that this set forms a model able to be used in any mobile game evaluation and consists of three modules:

- **Game Usability**: The game usability heuristics cover aspects related to the game controls and interface through which the player interacts with the game. As a general rule, the game interface should allow the player to control the game easily and display all necessary information about the game status and possible actions, making the set of actions accessible;
- **Mobility**: The mobility heuristics cover aspects that affect the mobility of the game. Since mobile devices let the players choose where and when games are played, the game design should assimilate this freedom into the game experience;
- **Gameplay**: Gameplay heuristics are valid regardless of the platform on which the game is played, and cover aspects related to the interaction of the player with the game mechanics and other players. In this model, the authors also consider the game story as part of the gameplay model. When evaluating gameplay, it is recommended that evaluators have at least some game design expertise. They should also understand the design goals and know the target players.

The model proposed by Korhonen and Koivisto (2006) is graphically represented in figure 9. The heuristics for evaluating game usability, mobility, and gameplay are presented in tables 2, 3, and 4, respectively.

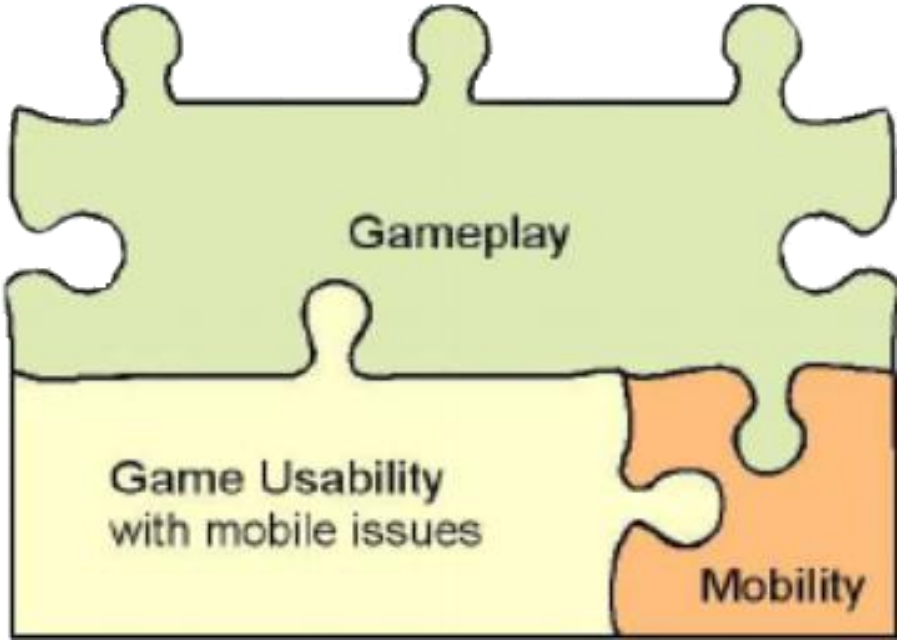


Figure 9. Modules in the Core Playability Model (KORHONEN, KOIVISTO, 2006)

| No. | Game Usability Heuristics |
|---|---|
| GU1 | Audio-visual representation supports the game |
| GU2 | Screen Layout is efficient and visually pleasing |
| GU3 | Device UI and game UI are used for their own purposes |
| GU4 | Indicators are visible |
| GU5 | The player understands the terminology |
| GU6 | Navigation is consistent, logical, and minimalist |
| GU7 | Control keys are consistent and follow standard conventions |
| GU8 | Game controls are convenient and flexible |
| GU9 | The game gives feedback on the player's actions |
| GU10 | The player cannot make irreversible errors |
| GU11 | The player does not have to memorize things unnecessarily |
| GU12 | The game contains help |

Table 2. Heuristics for evaluating game usability (KORHONEN, KOIVISTO, 2006, p.13)

| No. | Mobility Heuristics |
|---|---|
| MO1 | The game and play sessions can be started quickly |
| MO2 | The game accommodates with the surroundings |
| MO3 | Interruptions are handled reasonably |

Table 3. Heuristics for evaluating game mobility (KORHONEN, KOIVISTO, 2006, p.14)

| No. | Gameplay Heuristics |
|---|---|
| GP1 | The game provides clear goals or supports player-created goals |
| GP2 | The player sees the progress in the game and can compare the results |
| GP3 | The players are rewarded, and rewards are meaningful |
| GP4 | The player is in control |
| GP5 | Challenge, strategy, and pace are in balance |
| GP6 | The first-time experience is encouraging |
| GP7 | The game story supports the gameplay and is meaningful |
| GP8 | There are no repetitive or boring tasks |
| GP9 | The players can express themselves |
| GP10 | The game supports different playing styles |
| GP11 | The game does not stagnate |
| GP12 | The game is consistent |
| GP13 | The game uses orthogonal unit differentiation[5] |
| GP14 | The player does not lose any hard-won possessions |

Table 4. Heuristics for evaluating game gameplay (KORHONEN, KOIVISTO, 2006, p.14)

In new research related to what was proposed by Korhonen and Koivisto (2006), Korhonen (2016) addresses game design issues with an analytical inspection method

[5] Units in the game should be designed in a way that that they are functionally different (KORHONEN, KOIVISTO, 2006)

called expert review, and its use on the playability evaluations of a game. Also, in this work, new playability heuristics are defined that could be used with the expert review method to evaluate video games during the design and implementation phases of a game development project. These heuristics create new sets or new heuristics, to be added to the previous group of sets defined by Korhonen and Koivisto (2006).

Then, Korhonen (2016) adds four more mobility heuristics, as displayed in table 5.

| **No.** | **Mobility Heuristics** |
|---|---|
| MO4 | The graphical design is accommodated to current brightness |
| MO5 | The player should be aware of some device features while playing |
| MO6 | Mobile devices have their own conventions for input |
| MO7 | The tutorial should respond to immediate demand |

Table 5. Additional heuristics for evaluating game mobility (KORHONEN, 2016)

In addition, Korhonen (2016) presents two brand new sets of heuristics:

- **Context Aware**: It is a list of heuristics that could be used to evaluate context-aware games. Thus, these are factors that affect the playability of pervasive mobile games. These heuristics are presented in table 6;
- **Multi-Player**: These heuristics are focused on the social activity and the community-building mechanisms that are common in multi-player games. The heuristics are presented in table 7.

| **No.** | **Context Aware Heuristics** |
|---|---|
| CA1 | Perception of the current context |
| CA2 | Players should have an equal chance to play |
| CA3 | Adjustable play sessions |

| | |
|---|---|
| CA4 | Communication outside the game world |

Table 6. Heuristics for evaluating context aware aspects (KORHONEN, 2016)

| **No.** | **Multi-Player Heuristics** |
|---|---|
| MP1 | The game supports communication |
| MP2 | There are reasons to communicate |
| MP3 | The game supports groups and communities |
| MP4 | The game helps the player to find other players and game instances |
| MP5 | The game provides information about other players |
| MP6 | The design overcomes the lack of players and enables soloing |
| MP7 | The design minimizes deviant behavior |
| MP8 | The design hides the effects of the network |
| MP9 | Players should play with comparable players |

Table 7. Heuristics for evaluating multi-player aspects (KORHONEN, 2016)

The author explained that there are some heuristics that supplement other ones. Figure 10 displays the relationships between different heuristics, that are in different modules (KORHONEN, 2016).

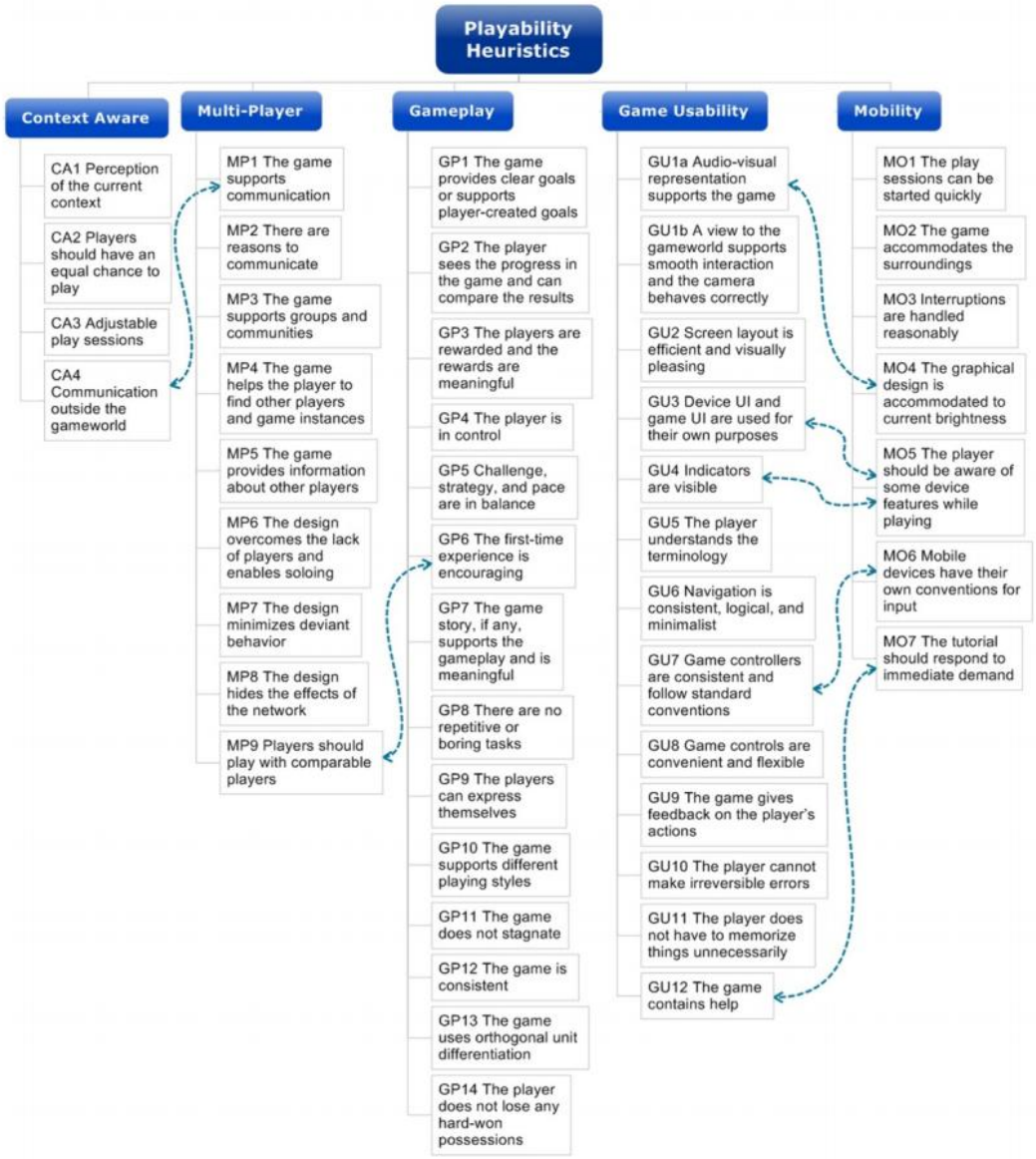


Figure 10. Playability heuristic set and relationships of individual heuristics between modules (KORHONEN, 2016, p.68)

This last study of Korhonen presents significant aspects related to multiplayer, mobility and pervasive elements, which helps his proposed playability heuristic set be updated with current trends.

As we explained before, Federoff (2002) has built a set of heuristics and usability guidelines for the creation and evaluation of fun in video games. A compiled standard list of heuristics, covering game interface, game mechanics and gameplay aspects, was the result of that study, and is presented in table 8.

| | |
|---|---|
| Game Interface | Controls should be customizable and default to industry standard settings |
| Game Interface | Controls should be intuitive and mapped in a natural way |
| Game Interface | Minimize control options |
| Game Interface | The interface should be as non- intrusive as possible |
| Game Interface | For PC games, consider hiding the main computer interface during game play |
| Game Interface | A player should always be able to identify their score/status in the game |
| Game Interface | Follow the trends set by the gaming community to shorten the learning curve |
| Game Interface | Interfaces should be consistent in control, color, typography, and dialog design |
| Game Interface | Minimize the menu layers of an interface |
| Game Interface | Use sound to provide meaningful feedback |
| Game Interface | Do not expect the user to read a manual |
| Game Interface | Provide means for error prevention and recovery through the use of warning messages |
| Game Interface | Players should be able to save games in different states |
| Game Interface and Play | Art should speak to its function |
| Game Mechanics | Mechanics should feel natural and have correct weight and momentum |
| Game Mechanics | Feedback should be given immediately to display user control |
| Game Mechanics and Play | Get the player involved quickly and easily |
| Gameplay | There should be a clear overriding goal of the game presented early |
| Gameplay | There should be variable difficulty level |
| Gameplay | There should be multiple goals on each level |
| Gameplay | A good game should be easy to learn but hard to master |
| Gameplay | The game should have an unexpected outcome |
| Gameplay | Artificial intelligence should be reasonable yet unpredictable |
| Gameplay | Game play should be balanced so that there is no definite way to win |
| Gameplay | Play should be fair |

| | |
|---|---|
| Gameplay | The game should give hints, but not too many |
| Gameplay | The game should give rewards |
| Gameplay | Pace the game to apply pressure to, but not frustrate the player |
| Gameplay | Provide an interesting and absorbing tutorial |
| Gameplay | Allow players to build content |
| Gameplay | Make the game replayable |
| Gameplay | Create a great storyline |
| Gameplay | There must not be any single optimal winning strategy |
| Gameplay | Should use visual and audio effects to arouse interest |
| Gameplay | Include a lot of interactive props for the player to interact with |
| Gameplay | Teach skills early that you expect the players to use later |
| Gameplay | Design for multiple paths through the game |
| Gameplay | One reward of playing should be the acquisition of skill |
| Gameplay | Build as though the world is going on whether your character |
| Gameplay | If the game cannot be modeless, it should feel modeless to the player |

Table 8. Compiled list of game heuristics (FEDEROFF, 2002, p.41)

Desurvire, Caplan, and Toth (2004) have presented a research study where they introduced the Heuristic Evaluation for Playability (HEP), a comprehensive set of heuristics for playability, based on the literature, and playtesting heuristics, that were specifically created to evaluate video, computer, and board games. The authors explain that this set of heuristics was tested on a new game at the beginning of the development design cycle to assess their validity and evaluation effectiveness compared to more standard user testing methodologies. They conclude that HEP has identified qualitative similarities and differences with user testing and that HEP is the best option for evaluating general issues in the early development phases through a prototype or mock-up. Combined with user studies, HEP is presented as a new method for the Human-Computer Interaction game community, focused on providing more usable and playable games.

Then, as presented in table 9, Desurvire, Caplan, and Toth (2004) introduce their set of heuristics for evaluating playability, divided into four categories: Game Play; Game Story; Mechanics; Usability.

| **No.** | **Heuristic and Description** |
|---|---|
| Game Play - 1 | Player's fatigue is minimized by varying activities and pacing during game play. |
| Game Play - 2 | Provide consistency between the game elements and the overarching setting and story to suspend disbelief. |
| Game Play - 3 | Provide clear goals, present overriding goal early as well as short-term goals throughout play. |
| Game Play - 4 | There is an interesting and absorbing tutorial that mimics game play. |
| Game Play - 5 | The game is enjoyable to replay. |
| Game Play - 6 | Game play should be balanced with multiple ways to win. |
| Game Play - 7 | Player is taught skills early that you expect the players to use later, or right before the new skill is needed. |
| Game Play - 8 | Players discover the story as part of game play. |
| Game Play - 9 | Even if the game cannot be modeless, it should be perceived as modeless. |
| Game Play - 10 | The game is fun for the Player first, the designer second and the computer third. That is, if the non-expert player's experience isn't put first, excellent game mechanics and graphics programming triumphs are meaningless. |
| Game Play - 11 | Player should not experience being penalized repetitively for the same failure. |
| Game Play - 12 | Player's should perceive a sense of control and impact onto the game world. The game world reacts to the player and remembers their passage through it. Changes the player makes in the game world are persistent and noticeable if they back-track to where they've been before. |
| Game Play - 13 | The first player action is painfully obvious and should result in immediate positive feedback. |
| Game Play - 14 | The game should give rewards that immerse the player more deeply in the game by increasing their capabilities (power-up), and expanding their ability to customize. |
| Game Play - 15 | Pace the game to apply pressure but not frustrate the player. Vary the difficulty level so that the player has greater challenge as they develop mastery. Easy to learn, hard to master. |
| Game Play - 16 | Challenges are positive game experiences, rather than a negative experience (results in their wanting to play more, rather than quitting). |
| Game Story - 1 | Player understands the story line as a single consistent vision. |

| | |
|---|---|
| Game Story - 2 | Player is interested in the story line. The story experience relates to their real life and grabs their interest. |
| Game Story - 3 | The Player spends time thinking about possible story outcomes. |
| Game Story - 4 | The Player feels as though the world is going on whether their character is there or not. |
| Game Story - 5 | The Player has a sense of control over their character and is able to use tactics and strategies. |
| Game Story - 6 | Player experiences fairness of outcomes. |
| Game Story - 7 | The game transports the player into a level of personal involvement emotionally (e.g., scare, threat, thrill, reward, punishment) and viscerally (e.g., sounds of environment). |
| Game Story - 8 | Player is interested in the characters because (1) they are like me; (2) they are interesting to me, (3) the characters develop as action occurs. |
| Mechanics - 1 | Game should react in a consistent, challenging, and exciting way to the player's actions (e.g., appropriate music with the action). |
| Mechanics - 2 | Make effects of the Artificial Intelligence (AI) clearly visible to the player by ensuring they are consistent with the player's reasonable expectations of the AI actor. |
| Mechanics - 3 | A player should always be able to identify their score/status and goal in the game. |
| Mechanics - 4 | Mechanics/controller actions have consistently mapped and learnable responses. |
| Mechanics - 5 | Shorten the learning curve by following the trends set by the gaming industry to meet user's expectations. |
| Mechanics - 6 | Controls should be intuitive and mapped in a natural way; they should be customizable and default to industry standard settings. |
| Mechanics - 7 | Player should be given controls that are basic enough to learn quickly yet expandable for advanced options. |
| Usability - 1 | Provide immediate feedback for user actions. |
| Usability - 2 | The Player can easily turn the game off and on, and be able to save games in different states. |
| Usability - 3 | The Player experiences the user interface as consistent (in control, color, typography, and dialog design) but the game play is varied. |
| Usability - 4 | The Player should experience the menu as a part of the game. |
| Usability - 5 | Upon initially turning the game on the Player has enough information to get started to play. |
| Usability - 6 | Players should be given context sensitive help while playing so that they do not get stuck or have to rely on a manual. |
| Usability - 7 | Sounds from the game provide meaningful feedback or stir a particular emotion. |

| | |
|---|---|
| Usability - 8 | Players do not need to use a manual to play game. |
| Usability - 9 | The interface should be as non-intrusive to the Player as possible. |
| Usability - 10 | Make the menu layers well-organized and minimalist to the extent the menu options are intuitive. |
| Usability - 11 | Get the player involved quickly and easily with tutorials and/or progressive or adjustable difficulty levels. |
| Usability - 12 | Art should be recognizable to player and speak to its function. |

Table 9. Heuristics for Evaluating Playability (DESURVIRE, CAPLAN, TOTH, 2004, p. 3)

As the last set of heuristics covered by Schaffer (2008) in his table of heuristics from Research on Applying Heuristics to Games, Schaffer (2007), in a technical report, presents a set of heuristics in the form of a white paper. The author explains that, during an internship at Mobile2Win in Mumbai, India, he developed both a protocol for usability testing and a set of usability heuristics. Then, he presented the heuristics in a format that, he has defended, is relatively easy for game designers to implement. This set is followed by, at least, one example for each heuristic, in order to make them clear and understandable.

Then, Schaffer (2008) presents a set of 29 heuristics, divided into 3 categories:

- **General**: It is about making the game more intuitive for the player. This includes controls, Heads-Up Displays (HUDs), path finding, and goals;
- **Graphical user interface**: It is about the persistent displays on the screen, such as life points, score, level and ammunition;
- **Gameplay**: Divided into three subcategories: General; Control Mapping; Level Design.

The heuristics proposed by Schaffer (2007), as well the way they are organized into categories (and subcategories), are presented in table 10.

| **Category** | **Heuristic** |
|---|---|
| General | Minimize flashing |
| General | Avoid large blocks of text |

| | |
|---|---|
| General | Don’t rely on players’ memory: Don’t use abbreviations or acronyms. |
| General | Don’t rely on players’ memory: Don’t require the player to count resources like bullets and life. |
| General | Don’t rely on players’ memory: Players shouldn’t have to memorize the level design (but it’s arguable there are exceptions) |
| Graphical User Interface | All relevant information should be displayed, such as life points, lives, and ammunition |
| Graphical User Interface | Don’t display irrelevant information |
| Graphical User Interface | Critical information should stand out |
| Graphical User Interface | Don’t bury frequently used information |
| Graphical User Interface | Menu item names should be intuitive and obvious |
| Graphical User Interface | The player should know where they are on the mini-map, if there is one |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify Goals |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify failure conditions (How they lose) |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify game elements like the Avatar |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify game elements like the Enemies |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify game elements like the Obstacles |
| Gameplay -> General | It should be clear what’s happening in the game. Players should understand and be able to identify game elements like the Power Ups |
| Gameplay -> General | Give players the feeling they can make a few mistakes by giving some room for error |
| Gameplay -> General | Players should feel in control, so they need the time and information to respond to threats and opportunities. That is, players should see enemies, obstacles, and power-ups coming |
| Gameplay -> Control Mapping | Use natural mappings. Control mapping should be intuitive enough that new players don’t have to read the instructions. If the game has relatively complicated controls, new players should be able to play after reading the instructions only once |
| Gameplay -> Control Mapping | If industry standards exist for the controls on the type of game you’re working on, adhere to them. For example, if most fighting games use the back button to block, then you should do the same thing. |

| | |
|---|---|
| | If possible, users should be able to play mobile games with one hand |
| Gameplay -> Control Mapping | Make it hard to accidentally hit the wrong button. The more trouble hitting the wrong button causes, the farther that button should be from the normal game controls |
| Gameplay -> Level Design | Don't make it easy for players to get stuck or lost. The goal of the game and the next step towards that goal should always be clear. There should be a sense of progress towards that goal, so players never feel lost or like they're going around in circles |
| Gameplay -> Level Design | Things the player needs to see (enemies, enemy fire, power ups, etc.) should stand out. So everything the player needs to see needs to be big enough to be perceived. Remember that some players don't have perfect eyesight |
| Gameplay -> Level Design | Things the player needs to see (enemies, enemy fire, power ups, etc.) should stand out. To make things stand out, use contrast with the background: Texture, Color, Brightness (light/dark). Remember that some players will be color blind, so red and green will be seen as the same for some players |
| Gameplay -> Level Design | Objects in the game should look like they'll do what they do. This idea is called Affordance |
| Gameplay -> Level Design | The player shouldn't easily misinterpret things as power ups, enemies, or obstacles |
| Gameplay -> Level Design | If there are tasks which you expect to be challenging, don't require players to complete them more than once. That is, make sure that if they die soon after completing a hard task that they don't have to complete the hard task again |

Table 10. Schaffer's heuristics white paper (SCHAFFER, 2007)

In the original source, as explained before, these heuristics are explained in more detail, followed by some images of a game that depict the specific heuristic (SCHAFFER, 2007). An example of the way one of these heuristics are presented in the source is displayed in figure 11.

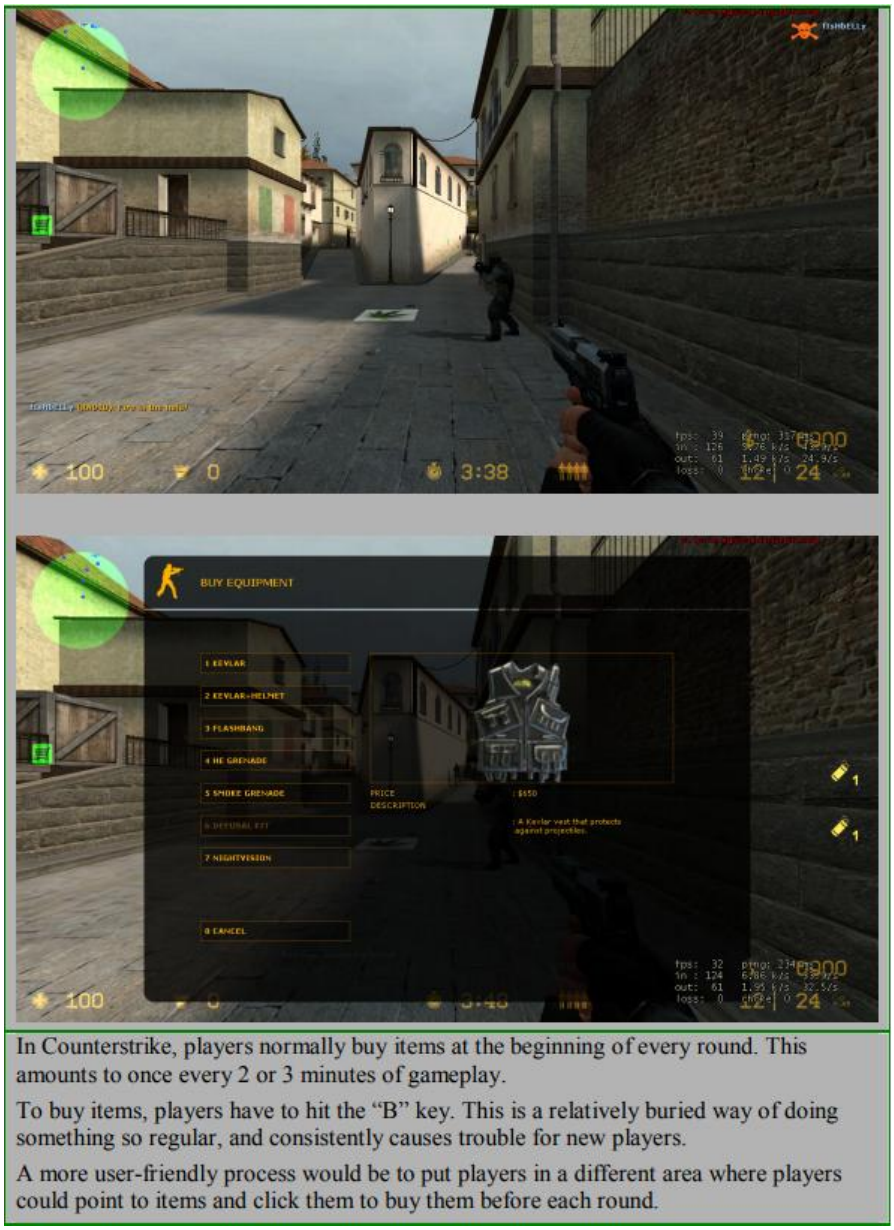


Figure 11. Presentation of “Don’t bury frequently used information” heuristic (SCHAFFER, 2007)

In addition to what was covered by Schaffer (2008), and the set of heuristics proposed by Pinelle et al. (2008), there are other sets of heuristics, or studies about heuristics, addressed to aid the game design area.

For example, using the HEP, sets of heuristics proposed by Desurvire, Caplan, and Toth (2004), Röcker and Haar (2006) have developed a research where they investigate whether these heuristics can be used by pervasive game developers, or if

specific design guidelines for smart home environments are required. Then, they conclude that design guidelines for pervasive gaming applications should be extended with a specific heuristic, addressing this topic. Therefore, the authors suggested complementing the HEP with a heuristic like, “pervasive gaming application should support a direct interaction between human players and use game elements which require direct interaction between players”.

In another approach, this time focusing on assembling solutions that come from many sources, Koeffel et al. (2010), proposed a framework, based on three sets of heuristics, in order to evaluate the overall user experience of video games and advanced interaction games. These sets of heuristics are: Game Play / Game Story; Virtual Interface; Tabletop Specific. According to the authors, the mix of heuristics to represent the categories of Gameplay / Game Story and Virtual Interface, is a combination, methodologically chosen, of the heuristics proposed by Schaffer (2007), Desurvire et al. (2004), Pinelle et al. (2008), Federoff (2002), Korhonen and Koivisto (2006), and Röcker and Haar (2006). Furthermore, the authors have developed a set of specific heuristics to address tabletop games, as presented in table 11.

| No. | Heuristic |
|---|---|
| 1 | **Cognitive Workload**: The cognitive workload which is not connected to the game play, should be minimized. |
| 2 | **Challenge**: The system should be designed in a way that the challenge satisfies the preconditions of a tabletop setup and the target group. |
| 3 | **Reach**: The reach of the players should be adapted to the requirements of the game play |
| 4 | **Examinability**: The players should not be hindered to examine the area required by the game play |
| 5 | **Adaptability**: The system should be adaptable to the player in terms of the setup |
| 6 | **Interaction**: The interaction method should satisfy the expectations of the player and follow the game logic |
| 7 | **Level of Automation**: The player should be able to execute all actions relevant to the game by herself |
| 8 | **Collaboration and Communication**: The interpersonal communication and collaboration should be supported by the entirety of the game |

| | |
|---|---|
| 9 | **Feedback**: Feedback and feedthrough should be adapted to the possibilities of tabletop games, used adequately and be provided to the players when appropriate |
| 10 | **Comfort of the Physical Setup**: The construction of the setup should be comfortable to use and not require the player to take an awkward position |

Table 11. Device-specific heuristics for tabletop games (KOEFFEL et al. 2010)

Considering touch screens on mobile devices, Ulger (2013) presents a study that aims to be an extension of the heuristics proposed by Korhonen and Koivisto (2006), focused on playability for touchscreen devices. He defends that existing mobile game heuristics are developed for old generation devices, which has mostly keypad instead of touchscreen technology. The new generation mobile games are developed for devices like *iPad*, *Android* tablets and *smartphones*, which have touchscreens. Thus, new requirements have emerged for mobile games playability.

Then, Ulger (2013) in his thesis focused on presenting new heuristics to game developers to enlighten their way through developing a good mobile touch screen game. To develop these heuristics, he reviewed the previous research on mobile game playability and developments in touchscreen display, and he discussed existing mobile game playability heuristics. As a result of that work, the author has proposed four new heuristic rules:

- **Impartial Distribution of Game Items for Left-Handed and Right-Handed Players**: For both left-handed and right-handed people, game items should be distributed symmetrically/homogenized on the device screen if the gameplay mechanics allows. Alternatively, it should have a setting property for left-handed and right-handed people;
- **Usage of the Mostly Edge Part of the Screen for Two Handed Larger Screens**: The game items and control mechanism items should be placed mostly near the edges of the screen if the gameplay forces the player to hold the device with two hands; prevent the game from putting game items and control mechanisms somewhere else. This heuristic is more applicable for tablet devices like iPad, Android tablets, etc.;

- **Usage of Tilt Property**: Tilt property is used commonly among the mobile games. However, this property can damage the playability of the game. Being forced by the game to move the device and screen which the player is looking at disturbs the player, causes frustration, and ruins the balance of the game;
- **Tactile Feedback Effect:** Tactile feedback; in other words, haptic feedback is not preferable when using an application. However, when playing a mobile game feedback stimulates the player and affects playability positively.

## 3.4 ARM GUIDELINES FOR F2P MOBILE GAMES

In this section we are reviewing and selecting some guidelines, best practices, and even tips, indicated by professionals and researchers related to this subject to be used in the creation of the set of heuristics for ARM design on F2P mobile games proposed in this work. This final selected collection will be transformed into a set of specific and organized heuristics.

The next subsections will cover the researched guidelines for ARM F2P Mobile Game, considering Version 1.0 of The ARM Framework for F2P Mobile Games, presented in figure 18.

### 3.4.1 Acquisition Guidelines

This subsection is presenting some guidelines, hints and best practices, related to acquisition methods in F2P Mobile Games.

As explained before, the use of *Invitation Mechanics*, that reward players for every invited person that installs the game, can work as an incentive for users to invite their friends, increasing the virality. As well, the use of *Timeline Social Features Sharing* elements can also increase user *retention* and growth.

As another tip related to acquisition mechanics, Williams (2012, p.1) says "*Word-of-mouth* is a huge organic driver of installs for mobile devs right now, so focus on gameplay, and reap the benefits". Therefore, this guideline means that if the developer focuses on providing an engaging game that brings a good experience, it should make more players tell their friends about it, as explained before, in this work.

Luton (2013), talking about *Cross-promotions*, explains that it may seem counterintuitive to send a player to a rival, but it is a good deal to keep players in a closed network that shares its players, because churned players may return to the game or another of your titles in the future.

Talking about *IP Based* Chen (2017) analyses that, creating games based on IP is one of the most well-tested ways to ensure an effective launch and long-term success. The built-in fan-base makes it easy to reach a certain number of downloads, and over time the benefits of achieving those initial downloads can become immeasurable.

### 3.4.2 Retention Guidelines

This subsection is presenting some guidelines, hints and best practices, related to retention methods in F2P Mobile Games.

Talking about *Location Triggers*, Luton (2013, 48) explains that, the opportunity to "winning a spot from a rival or collecting a rare in-game resource may cause players to return to a game when they are at work, school, home, or riding a bus" and "the claiming or tagging of real spots provides a sense of territorialism that acts in a similar manner to competitive triggers". Furthermore, talking about the same subject, Luton (2013) says that an emotional link and a strong sense of territory can be created by contextualized location data being associated with nearby shops, landmarks, public spaces, and streets.

Askelöf (2013) says that hidden *Achievements* are badges acquired by meeting unknown conditions, so this reward comes as a good surprise to the player. The author

also explains that the opposite, predictable achievements, are badges whose conditions are made clear to the player beforehand. This provides goals for players and inspires them to explore parts of the game which they otherwise would not have bothered with.

Furthermore, as explained before, the *Sharing of Achievements* can allow players to have competitive and exposure interactions.

Luton (2013), this time talking about *Limited-Time Events*, says that there is a need to balance between how regularly these events can happen: If they happen very often they lose their value, whereas big gaps between each event signifies lost opportunities.

As explained before, the *Help Request Mechanics* system can encourage players to bring new players in and existing players back to the game. In a similar way, *Gifting Mechanics* can encourage players to join or come back to the game to return the favor, as well the reciprocity relationship strengthens the social ties between the players, reminds them to keep playing.

Another important subject related to retention in mobile games is the *Tutorial*. To keep players playing a game, a good practice is to avoid lengthy tutorials, and instead, present new game mechanics through a progressive and intuitive learning process (SIMPLE USABILITY, 2012).

*Come Back Message*, or *Push Notification*, consists of a direct contact with players, in order to remind them to come back to the game, what is seen as one of the weakest return triggers. Although it is a last weak attempt to retain a player who has missed or was not affected by other return triggers, they are worthwhile despite their low success rate (LUTON, 2013).

Another mechanism to incentivize players to keep playing the game is the *Reward for Return*. An interesting approach using this technique is, as explained before, not just rewarding players that return, but giving players that keep returning with some frequency progressively better rewards.

In a kind of inverse mechanism called *Punishment for Absence*, as we presented before, the player receives some penalty for not returning, in some specific period of time, which, according to Askelöf (2013) forces the player to return frequently.

In another explanation, Luton (2013) says that, usually, *collectible* rewards follow an increasingly variable schedule where the chance an item is found in the game world is related to its rarity. Items that have some impact on the gameplay have an increased level of power associated with their rarity, preventing new players, with good luck, from being able to rip through the game in an accelerated manner.

Missions, as part of the *goals* systems, often feature a fixed reward schedule because the quest, or mission, takes a considerable amount of effort from the player, resulting in infrequent rewards. Therefore, a low-value reward could not be seen as a good prize for the related effort, and it could cause demotivation. However, other games provide a mixture of random and fixed rewards (LUTON, 2013).

Adrian Crook's (2017) analyses that *Rewards Limited by Time* (or Time Gated Rewards) are a system that provides a strong monetization incentivization, as well a predictable progression, without forcing players to stop playing, as the traditional energy mechanics do. It happens because, in this kind of system, the rewards given are controlled by some kind of time-based control.

We are considering *Time Gated Rewards* as a *retention* element, that helps to monetize through *Play Accelerators*, a *monetization* element.

*Leaderboards* are a potential retention mechanism since players get addicted to the competition generated by that, as well, its sense of progress. The possibility of achieving a good position on the leaderboard is very attractive. As well, not achieving a good position, or having your score beaten, can encourage the player to return and repeat play sessions. Any change in a player's leaderboard position generates a new reason for that player to return (LUTON, 2013).

When talking about *Cooperation Environment* and *Clans*, Luton (2013) says that a guild (or clan) system can act as a great social commitment trigger, since players have similar interests and build strong social bonds.

In an interesting analysis about *Annuities*, related to monetization and retention issues, Scientific Revenue (2017) explains that an annuity is a purchase of currencies or goods that is delivered over some time. Then, annuities have a good appeal to players who have a good impulse control and put forth time and effort in order to get a lower price. Considering this, annuities in games have a very strong retention

component, making the player develop the habit of playing daily, as well as helping the game developer to monetize through a type of player that normally rarely spends money on the game. Thus, the author gives the following hint: Deliver a small amount of currency each day, but offer a great exchange rate, compared to the standard payment wall.

Luton (2013), this time talking about the *Energy System*, details that the game energy is a fairly recent element invented for F2P games. It is a resource that allows for the completion of an action, usually one within a core loop, and its main function is to control the length of game sections.

In a similar way, the *Time to Complete (Waiting Time)* the building of some object, learn a new ability, or finish any other waiting bar that allows new resources in the game, can also help to control the length of game sessions (ASKELÖF, 2013; NARINEN, 2014; LUTON, 2013).

### 3.4.3 Monetization Guidelines

This subsection is presenting some guidelines, hints and best practices, related to monetization methods in F2P Mobile Games.

Luton (2013) explains that paid *Extra Content* can be the weakest of all the *IAP* elements if it is used alone because of its durable nature, which creates a finite cap on spending. Furthermore, many F2P titles give away new content because it keeps the game fresh, helping the return of churned players[6], which puts games that charge for content at a retention disadvantage. However, content purchases are usually the best option to be used on narrative games.

This last citation affects the *Extra Content* element, as well the *Levels* element, from the *Retention* category.

*Play Accelerators* appeal to achieve player types who want to see the progression in the game sooner. Although many players take pride in their time and dedication on the game, and so avoid *Play Accelerators*, other time-poor players use

[6] Players that left the game with no plans to return.

these purchases to quickly reach where they want to be. In this context, it has also been seen that *Play Accelerators* can be a great monetization method, because of its consumable nature, allowing players to repeatedly buy them (LUTON, 2013).

When talking about *gacha* systems, Adrian Crook (2017) explains that it is a very good method, since players love the excitement of the unknown, when they open a package and do not know what is coming up. Then, the author explains that the usage of gacha systems can improve engagement and revenue.

Luton (2013) details that *Competitive Advantage* purchases can be controversial due to their propensity, if badly designed, to unbalance the game in favor of players that spend more money. When this happens, a game is referred to as pay-to-win. Considering this, the author explains that it is important that players, paying or not, feel that they're able to compete, while the game is still offering a tangible benefit in a *Competitive Advantage* purchase. Commonly, this problem is overcome by making the *Competitive Advantage* purchases act more like a convenience, where players can grind out to gain the same benefits without having to spend money.

Luton (2013) analyses that the drive for *Customization (To-Set-Up)* comes from players' desires for self-expression. Considering that, the author explains that players strive to have their own identity in the game's world. This is directly related to their esteem and pride for their creations. Hard to obtain, or available only via IAP, customization items act as status symbols within the game world, and the breaking of the barrier, in order to acquire them, indicates the player's commitment or their success in the game, elevating that player's social status. For many successful F2P games, customization is the biggest revenue source, and for some of them, it is the only source.

Payton (2018) makes an analysis of the game LEGENDARY: Game of Heroes, where in addition to other themes, he addresses the *VIP Subscription / Season Pass* element. He highlights two good approaches, with a generic application, that can help when designing VIP Subscription:

- The VIP Subscription for a first-time buyer provides an amount of hard currency equivalent to the value of the purchase, offering a powerful anchoring effect to get players;
- The VIP subscription includes “Lifetime Rewards”, that improve as players reaches higher VIP tiers, which encourages players to maintain their subscription indefinitely.

Talking about *Virtual Currencies*, Luton (2013) explains that F2P games use single currency or dual currency systems, where the dual currency system contains the hard and soft currencies. The decision to use a single or dual currency system is based on balance. To design soft currencies to be abundant — allowing players to be rewarded on an infinitely repeatable action — while strictly controlling hard currencies — rewarding players with a finite number of or in a low frequency of actions — often makes dual currencies systems easier to manage. However, single currency games are harder to be balanced. They must balance constant rewards given through the core loop, placing some items out of easy reach to encourage a purchase.

An interesting note about *Video Ads* was made by Morel (2012), where he explains that although this category of ads enables games to show short videos during natural breaks, also paying well, it can have a negative impact on the game retention because users tend to quit instead of watching an interruptive video.

Considering that, the *Video Ads* seems to be a good monetizing alternative when it doesn’t act in an interruptive way.

*Offer Walls* act as an alternative to an IAP, where the player is rewarded with some resource, such as virtual currency, and the publisher is paid on a CPA (cost per acquisition) basis. This is a highly effective method because players and publishers are rewarded for actions that a player opts into rather than those that are forced upon them (Luton, 2013).

Luton (2013), this time talking about *Merchandise*, explains that though merchandising is most prevalent in big hits, the current print-on-demand services allow developers to sell products directly from the game with little to no outlay. The developer

just needs to upload a design, lay it out on a product and set it to sell in the store for players to buy.

In the next chapter, we are going to cover the methodology aspects related to this research.

# 4. RESEARCH METHODOLOGY

Our overall research problem stands as a way to create a set of ARM heuristics for F2P mobile games. To do so, we divided our research in two studies where the first one is complementary to the second on: [1] The first one intends to investigate the state of the art, and what is recommended by game market professionals, in terms of ARM elements and techniques in F2P Mobile Games; and [2] a second study will use the results of the first survey as a reference to guide it, in order to investigate the state of the art, and also what is recommended by game market professionals, in terms of guidelines, best practices and heuristics ARM for F2P Mobile Games.

Therefore, in this chapter, we are covering aspects related to the research methodology used to reach the necessary data to develop both the ARM framework, as well the set of ARM heuristics.

## 4.1 DEFINING AN ARM FRAMEWORK FOR F2P MOBILE GAMES

In this section, we explain what approaches we used to define an ARM Framework for F2P Mobile Games, as well any other aspects related to the methodology used to collect the needed data.

### 4.1.1 The Baseline ARM Framework

In this subsection, we discuss what approach we used to create the baseline framework presented. This framework was the first step to create a polished and validated version.

To identify the elements of the baseline framework we have done an extensive literature review, covering authors from the game market and academia, as can be reviewed in chapter 2. A series of elements covered by multiple authors were identified, as well others covered by just one author. We selected the baseline framework elements based on three criteria:

- What was presented by authors;
- What is not redundant;
- What is understood as something that aids the ARM process in F2P Mobile Games.

The subcategories were selected based on what was proposed by the authors and what properly fits all elements founded and selected. We also had to make some minor adaptations to make the framework more intuitive and not redundant, as explained in chapter 2.

### 4.1.2 First Survey - Comprehension Test

We have prepared a questionnaire in order to verify if users could properly identify the meaning of the categories of the ARM framework proposed, just by the label. This was done to minimize the chances of misunderstanding when future interviewees read the next survey, even considering that the label's description will be shown to interviewees on the next survey. In addition, this questionnaire has the goal of evolving the proposed framework, identifying possible problems and opportunities to change.

The survey was conducted through *Google Forms*, and it was divided into six sections. The first section is called the introduction, where the aim of the study is explained, a necessary basic explanation about ARM and some guidance on the questions; section two is a simple professional profile questionnaire, asking interviewees about subjects such as area of expertise, years of experience, and experience on F2P mobile games; section three presents the baseline ARM framework for F2P mobile games proposed, explaining textually and graphically, how the main categories, subcategories, and elements, are organized; then, sections four, five and six, present the main categories and subcategories with their descriptions, and asks interviewees, based only on their knowledge and perception, to write a short description about how they understand each one of the related elements presented.

This questionnaire is focused on open questions, in order to verify if the specific ideas that the interviewees have about the labels of the elements match the meanings that need to be conveyed by the proposed framework. Open and multiple-choice questions were used to acquire professional information about interviewees. It is an open interview, then the interviewees have answered the same questions in the same order.

The entire questionnaire can be checked in *Appendix A*.

Five game market professionals, with experience in Production, Game Design, Project Management, Game Programming, Game & Data Analysis, Business Development & Marketing, areas, have been part of this survey. All of them have, at least, some experience with game design or production areas, as well as some experience working on mobile F2P games. They work in companies from Germany, Finland, Canada, New Zealand and Sweden.

In this interview we presented our framework and explained the meaning of the categories (Acquisition, Retention, and Monetization), and their subcategories as well. But we didn't explain the meaning of the elements inside the subcategories. Then, we asked the interviewees what they understand about each one of the elements proposed, considering their categories and subcategories involved.

Then, we categorized their answers in three levels, according to the understanding level identified:

A. **Understood**: Interviewee understands the meaning of the element the same way we proposed;

B. **Half Understood**: Interviewee understands the meaning of the element similar to the way we proposed, but not exactly the same;

C. **Misunderstood**: Interviewee doesn’t understand the meaning of the element the same way we proposed;

As the last step of this stage we identified the need to change labels, based on the following criteria:

- At least 2 answers about the element were categorized as C;
- At least 3 answers about the element were categorized as B;
- At least 1 answer about the element was categorized as C and 1 as B;
- We identified a good opportunity to change the label for something more intuitive, based on suggestions, interpretations or even misunderstandings.

### 4.1.3 Second Survey - Framework Evaluation

After the assessment of understanding survey, we prepared a questionnaire of evaluation in order to identify how game market professionals rate the framework proposed, and what they think should be changed. That was done to maximize the chances the framework will be useful to game market professionals, creating a sense of understanding about the elements, its organization, and possibilities related to ARM. In addition, this questionnaire has the goal of helping evolve the proposed framework, identifying possible problems and opportunities to improve it.

The survey was conducted through *Google Forms*, and it was divided into three sections. Like the first survey, the first section is called introduction, where the aim of this study is detailed, a necessary basic explanation about ARM, and how to approach and answer the questions is explained; also similar to the first survey, section two is a simple professional profile questionnaire, asking interviewees about subjects related to their professional, mobile, and F2P, experience.

Then, section three presents the Second Version of The ARM Framework for F2P Mobile Games, explaining textually and graphically, how the main categories, subcategories, and elements, are organized, and providing a link with the description of

all elements of the framework, as well as their categories and subcategories. Also, section three asks interviewees to:

- Rate how much the presented framework properly covers the related ARM aspects;
- Explain how much the presented framework seems to be useful for ARM design on F2P mobile games;
- Identify if there are elements or subcategories that should be adjusted, and if necessary, explain what exactly should be adjusted;
- Identify and explain what, if it's necessary, should be added as new elements;
- Provide any other specific suggestion or commentary to say about the proposed framework.

This questionnaire has open and Likert based questions, in order to measure how much interviewees believe the current framework version properly covers the ARM categories, elements and techniques for F2P mobile games, and how much they believe they believe these frameworks are useful to ARM mobile game design. The open questions allow interviewees to give any kind of feedback regarding the elements, subcategories, or any other suggestion or commentary about the proposed framework. Open and multiple-choice questions were also used to acquire professional information about the interviewees. It is important to note that it is an open interview, and the interviewees have answered the same questions in the same order.

The entire questionnaire can be checked in *Appendix B*.

Thirty game market professionals, with experience in Production, Game Design, Project Management, Game Programming, Game Testing, Sound Design, Game & Data Analysis, Academic & Research, Business Development & Marketing, areas, have been part of this survey. All of them have, at least, some experience working on mobile F2P games, and 39 of them have experience working as a game designer. They work in

companies from Russia, Finland, Canada, United Kingdom, Brazil, Germany, Australia, Netherlands, India, USA, Romania, Ukraine and Pakistan.

In this interview, we presented the second version of our ARM framework for F2P mobile games and explained the meaning of the categories (Acquisition, Retention, and Monetization), and their subcategories as well. Furthermore, as explained before, we have provided a link that explains the meaning of the elements in the subcategories.

Then, we analyzed each answer, in section three, according to the kind of specific feedback it could provide. Thus, we have started to do changes on the second version of the framework, considering the following criteria for each question:

1. **How much do you agree with this statement: "The way it is now, this framework seems to properly cover the ARM categories, elements and techniques"?**: This is a Likert based question, that helps to identify the percentage of acceptance, among the interviewees, that the proposed framework properly covers the ARM categories, elements, and techniques. The results of this question can help to identify how close we are to having a framework that properly covers the ARM items;

2. **How much do you agree with this statement: "The way it is now, this framework seems to be very useful for design ARM F2P mobile games"?**: This is another Likert based question, that can help to identify the percentage of acceptance, among the interviewees, that the proposed framework can be a very useful tool, to help design ARM categories, elements, and techniques for mobile games. The results of this question can help to identify how close we are to having a framework that is really able to help design ARM for mobile games;

3. **Do you believe that the proposed framework has elements or subcategories that should be adjusted? If yes, what should be done?**: This is an open question, that can help to identify if it is necessary to make any adjustments to the subcategories and elements. If more than one response indicated the same element or subcategory needed to be changed, we are going to investigate and try to create another way to organize the indicated item taking into consideration the issues and recommendations specified by the interviewee;

4. **Do you believe it's necessary to add some new element(s)? If yes, what? Where should it be placed?**: That is another open question, that aims to help identify if it is necessary to increase any forgotten, or not properly covered, element, and where it should be placed, considering the framework presented to the interviewees. Any suggestions about element additions was analyzed considering the following criteria:

    a. It was verified if the element is really not yet covered;

    b. If the element was covered, then the need to change its label, or split the current label into two (creating a new element), in order to make it more clear and relevant, was verified;

    c. If the element was not covered, it was analyzed to see if it really fits our framework, and where it should be placed, considering any suggestions by the interviewees;

5. **Do you have any other suggestion or commentary to say about the proposed framework?**: That is one more open question that aims to help to identify if it is necessary to do any other changes on the framework not covered by the other questions. It is an important question, because it is open for any kind of feedback that could help us to identify opportunities to improve.

It is important to say that, we are also considering the whole group of results related to this section considering the following criteria:

- At least 2 answers indicating the same issue were found, considering any match of questions;
- Any kind of feedback that seems to provide good solutions that properly fit into the proposed framework;
- We identified a good opportunity to change the label to something more intuitive, based on suggestions, interpretations or even misunderstandings.

In the next section we are going to present the methodology used to collect the data related to the construction of our Set of ARM Heuristics for F2P Mobile Games.

## 4.2 DEFINING A SET OF ARM HEURISTICS FOR F2P MOBILE GAMES

In this section, we are presenting the research methodology used to create a set of ARM heuristics for F2P mobile games.

### 4.2.1 The Baseline ARM Heuristic Set

In this subsection, we discuss the approach we used to create the baseline set of ARM heuristics for F2P mobile games. This set was the first step to creating a polished and validated version.

To identify content that could be used to help the creation of our baseline set of heuristics we have done an extensive literature review, covering authors from the game market and academia, as can be reviewed in chapter 3. We also have used the version 1.0 of our ARM Framework for F2P Mobile Games as a reference for creating guidelines, better practices or even heuristics, related to our research. Considering that, we used our ARM Framework in this way:

- We have checked element by element, and reviewed its related literature;
- If we found a new guideline, better practice, or a related heuristic, we registered it;
- If we did not find anything like that, we registered this information.

A series of guidelines, better practices, and heuristics, covered by multiple authors were identified, as well as others covered by just one author. We have created the baseline set of heuristics based on three criteria:

- As explained before we reviewed the literature related to ARM guidelines and heuristics, and we used our ARM framework as a guide to finding possible heuristics;

- We checked and selected what is not redundant;
- We also identified which of our categories the selected heuristics could be allocated to;
- We used simple and straightforward language, but keeping the same idea of the related guideline, or best practice.

As explained before, we are using a framework for characterizing heuristics, presented by De Jong and Van Der Geest (2000). Considering the categories of this framework, we have selected a specific configuration, in order to help us build a set of heuristics in a more parameterized way. We are defining a configuration in this subsection that will be used in the baseline set of heuristics, but it will be also used as the basis to build the next sets, until the 1.0 version.

Therefore, the configuration of our ARM set of heuristics, using the framework proposed by De Jong and Van Der Geest (2000), follows below:

- **Information Covered by The Heuristics**
  - **Specificity**: About the specificity, our set of heuristics are **feature-specific** type since they are focused on providing ARM specific recommendations;
  - **Exhaustiveness**: Our set uses a **systematic** approach since we use an ARM framework to guide us through the categories we are aiming to cover;
- **Validity of the Heuristics**
  - **Foundations**: We are proposing **practitioners' heuristics**, that reflect the views and experiences of game market professionals;
  - **Novelty Value**: In our set, we are using both **high** and **low** novelty value for our heuristics, in order to provide solutions for experienced and new game designers;
  - **Room for Interpretation**: We are proposing both **mechanistic** and **expert-mediated** heuristics. Some of them have a more open interpretation, where more experienced game designers can go

beyond the basics of them, while other heuristics usually should provide the same conclusions;

- **Validation Research**: We are classifying not the baseline version, but the 1.0 version of our set of heuristics, as **Available**, when talking about validation research, since we are validating them through game market professionals' opinions;

- **Presentation Format of the Heuristics**
  - **Structure**: We are adopting the use of a **meaningfully structured** set of heuristics, dividing them into categories such as acquisition, retention, monetization, and a mix of two of them. We are using this structure to make the comprehension of the proposed set easier;
  - **Formulation of Items**: A mix of **instructions** and **requirements** have been adopted to create our heuristics. We choose to not use **questions** to keep all the heuristics straightforward, and focused to provide specific solutions;
  - **Types of Answers**: We are not using question type heuristics, so we do not have the need to classify the *type of answers*;
  - **Level of Heuristics**: We are using **high-level** and **low-level** heuristics, to allow us to cover both specific and generic issues;
- **Use of the Heuristics**
  - **Phase in The Design Process**: Our proposed heuristics could be used as **planning-oriented** and **evaluation-oriented**, allowing designers to use them as a support to create solutions or evaluate and improve them;
  - **Focus of Support**: We are using a combination of **process-oriented** and **product-oriented** heuristics, depending what fits better for each situation;
  - **Function in The Design Process**: We are adopting a combination of **idea-generating** and **verifying** heuristics, focusing on identifying certain characteristics that should be accomplished, as well as providing help for possible solutions;

- **Assumptions About Actual Use**: We are adopting an **external representation**, since we are building a large set of heuristics.

### 4.2.2 The First survey - Evaluating the Understanding and Asking for New Guidelines

We have prepared a first questionnaire related to the building of our set of ARM heuristics. This questionnaire has two main goals: identify, in our baseline heuristic set, if the proposed heuristics are clear enough for game market professionals; identify possible new heuristics, covering both elements already covered, as well as elements not covered yet. This allows us to identify what could be done to maximize the audience's understanding of our proposed heuristics, as well to increment the proposed set of heuristics to better cover the related ARM elements. In addition, this questionnaire has the goals of evolving the set of proposed heuristics, identifying possible problems and any extra opportunity to improve it.

This survey was conducted through *Google Forms*, and it was divided into four sections. The first section is called introduction, where the aim of this study is explained, a necessary basic explanation about ARM and a small guidance about the questions; section two is a simple professional profile questionnaire, asking interviewees about subjects such as area of expertise, years of experience, and experience on F2P mobile games; in section three we present the 1.0 version of the ARM framework for F2P mobile games proposed, also providing a link that explains, with details, each one of its elements and organization. Then, we ask the interviewees to suggest guidelines to design the ARM elements we are not covering in our baseline set of heuristics. We also have a more open question, where we ask interviewees to suggest any other ARM guideline, related to designing ARM on F2P Mobile Games. Finally, in section four, we present each one of the heuristics proposed in our baseline set and ask interviewees to check if they are clear or not and also to suggest changes to make them clearer (if necessary).

This questionnaire has closed questions, to easily verify, according to interviewees, how clear our proposed baseline set of heuristics are. It also has open questions, to better identify possible ways to make our proposed heuristics clearer and to assist in the creation of new heuristics. It also used open and multiple choices questions, to acquire professional information about interviewees. It is an open interview, and the interviewees have answered the same questions in the same order.

We have decided to apply this questionnaire to a small selected group of three very experienced game market professionals, with relevant experience in F2P mobile games. We made this decision for the following reasons:

1. It is a large questionnaire, that can bring some valuable specific feedback;
2. For this questionnaire, we are looking for suggestions about new possible heuristics, as well as evaluations of the way we wrote our baseline heuristics. So, it would be more straightforward to find these answers through a small, but specialized group;
3. The special characteristics of the selected members of this group can provide a very qualified feedback.

About our selected interviewees, they have the following characteristics:

1. The first one has over five years of experience working in the game industry and over one year working with F2P mobile games. He has experience in production, game design, project management, programming, and game and data analysis areas. He had been the head of game design for over a year and a half in a Canadian company, designing F2P mobile games;

2. The second one has over five years of experience working in the game industry and over three years working with F2P mobile games. He has experience in production, game design, and project management areas. He has been the design director for a large game development company in New Zealand for five years, also creating F2P mobile games;

3. The third one has over five years of experience working in the game industry and over five years working with F2P mobile games. He has experience in production, game design, project management, programming, game art, game and data analysis, business development and marketing, game testing, sound design, and academia and research, areas. He has worked in game leadership roles in companies from many countries, such as Canada, United Kingdom, and Sweden. He also has a book published about F2P games.

The entire questionnaire applied to this group can be checked in *Appendix C*.

Therefore, to create a new group of heuristics to add to our baseline set, based on this interview, we have adopted the following criteria:

- We checked what could be used to create a heuristic or used as a heuristic;
- We checked and merged what is redundant;
- We selected what makes a real connection with ARM categories;
- We selected what is not really covered yet;
- We adapted them to our previously established configuration, based on the framework proposed by De Jong and Van Der Geest (2000);
- We inserted them in the second version of our set of heuristics.

Furthermore, to decide what heuristics we should rewrite, and how to rewrite, we have adopted the following criteria:

- If all the interviewees say a heuristic is clear enough, we keep it as the same;
- If at least one interviewee says a heuristic is not clear enough, we rewrite it;
- If an interviewee suggests a change for a heuristic

- We checked if their proposal properly covers the same idea;
- We checked if there are more suggestions from other interviewees for the same heuristic;
  - In this case we checked and merge when redundant;
- Then we decided how to change the heuristic indicated.

### 4.2.3 Second Survey - Heuristics Evaluation

After the first survey, to evaluate the set's understandability and ask for new guidelines related to our baseline set, we have prepared a questionnaire to identify which heuristics should be taken out of the second version of our proposed set of ARM heuristics for F2P mobile games, based on how much game market professionals agree with them. That was done to maximize the chances this final set of heuristics will be useful to game market professionals, keeping in it only the heuristics that received good evaluations.

The survey was conducted through *Google Forms*, and it was divided into three sections. Similar to the last survey, the first section is called introduction, where the aim of this study, a necessary basic explanation about ARM, and how to approach and answer the questions is explained; also similar to the last survey, section two is a simple professional profile questionnaire, asking interviewees about subjects related to their professional, mobile, and F2P, experience.

Then, section three presents the second version of The Set of Heuristics for F2P Mobile Games, asking the interviewees to rate how much they agree with each one. Furthermore, at the end of this section, we asked interviewees if they have any specific suggestion to any of the presented heuristics.

This questionnaire has open and Likert based questions, in order to measure how much interviewees agree with each one of the heuristics presented, and to acquire extra information, giving interviewees the chance to provide non-predictable feedback and more specific suggestions to correct any possible mistake. Open and multiple-choice questions were also used to acquire professional information about the

interviewees. It is an open interview, and the interviewees have answered the same questions in the same order.

The entire questionnaire can be checked in *Appendix D*.

Forty-five game market professionals, with experience in Production, Game Design, Project Management, Sound Design, Game Programming, Game Art, Game Testing, Game & Data Analysis, Academic & Research, Business Development & Marketing, areas have participated in of this survey. All of them have, at least, some experience working on mobile F2P games, and 23 of them have experience working as a game designer. They work in companies from Russia, Finland, Australia, Canada, Vietnam, United Kingdom, France, Brazil, Serbia, Poland, Germany, China, Denmark, Japan, Lithuania, India, USA, and Ukraine.

To decide which heuristics we should keep in our set and which we should take out of the set, we have adopted the following criteria:

- As proposed by Greenacre (2017), and similar to the *average ranking calculation* proposed by Oliveira (2005), and considering that the Likert questions, used in the evaluation of our proposed set of heuristics, we are using ordered categories (*Strongly Disagree*; *Disagree*; *Undecided*; *Agree*; *Strongly Agree*), and we are using the values 1 to 5 to numerically represent these categories (1 = *Strongly Disagree*; 2 = *Disagree*; 3 = *Undecided*; 4 = *Agree*; 5 = *Strongly Agree*);
- By assigning numeric values to our set of possible answers, also as proposed by Greenacre (2017) and Oliveira (2005), we calculate the average score of each heuristic. It is just necessary to sum all the scores provided by the interviewees and divide the result by the number of interviewees;
- Then, we remove heuristics whose average score is less than 4 (representing *Agree*, as the average).

Furthermore, to decide which heuristics we should rewrite, and how to rewrite them, we adopted the following criteria:

- If an interviewee suggests a change for a heuristic
    - We checked if their proposal properly covers the same idea;
    - We checked if there are more suggestions, from other interviewees, for the same heuristic;
        - In this case we checked and merged when redundant;
    - Then we decided how to change the indicated heuristic.

In the next chapter, we are going to cover the results related to the presented research, collected through the methodologies explained in this chapter.

# 5. EXPERIMENTAL PROCEDURES AND RESULTS DISCUSSION

In this chapter, we explain and analyze the results of our investigations, in this research, collected through the methodologies explained in chapter 4.

## 5.1 ASSESSING AND EVOLVING THE ARM FRAMEWORK FOR F2P MOBILE GAMES

In this section, we explain and analyze the results of our investigation about the ARM Framework for F2P Mobile Games that we are proposing, as well any other aspect that can bring helpful insights for this study.

### 5.1.1 Designing the Baseline ARM Framework for F2P Mobile Games

It has been verified that the majority of what is found about ARM, in the Free-To-Play mobile games context, comes from the game market instead of academia, while the majority of what comes from academia uses more market references to support the proposed elements than references from academia.

We have found forty-five elements, and eight subcategories, and then organized them in a cycle graph, to represent the whole first version of the framework, the baseline framework, as presented in figure 12.


Figure 12. Baseline ARM Framework for F2P Mobile Games (The Author)

### 5.1.2 First Survey Results - Data Analysis and Adjustments on The Baseline Framework

The professionals selected for this survey all have at least one year of experience working on F2P mobile games. Out of the five interviewees, one of them has been working between one and three years; two of them have been working between three and five years; two of them have been working more than five years. All of them have more than five years of experience working in the game industry including experience working in the game design area.

From our baseline framework, fourteen label elements (out of forty-five) were identified as needing to be adjusted. These label elements and adjustments were identified following the criteria explained at the end of section 3.2. Below, we present our analysis and justification for making the adjustments:

- **Off Game/App Advertising**: Although the label could be understood for all the interviewees, based on an observation made by one interviewee, we perceived a more usual term. Now we are using the term **Non-Game Media Advertising** for this element;
- **Objective**: We decide to change the label to **Goals**, because it was a more usual term for the interviewees;
- **Help Request**: We changed this label to **Help Request Mechanics**, adding mechanics at the end of the sentence, to make clear to the users we are talking about some action provided by the game system;
- **Gifting**: We changed this label to **Gifting Mechanics**, adding mechanics at the end of the sentence, to make it clear to the users we are talking about some action provided by the game system;
- **Challenges**: Based on three misunderstood labels we perceive the interviewees understand that as a kind of specific goal or extra challenge, and not a challenge mechanic where you can invite someone to compete. To fix that problem we changed the label to **Challenge Invitation**;
- **Competition Sense**: We decided to change this label to **Competitive Environment** to make clear we are not talking about a specific mechanic, but the whole game environment that involves competitive aspects;
- **Cooperative Sense**: Like **Competitive Sense**, we have decided to change this label to **Cooperative Environment**, because it is not about a specific mechanic, but the whole game environment that involves cooperative aspects;

- **Time to Complete**: Three interviewees have understood this as a *countdown timer* to complete some game challenge. Because of this reductionist interpretation, we have decided to change this label to **Time to Complete (Waiting Time)** and create a brand new one, called **Countdown Timer**;

- **Reward for Replay**: We have decided to change this label to **Reward for Return**, because two interviewees understood that as the possibility to redo a game challenge;

- **Come Back Message**: We changed this label to **Come Back Message (Push Notification)**, just adding “Push Notification” to make clear it’s not about a message inside the game;

- **Content**: We perceived it could be confused with any kind of content in the game. Because of that, we changed this label to **Extra Content** to make it more aligned with the original intention;

- **Customization**: We have changed this label to **Customization (To Set Up)**, because two interviewees have limited this just to cosmetic customizations;

- **Collectibles**: We changed this to **Collectible Collection**, to make clear that it is not about any kind of item that can be collected;

- **Gifts**: To make it clearer that it is about a gift that the player needs to buy, we changed this label to **Purchase Gifts**.

The new element named **Countdown Timer**, is a time constraint for the player to complete a specific challenge. We decided to add this element because it was identified per three of the five interviewees, and it is not covered by any other element. This element should be part of the *Space and Time-Based Limitations* subcategory, inside *Retention* category.

Based on all previous feedbacks, our established criteria, and analysis, the new framework version is represented on figure 13.

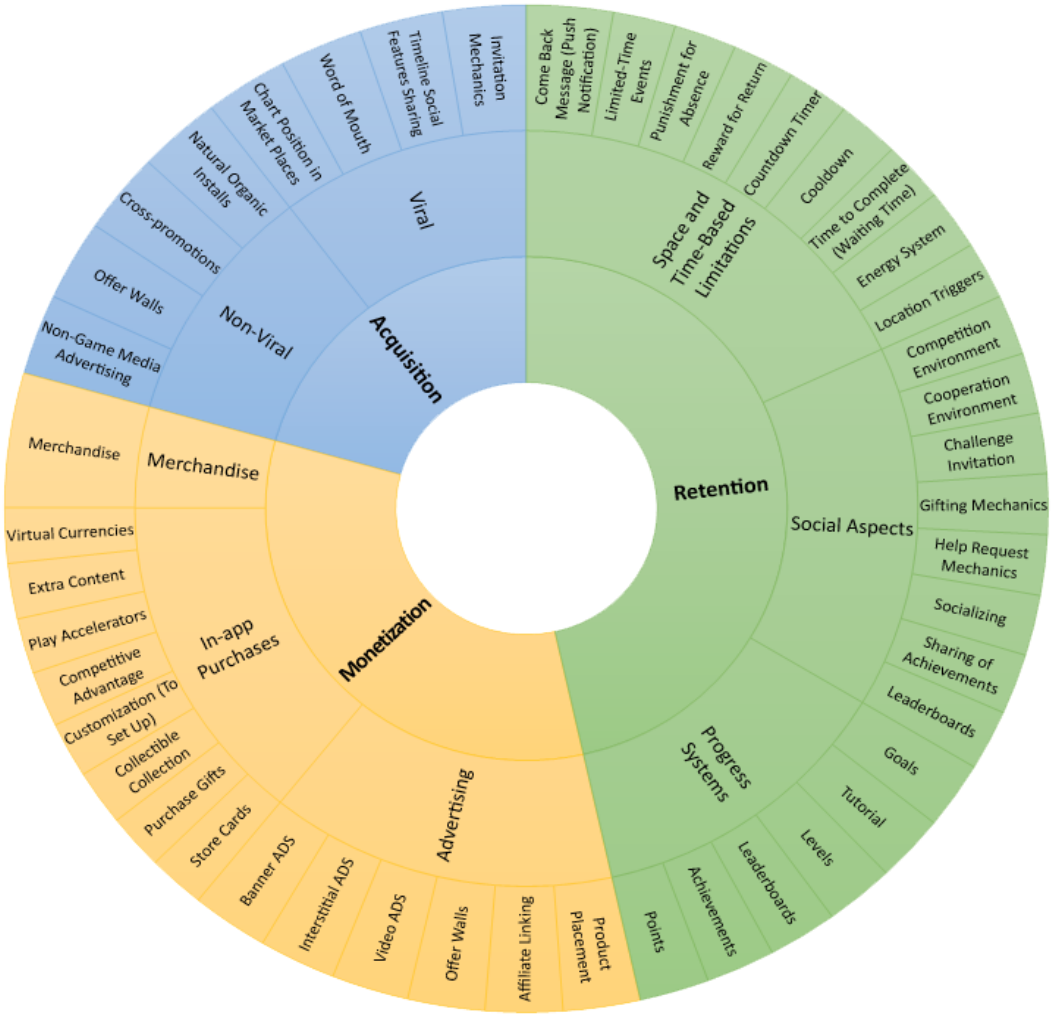


Figure 13. Second Version of The ARM Framework for F2P Mobile Games (The Author)

### 5.1.3 Second Survey - Data Analysis and Designing 1.0 Version of the ARM Framework for F2P Mobile Games

This survey has selected professionals with at least 1 year of experience working in the game industry, and some experience working on F2P mobile games. However, as displayed in figure 14, 86.7% of the interviewees have been working in the game

industry for at least 5 years, 6.7% between 3 and 5 years, and 6.7% between 1 and 3 years.

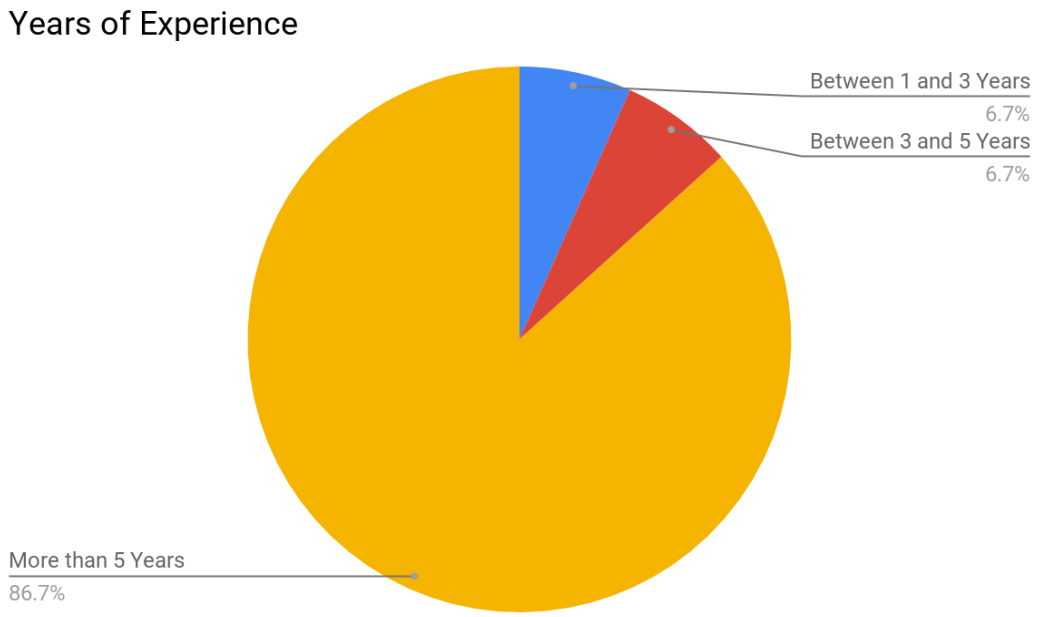


Figure 14. Years of experience the interviewees have been working on the game industry (The Author)

Figure 15 displays for how long the interviewees have been working on F2P mobile games. 53.3% of the interviewees have been working for at least 5 years, 23.3% between 1 and 3 years, 16.7% between 3 and 5 years, and 6.7% for less than 1 year. As perceived, the answers demonstrate that most of the interviewees have more than 5 years of experience working in game industry and working on F2P mobile games.

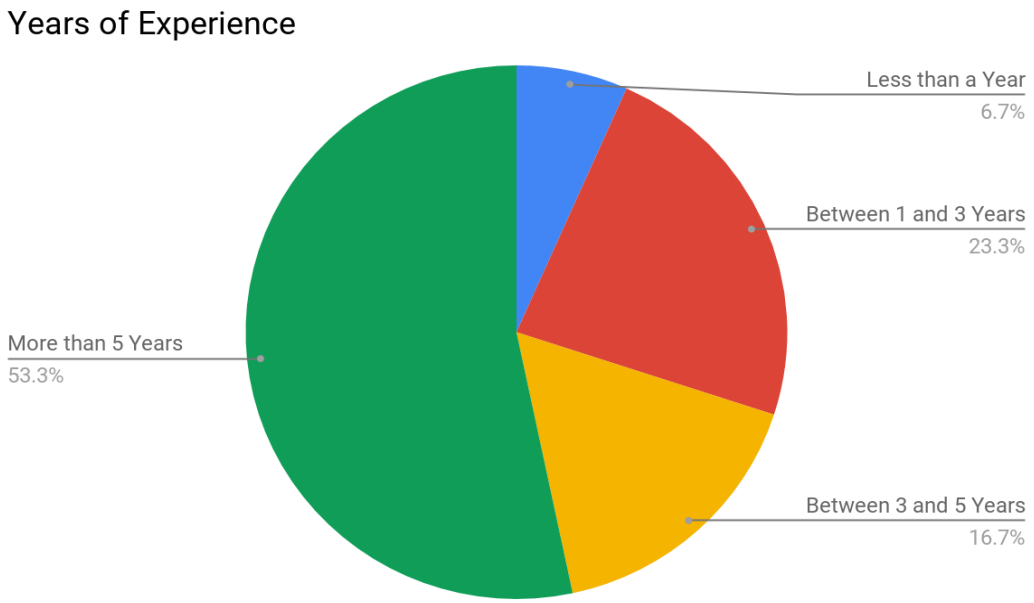


Figure 15. Years of experience the interviewees have been working on F2P Mobile Games (The Author)

As displayed in figure 16, 60% of the interviewees agree that the second version of our framework properly covers the ARM categories, elements and techniques in F2P mobile games, while 20% strongly agree and 20% are undecided about it.

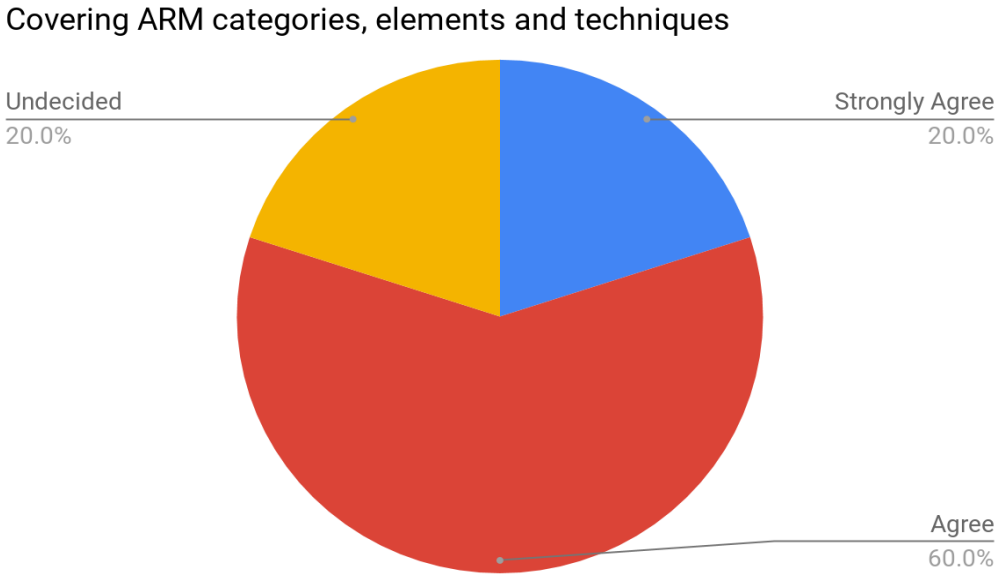


Figure 16. How much interviewees agree our second framework proper cover the ARM categories, elements and techniques in F2P mobile games (The Author)

Figure 17 shows how much the interviewees agree that the second version of our framework is very useful to aid in the design of ARM on mobile games. Then 50% of the interviewees agree that the second version of our framework is useful to design ARM on mobile games, 26.7% are undecided, 20% strongly agree, and 3.3% disagree. It is important to notice that 70% of the interviewees, in some way, agree that our framework shows to be useful to design ARM on mobile games. Then, considering figures 16 and 17, it is possible to conclude that our second framework version has some considerable degree of acceptance.

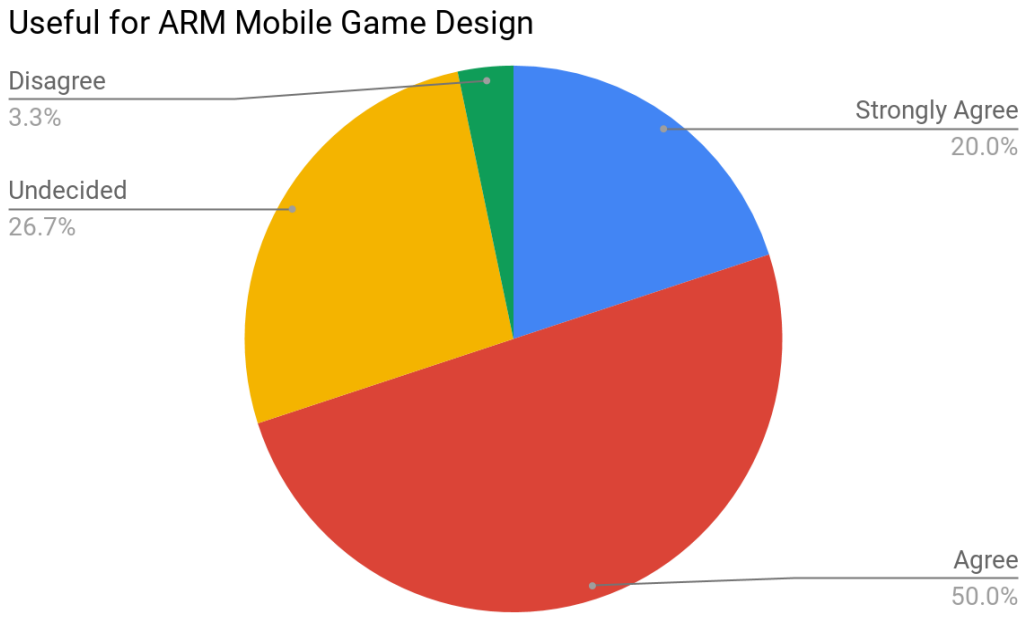


Figure 17. How much interviewees agree our second framework is useful to the design of F2P mobile games (The Author)

In our second survey it was possible to notice that some interviewees have identified that there is room for improvement if we keep making changes on this framework from time to time. Furthermore, it was possible to identify, during this whole work, that new techniques and elements related to ARM practices are continuously being developed, which could make the practice of keeping the framework updated even more relevant.

Therefore, considering our second framework version, and the answers of the Likert and open questions of the second survey, we can present the following changes we used to create the third version of our framework, as also an additional feedback to be considered:

- **Increasing New Elements**
    - **VIP Subscription / Season Pass**: That is an **In-App Purchases** element, where players pay for exclusive content and advantages. Basically, the idea is that players that pay for it have a kind of temporary access to exclusive content;
    - **Up-Sells**: This is an **In-App Purchases** element, that is about the way the game offers better options for buying goods, where the cost savings is proportionally inferior to the quantity purchased. For example, when the game offers a package of 1K gold for 1 dollar and, at the same time, offers 5K gold for 3 dollars;
    - **Discounts**: It is an **In-App Purchases** element, where the game offers, for a limited time, an in-game product (or products) cheaper than the normal price;
    - **Targeted-Offers**: This element is part of the **In-App Purchases** subcategory. That is an approach where the game offers specific promotions to the players, according to their gameplay style or activity;
    - **Gacha**: This is another **In-App Purchases** element. *Gacha* is a system where players acquire a kind of package, without knowing what comes inside until they open it;
    - **Annuities**: That is an **In-App Purchases**, as well as a **Space and Time-Based Limitations**, element. In this technique, the player pays for rewards but needs to keep returning at a specific frequency to get them because they are distributed over some

period of time. Generally, the game administrator offers better deals when using this technique. It also increases the retention since the player needs to keep returning to get the full value for what they have bought;

- **Clans**: That is a **Social Aspects** element. Also called guilds, this is an in-game structure that allows players to create or be part of a group that allows them to communicate between themselves, share resources, help each other, chase common goals, or to do other special interactions;
- **Visiting Other Players**: That is another **Social Aspects** element. This element is about how the game allows players visit other players' home, and then check how well other players are in the game;
- **Community Management**: That is a **Social Aspects**, as well a **Viral**, element. It is about how the game company deals with the external and internal community of players, through executing events and contests, expanding and maintaining the online community, supporting the community on social media platforms, and more related issues;
- **Time Gated Rewards**: That is a **Space and Time-Based Limitations** element. Using this technique, the game limits the amount of rewards the player can acquire in some amount of time. Doing this, the player needs to keep returning to try to acquire new rewards, unlocked over time;
- **IP Based**: This is a **Non-Viral** element. It means the game uses established intellectual property (like cartoon or comic book characters), in order to acquire new players. We have classified this element as a Non-Viral because it is not something that comes

from players, to acquire new players, but something that makes the game more attractive by itself;

- **To be Excluded**
    - **Socializing**, from the **Social Aspects** subcategory was excluded, because its interpretation could be ambiguous. Also, in some ways, its meaning is going to be covered by the combination of the new **Clans** element, and other old ones, like **Cooperation Environment** and **Competition Environment**;
- **Other Changes**
    - The element **Collectible Collection**, from **In-App Purchases** subcategory, now is also added to **Progress Systems** subcategory, since it was perceived that it could be understood by the player as a long-term goal;
- **Keep Developing**
    - Based on some feedback and this work itself, we have decided to keep making continuous changes, additions and adaptations to this framework, with the help of the game development community, in the upcoming works;

It is important to note that there were some suggestions proposing elements that are already covered, in some way. Also, there were some suggestions that just do not fit on a framework to design ARM elements on F2P mobile games.

Therefore, based on all previous feedbacks, our established criteria, and analysis, the new framework version is represented in figure 18, presenting fifty-nine elements. In addition, this version of our framework is the final version of this work, but we will keep developing it, after this work, based on the feedback of game market professionals, the related literature, and the new trends of the F2P mobile game market.

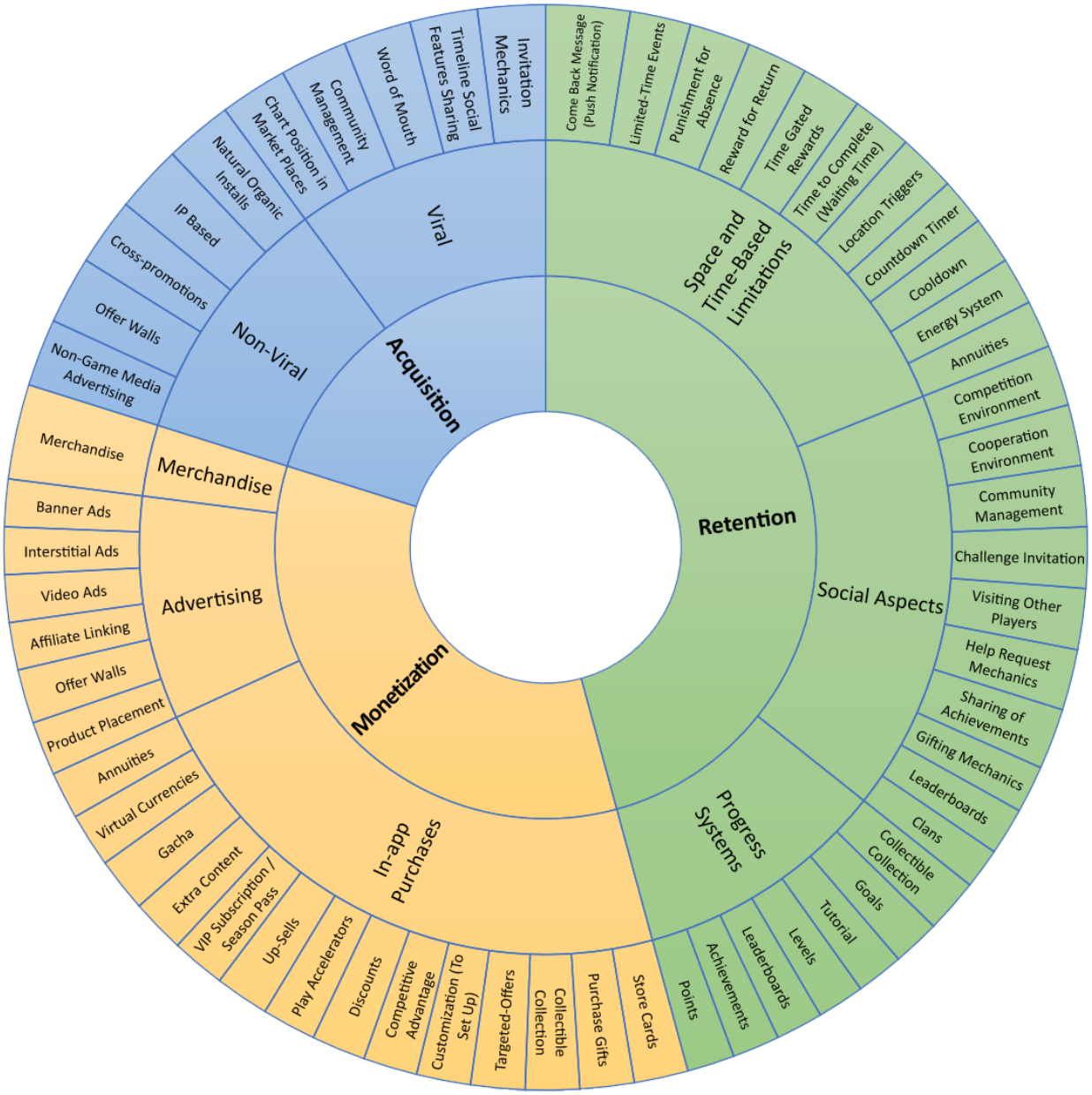


Figure 18. Version 1.0 of The ARM Framework for F2P Mobile Games (The Author)

A brief description, subcategory and category of each element of our third version (version 1.0) framework follows in table 12.

| **Category** | **Subcategory** | **Element** | **Description** |
|---|---|---|---|
| Retention | Progress Systems | Points | They can be: experience points; redeemable points (or game coins); skill points; karma points; reputation points; progress points (or levelling up) |

| | | | |
|---|---|---|---|
| Retention | Progress Systems | Achievements | Provide the feeling of reaching something, rewarding to players who fulfill the required conditions |
| Retention | Progress Systems | Collectible Collection | These items belong to a set of items and exist only to be collected. |
| Retention | Progress Systems | Leaderboards | It is a competitive return trigger, focused on making comparisons between players |
| Retention | Progress Systems | Levels | It's an indication of how far the player has progressed in the game |
| Retention | Progress Systems | Tutorial | It is the practice of guiding and teaching players in some moments of the game when they need to do something new |
| Retention | Progress Systems | Goals | A goal is a task, mission, quest or challenge for the player to clear in the game |
| Retention | Social Aspects | Leaderboards | Leaderboards are an important social element to keep players competing against each other, while exposing their ranking position |
| Retention | Social Aspects | Sharing of Achievements | It is a game mechanic that allows players to share what they have achieved |
| Retention | Social Aspects | Clans | Also called guilds, this is an in-game structure that allows players to create or be part of a group that grants them the ability to perform special interactions between each other |
| Retention | Social Aspects | Help Request Mechanics | It is a game mechanic where the player can ask for help from their friends |
| Retention | Social Aspects | Gifting Mechanics | That is the possibility to spontaneously give gifts to other players |
| Retention | Social Aspects | Visiting Other Players | This element is about how the game allows players to visit other players' homes, and then check how well other players are doing in the game |
| Retention | Social Aspects | Challenge Invitation | Players can invite others to a challenge |
| Retention | Social Aspects | Community Management | It is the way the game company deals with the external and internal community of players |
| Retention | Social Aspects | Cooperation Environment | It's about any other kind of situation players interact with each other to help |

| | | | |
|---|---|---|---|
| Retention | Social Aspects | Competition Environment | It's about any other kind of situation players competing against the machine, against oneself and against others |
| Retention | Space and Time-Based Limitations | Annuities | In this technique, the player pays for rewards but needs to keep returning at a specific frequency to get them |
| Retention | Space and Time-Based Limitations | Energy System | This is a system where actions consume energy, and if the player's energy drains to zero, they need to wait until their energy bar is restored to continue |
| Retention | Space and Time-Based Limitations | Time to Complete (Waiting Time) | That is the time taken to build some object, learn a new ability, or complete any other waiting bar |
| Retention | Space and Time-Based Limitations | Time Gated Rewards | Using this technique, the game limits the amount of rewards the player can acquire in some amount of time |
| Retention | Space and Time-Based Limitations | Cooldown | It's a time limit on how often certain actions can be used in game |
| Retention | Space and Time-Based Limitations | Countdown Timer | That is a time constraint for the player to complete a specific challenge. |
| Retention | Space and Time-Based Limitations | Reward for Return | These are mechanisms that reward the player for returning to the game |
| Retention | Space and Time-Based Limitations | Punishment for Absence | The player receives some penalty for not returning for some specific period of time |
| Retention | Space and Time-Based Limitations | Limited-Time Events | Seasonal events that offer something special for a short period only, like an exclusive quest |
| Retention | Space and Time-Based Limitations | Come Back Message (Push Notification) | Messages that remind the player about the game when they haven't played the game for some time |
| Retention | Space and Time-Based Limitations | Location Triggers | Advantages for players playing in some specific places |
| Acquisition | Viral | Invitation Mechanics | Mechanics to incentivize users to invite their friends to try the game |
| Acquisition | Viral | Timeline Social | Social features like leaderboards and |

| | | | |
|---|---|---|---|
| | | Features Sharing | achievements players can share on their timeline |
| Acquisition | Viral | Word of Mouth | Things like natural invitations by the players without using actions on the game |
| Acquisition | Viral | Community Management | It is the way the game company deals with the external and internal community of players |
| Acquisition | Viral | Chart Position in Market Places | Better chart position in market places will provide more visibility |
| Acquisition | Non-Viral | Natural Organic Installs | Organic installs that are not influenced by the consumption by previous players or cross-promotions, like the pure store exposure |
| Acquisition | Non-Viral | IP Based | The game uses established intellectual property, in order to acquire new players. |
| Acquisition | Non-Viral | Cross-promotions | The ability to cross-promote a game with others |
| Acquisition | Non-Viral | Offer Walls | Through Offer Walls, the players can earn in-game currency by performing certain tasks |
| Acquisition | Non-Viral | Non-Game Media Advertising | Advertising that does not occur through other games or apps |
| Monetization | In-app Purchases | Annuities | In this technique, the player pays for rewards but needs to keep returning at a specific frequency to get them |
| Monetization | In-app Purchases | Virtual Currencies | Virtual money that allow players buy things in the game |
| Monetization | In-app Purchases | Extra Content | More content to explore the game, as maps, levels, new abilities, characters, or similar |
| Monetization | In-app Purchases | VIP Subscription / Season Pass | Players that pay for it, have a kind of temporary access to exclusive content |
| Monetization | In-app Purchases | Up-Sells | It is when the game offers better options for buying goods, where the cost savings is proportionally inferior to the quantity purchased. |
| Monetization | In-app Purchases | Play Accelerators | It consists of the purchase of anything that allows players skips ahead, providing them with something that normally would need time and dedication to reach it |
| Monetization | In-app Purchases | Gacha | It is a system where players acquire a kind of package without knowing what comes inside until |

| | | | |
|---|---|---|---|
| | | | they open it |
| Monetization | In-app Purchases | Discounts | The game offers, for a limited time, an in-game product (or products) cheaper than the normal price |
| Monetization | In-app Purchases | Competitive Advantage | Anything that provides players with any competitive advantage against the game or other players |
| Monetization | In-app Purchases | Customization (To Set Up) | How the game lets the players customize the avatar or the game's world |
| Monetization | In-app Purchases | Targeted-Offers | That is an approach where the game offers specific promotions to the players, according to their gameplay style or activity |
| Monetization | In-app Purchases | Collectible Collection | These items belong to a set of items and exist only to be collected |
| Monetization | In-app Purchases | Purchase Gifts | Gifts also can be acquired with hard currency |
| Monetization | In-app Purchases | Store Cards | Physical cards with codes that can be redeemed for credits to be spent in the game |
| Monetization | Advertising | Banner Ads | It's a thin strip that is usually shown at the top or bottom of the screen |
| Monetization | Advertising | Interstitial Ads | Ads that appear between the transition of two screens and are usually full screen |
| Monetization | Advertising | Video Ads | Video ads are one of the most effective ads |
| Monetization | Advertising | Offer Walls | Offer walls can monetize through actions that players need to do, such as installing another game or signing up for a service |
| Monetization | Advertising | Affiliate Linking | It is a link to a store, which tracks the player and pays out a percentage of sales made |
| Monetization | Advertising | Product Placement | It is the use of real products inside the game to promote advertisement; |
| Monetization | Merchandise | Merchandise | That is the act of selling physical goods associated with the game. |

Table 12. Description of the Elements of the ARM Framework v.1.0 for F2P mobile games (The Author)

## 5.2 Defining a Set of ARM Heuristics for F2P Mobile Games

In this section, we explain what approaches we used to define our proposal for an ARM Set of Heuristics for F2P Mobile Games, as well any other aspect related to the methodology used to collect the needed data.

### 5.2.1 Designing the First Version of the ARM Heuristic Set

During the analyses of our research from chapter 3 about heuristics, guidelines and best practices of ARM in F2P mobile games, we noticed that the most relevant part of the content comes from the game market instead of from academia. We noticed this during the creation of the ARM framework as well. Even in cases where we have a good number of academic references, the bases for the knowledge uses more market references to support it than references from academia.

During our research, we found a significant amount of information related, in some way, to heuristics in F2P mobile games. It allowed us to define a set of thirty-seven ARM heuristics. These heuristics cover all the main categories of our ARM framework for F2P mobile games, as well all subcategories. They also cover the following elements: *Cross-Promotions*; *Invitation Mechanics*; *Timeline Social Features Sharing*; *Word of Mouth*; *IP Based*; *Location Triggers*; *Achievements*; *Sharing of Achievements*; *Limited-Time Events*; *Help Request Mechanics*; *Gifting Mechanics*; *Tutorial*; *Come Back Message (Push Notification)*; *Collectible Collection*; *Goals*; *Leaderboards*; *Cooperation Environment / Clans*; *Levels*; *Energy System*; *Time to Complete (Waiting Time)*; *Reward for Return*; *Punishment for Absence*; *Time Gated Rewards*; *Extra Content*; *Play Accelerators*; *Competitive Advantage*; *Customization (To Set Up)*; *Virtual Currencies*; *Offer Walls*; *Merchandise*; *Video Ads*; *VIP Subscription / Season Pass*; *Annuities (Monetization /Retention)*; *Gacha*. Therefore, with this baseline set of heuristics, we are covering thirty-four out of the fifty-nine elements of our ARM Framework for F2P Mobile Games, version 1.0.

We have created table 13 where we organize and present the baseline set of heuristics to design ARM on F2P Mobile Games, also explaining what ARM category each one belongs to. We have decided not to label this table with the subcategories or elements because it could cause more confusion for those who do not know the labels. Also, it would be hard to organize considering some of the heuristics are covered by multiple categories. This makes the table cleaner and easier to understand and use.

| **Category** | **Heuristic** |
|---|---|
| Acquisition | When possible use cross-promotions through a closed network or your games |
| Acquisition | Provide rewards through invitation mechanics |
| Acquisition | Allow player sharing leaderboards and achievements through their timeline |
| Acquisition | To reach viralization by word-of-mouth, focus on provide a good gameplay |
| Acquisition | If possible use a popular IP to increase acquisition |
| Retention / Acquisition | Allow sharing of achievements to provide more competitive and exposure interactions |
| Retention / Acquisition | Allow players to request help to other players and non-players |
| Retention / Acquisition | Allow players to gift other players and non-players |
| Retention | Use hidden achievements and provide good surprises to your player |
| Retention | Design predictable achievements to suggest what player should explore |
| Retention | When utilizing Location Triggers create a meaningful connection between the game world and the real world |
| Retention | Limited-Time Events should not happen very often or in big gaps |
| Retention | Do not use lengthy tutorials, instead that, present new mechanics through a progressive and intuitive learning process |
| Retention | Push Notifications should be used as an additional resource, but you should not have high hopes on it |
| Retention | Do not provide items with power level far beyond players' level |
| Retention | Provide great rewards for great efforts |
| Retention | Design leaderboards able to provide the sense of competition and progress |
| Retention | Design the clan system in a way that creates social commitment return |

| | |
|---|---|
| | triggers |
| Retention | Release new content with some frequency |
| Retention | Design the energy system to help control player game sessions |
| Retention | Design the time need to build new game resources to help control player game sessions |
| Retention | Reward better and progressively, players that keep returning with some frequency |
| Retention | Provide punishment or missing rewards for absent players |
| Retention / Monetization | Use time-limited rewards to increase revenue and control progression |
| Monetization / Retention | Design annuities to deliverer incrementally, offering a great deal for the final sum |
| Monetization / Retention | Allow players to reach same advantages, paying or not, at different paces |
| Monetization | If you are designing a narrative game, consider use content purchases |
| Monetization | Allow players to skip waiting time buying play accelerators |
| Monetization | Create special customization content to be bought by hard currency |
| Monetization | Balance soft currency to be abundant and hard currency to be limited |
| Monetization | When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing |
| Monetization | Consider using offer walls as an alternative to IAP |
| Monetization | Consider using print-on-demand services to sell physical goods by demand |
| Monetization | Provide rewards for players watching videos |
| Monetization | Provide an extra incentive to players subscribe as a VIP |
| Monetization | Provide lifetime rewards that improve as players keep the VIP subscription |
| Monetization | Use a *gacha* system to provide the excitement of the unknown and increase revenue |

Table 13. Baseline set of ARM heuristics for F2P Mobile Games (The Author)

### 5.2.2 Redefining Labels and Adding New Heuristics

As explained before, for this survey we selected three very experienced professionals, each one with over five years of experience in the game design area and at least more than one year working on F2P mobile games. They currently work in the United Kingdom, New Zealand, and Canada, and have a good and relevant experience in big game companies.

Through this questionnaire, we have identified twenty-two heuristics we are adding on our set of ARM heuristics for F2P mobile games. These new heuristics cover an additional of eighteen extra elements from our framework. These new additional elements are: *Points*, *Sharing of Achievements*, *Visiting Other Players*, *Challenge Invitation*, *Community Management (Social Aspects)*, *Competition Environment*, *Cooldown*, *Countdown Timer*, *Community Management* (Viral), *Natural Organic Installs*, *Offer Walls*, *Non-Game Media Advertising*, *Up-Sells*, *Discounts*, *Collectible Collection*, *Banner Ads*, *Interstitial Ads*, *Product Placement*.

The new heuristics identified are presented below, with their categories indicated in parentheses:

- Provide more points as the way a player levels up, however the thresholds needed to level up should increase even faster (Retention);
- Design any type of score to also be a social aspect, allowing players to share, compare and use it in any other vanity way (Retention);
- Create achievements as a meaningful social proof, to make it more effective as a social mechanism (Retention);
- Allow players to interact while visiting other players (Retention);
- Make challenge invitation easy and simple to start (Retention);
- Be careful rewarding through challenge invitation, it can lead to exploits (Retention);

- Build a trustful group of volunteer moderators from the community and give to them tools to do good community management work (Retention / Acquisition);
- In competitive environments, make winning always meaningful, and the defeat doesn't punish low-level players (Retention);
- Design cooldowns in such a way as to minimize windows of inaction to the player (Retention);
- When designing a countdown timer make sure it is visible to the player, the more visible it is, the tenser it will make them (Retention);
- Use keyword optimization to acquire better rates of natural organic installs (Acquisition);
- When advertising in non-game media, focus on what media your target demographic consumes, as targeting anywhere else is a waste of money (Acquisition);
- Avoid breaking the flow when using offer walls since players might have to leave the app to complete them (Monetization);
- Offer better deals for bigger buying (Monetization);
- Announce your discounts loudly (Monetization);
- After a currency sale, provide ways to player spend faster (Monetization);
- Increase the player odds for getting a very rare item, every time they get a non-rare item (Monetization / Retention);
- When using banner ads make sure they do not interrupt gameplay (Monetization);
- Offer distinct rewards for players watching interstitial ads (Monetization);
- Do not force players to watch ads (Monetization / Retention);

- Only use product placement when you have a good relevant deal (Monetization);
- Be careful with potential exploits when designing gifting mechanics (Retention).

Furthermore, we also identified the need to make some changes in the current set of heuristics, as described below:

- We changed “Allow player sharing leaderboards and achievements through their timeline” to “Allow players to share leaderboards and achievements through their social media timeline”;
- We changed “Push Notifications should be used as an additional resource, but you should not have high hopes on it” to “Push Notifications should be used as an additional resource, but you should not have high hopes for them”;
- We changed “Release new content with some frequency” to “Release new content at least at the rate it is being consumed by top players”;
- We changed “Design the energy system to help control player game sessions” to “Design the energy system in a way it helps to control player game sessions”;
- We changed “Design the time need to build new game resources to help control player game sessions” to “Design the time needed to build new game resources in a way it helps to control player game sessions”;
- We changed “Reward better and progressively, players that keep returning with some frequency” to “Reward frequently returning players better and progressively, to keep them returning”;
- We changed “Provide punishment or missing rewards for absent players” to “Provide missing rewards for absent players”;

- We changed “If you are designing a narrative game, consider use content purchases” to “If you are designing a narrative game, consider using content purchases”;
- We changed “Allow players to skip waiting time buying play accelerators” to “Allow players to skip waiting through the purchase of time acceleration and skips”;
- We changed “Allow players to reach same advantages, paying or not, at different paces” to “Allow players to eventually, taking more time, reach the same advantages as paying players”;
- We changed “Create special customization content to be bought by hard currency” to “Create special customization content to be bought with hard currency”;
- We changed “Balance soft currency to be abundant and hard currency to be limited” to “Balance soft currency to be abundant (but balanced) and hard currency to be limited”;
- We changed “Design annuities to deliverer incrementally, offering a great deal for the final sum” to “Design annuities to deliver incrementally, offering a great deal for the final sum”.
- We changed “Use time-limited rewards to increase revenue and control progression” to “Use Time Gated Rewards to increase revenue and control progression”

In this second version of our set of heuristics, we are covering fifty-two out of the fifty-nine elements of our ARM Framework for F2P Mobile Games, version 1.0. The second version of the proposed set of ARM heuristics for F2P Mobile Games, presented in table 14, has fifty-nine heuristics.

| **Category** | **Heuristic** |
|---|---|
| Acquisition | When possible use cross-promotions through a closed network or your |

| | |
|---|---|
| | games |
| Acquisition | Provide rewards through invitation mechanics |
| Acquisition | Allow player sharing leaderboards and achievements through their social media timeline |
| Acquisition | To reach viralization by word-of-mouth, focus on provide a good gameplay |
| Acquisition | If possible use a popular IP to increase acquisition |
| Acquisition | Use keyword optimization to acquire better rates of natural organic installs |
| Acquisition | When advertising in non-game media, focus on what media your target demographic consumes, anywhere else is to waste money |
| Retention / Acquisition | Allow sharing of achievements to provide more competitive and exposure interactions |
| Retention / Acquisition | Allow players to request help to other players and non-players |
| Retention / Acquisition | Allow players to gift other players and non-players |
| Retention / Acquisition | Build a trustful group of volunteer moderators from the community and give to them tools to do good community management work |
| Retention | Use hidden achievements and provide good surprises to your player |
| Retention | Design predictable achievements to suggest what player should explore |
| Retention | When utilizing Location Triggers create a meaningful connection between the game world and the real world |
| Retention | Limited-Time Events should not happen very often or in big gaps |
| Retention | Do not use lengthy tutorials, instead that, present new mechanics through a progressive and intuitive learning process |
| Retention | Push Notifications should be used as an additional resource, but you should not have high hopes on them |
| Retention | Do not provide items with power level far beyond players' level |
| Retention | Provide great rewards for great efforts |
| Retention | Design leaderboards able to provide the sense of competition and progress |
| Retention | Design the clan system in a way that creates social commitment return triggers |
| Retention | Release new content at least at the rate it is being consumed by top players |

| | |
|---|---|
| Retention | Design the energy system in a way it helps to control player game sessions |
| Retention | Design the time needed to build new game resources in a way it helps to control player game sessions |
| Retention | Reward frequently returning players better and progressively, to keep them returning |
| Retention | Provide missing rewards to absent players |
| Retention | Provide more points as the way a player levels up, however, the thresholds needed to level up should increase even faster |
| Retention | Design any type of score to also be a social aspect, allowing players to share, compare and use it in any other vanity way |
| Retention | Create achievements as a meaningful social proof, to make it more effective as a social mechanism |
| Retention | Allow players to interact while visiting other players |
| Retention | Make challenge invitation easy and simple to start |
| Retention | Be careful rewarding through challenge invitation, it can lead to exploits |
| Retention | In competitive environments, make winning always meaningful, and the defeat doesn't punish low-level players |
| Retention | Design cooldowns in such a way as to minimize windows of inaction to the player |
| Retention | When designing a countdown timer make sure it is visible to the player, the more visible it is, the tenser it will make them |
| Retention | Be careful with potential exploits when designing gifting mechanics |
| Retention / Monetization | Use time gated rewards to increase revenue and control progression |
| Monetization / Retention | Design annuities to deliver incrementally, offering a great deal for the final sum |
| Monetization / Retention | Allow players to eventually, taking more time, reach the same advantages as paying players |
| Monetization / Retention | Increase the player odds to get a very rare item, every time they get a non-rare item |
| Monetization / Retention | Do not force players to watch ads |
| Monetization | If you are designing a narrative game, consider using content purchases |
| Monetization | Allow players to skip waiting through the purchase of time acceleration and skips |

| | |
|---|---|
| Monetization | Create special customization content to be bought with hard currency |
| Monetization | Balance soft currency to be abundant (but balanced) and hard currency to be limited |
| Monetization | When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing |
| Monetization | Consider using offer walls as an alternative to IAP |
| Monetization | Consider using print-on-demand services to sell physical goods by demand |
| Monetization | Provide rewards for players watching videos |
| Monetization | Provide an extra incentive to players subscribe as a VIP |
| Monetization | Provide lifetime rewards that improve as players keep the VIP subscription |
| Monetization | Use a gacha system to provide the excitement of the unknown and increase revenue |
| Monetization | Avoid breaking the flow when using offer walls, since players might have to leave the app to complete them |
| Monetization | Offer better deals for bigger buying |
| Monetization | Announce your discounts loudly |
| Monetization | After a currency sale, provide ways to player spend faster |
| Monetization | When using banner ads make sure they do not interrupt gameplay |
| Monetization | Offer distinct rewards for players watching interstitial ads |
| Monetization | Only use product placement when you have a good relevant deal |

Table 14. Second version of the Set of ARM heuristics for F2P Mobile Games (The Author)

### 5.2.3 Second Survey - Data Analysis and Designing 1.0 Version of the Set of ARM Heuristics for F2P Mobile Games

This survey was applied to professionals with at least 1 year of experience working in the game industry and some experience working on F2P mobile games. However, as displayed in figure 19, 77.5% of the interviewees have been working in the

game industry for at least 5 years, 17.5% between 3 and 5 years, and 5% between 1 and 3 years.

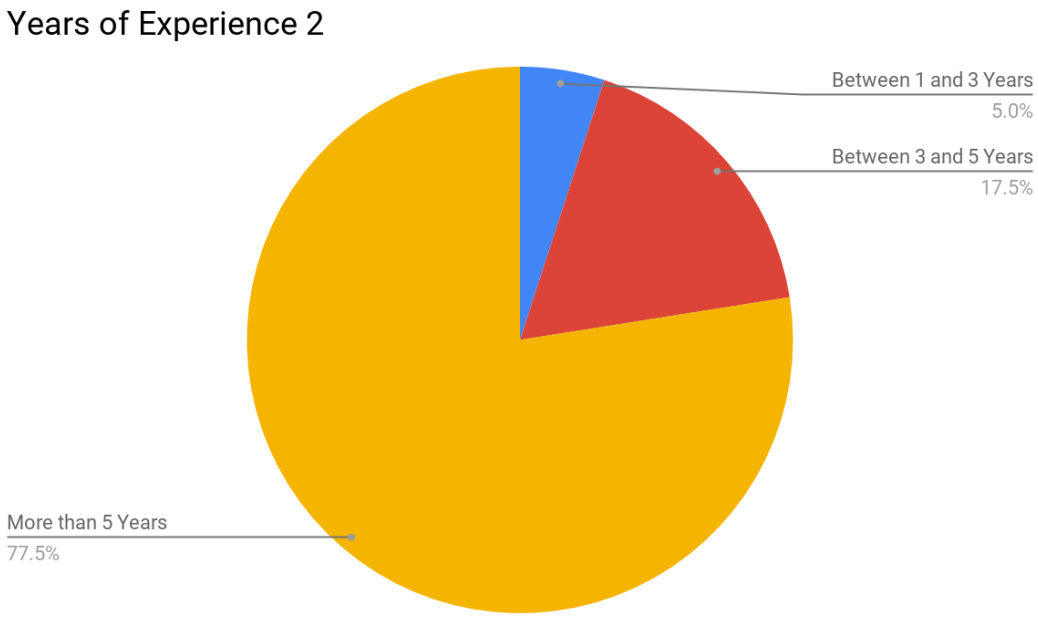


Figure 19. Years of experience the interviewees have been working on the game industry 2 (The Author)

Figure 20 displays for how long the interviewees have been working on F2P mobile games. 40.5% of the interviewees have been working for at least 5 years, 28.6% between 1 and 3 years, 28.6% between 3 and 5 years, and 2.4% for less than 1 year. As perceived, the answers demonstrate that most of the interviewees have over 5 years of experience working in the game industry and over 3 years working on F2P mobile games.

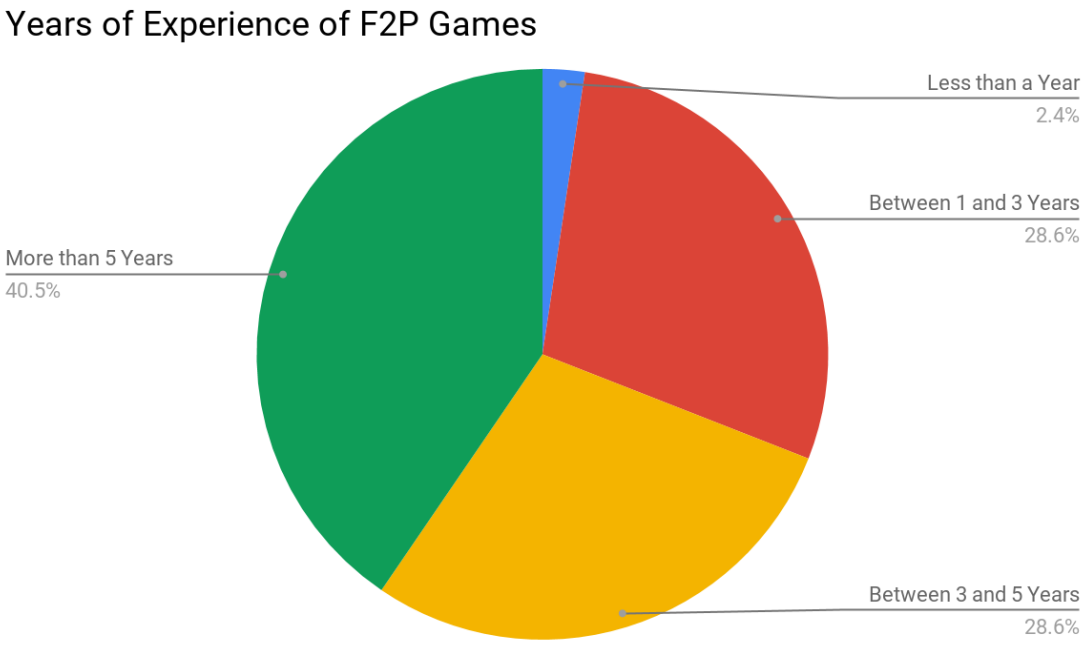


Figure 20. Years of experience the interviewees have been working on F2P Mobile Games (The Author)

Through the results of this questionnaire, we obtained the average score of each heuristic following the process explained in section 4.2.3. The average score of each heuristic is presented in table 15.

| **Heuristic** | **Average Score** |
|---|---|
| When possible use cross-promotions through a closed network or your games | 4.24 |
| Provide rewards through invitation mechanics | 4.17 |
| Allow player sharing leaderboards and achievements through their social media timeline | 3.95 |
| To reach viralization by word-of-mouth, focus on provide a good gameplay | 4.43 |
| If possible use a popular IP to increase acquisition | 3.76 |
| Use keyword optimization to acquire better rates of natural organic installs | 4.48 |
| When advertising in non-game media, focus on what media your target demographic consumes, anywhere else is to waste money | 3.6 |
| Allow sharing of achievements to provide more competitive and exposure interactions | 3.76 |
| Allow players to request help to other players and non-players | 3.9 |

| | |
|---|---|
| Allow players to gift other players and non-players | 4.19 |
| Build a trustful group of volunteer moderators from the community and give to them tools to do good community management work | 3.74 |
| Use hidden achievements and provide good surprises to your player | 3.69 |
| Design predictable achievements to suggest what player should explore | 4.45 |
| When utilizing Location Triggers create a meaningful connection between the game world and the real world | 3.69 |
| Limited-Time Events should not happen very often or in big gaps | 2.93 |
| Do not use lengthy tutorials, instead that, present new mechanics through a progressive and intuitive learning process | 4.67 |
| Push Notifications should be used as an additional resource, but you should not have high hopes on them | 3.64 |
| Do not provide items with power level far beyond players' level | 3.52 |
| Provide great rewards for great efforts | 4.31 |
| Design leaderboards able to provide the sense of competition and progress | 4.55 |
| Design the clan system in a way that creates social commitment return triggers | 4.4 |
| Release new content at least at the rate it is being consumed by top players | 3.79 |
| Design the energy system in a way it helps to control player game sessions | 3.57 |
| Design the time needed to build new game resources in a way it helps to control player game sessions | 3.74 |
| Reward frequently returning players better and progressively, to keep them returning | 4.24 |
| Provide missing rewards to absent players | 3.43 |
| Provide more points as the way player levels up, however, the thresholds needed to level up should increase even faster | 3.71 |
| Design any type of score to also be a social aspect, allowing players to share, compare and use it in any other vanity way | 3.86 |
| Create achievements as a meaningful social proof, to make it more effective as a social mechanism | 3.98 |
| Allow players to interact while visiting other players | 4.05 |
| Make challenge invitation easy and simple to start | 4.14 |
| Be careful rewarding through challenge invitation, it can lead to exploits | 3.79 |
| In competitive environments, make winning always meaningful, and the defeat doesn't | 4.36 |

| | |
|---|---|
| punish low-level players | |
| Design cooldowns in such a way as to minimize windows of inaction to the player | 3.98 |
| When designing a countdown timer make sure it is visible to the player, the more visible it is, the tenser it will make them | 3.69 |
| Be careful with potential exploits when designing gifting mechanics | 4.24 |
| Use time gated rewards to increase revenue and control progression | 3.95 |
| Design annuities to deliver incrementally, offering a great deal for the final sum | 3.71 |
| Allow players to eventually, taking more time, reach the same advantages as paying players | 4.21 |
| Increase the player odds to get a very rare item, every time they get a non-rare item | 3.48 |
| Do not force players to watch ads | 3.9 |
| If you are designing a narrative game, consider using content purchases | 3.81 |
| Allow players to skip waiting through the purchase of time acceleration and skips | 4.43 |
| Create special customization content to be bought with hard currency | 4.36 |
| Balance soft currency to be abundant (but balanced) and hard currency to be limited | 4.17 |
| When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing | 4.21 |
| Consider using offer walls as an alternative to IAP | 3.36 |
| Consider using print-on-demand services to sell physical goods by demand | 3.05 |
| Provide rewards for players watching videos | 4.29 |
| Provide an extra incentive to players subscribe as a VIP | 4.45 |
| Provide lifetime rewards that improve as players keep the VIP subscription | 4.26 |
| Use a gacha system to provide the excitement of the unknown and increase revenue | 3.81 |
| Avoid breaking the flow when using offer walls since players might have to leave the app to complete them | 4.07 |
| Offer better deals for bigger buying | 4.48 |
| Announce your discounts loudly | 4.38 |
| After a currency sale, provide ways to player spend faster | 4.29 |
| When using banner ads make sure they do not interrupt gameplay | 4.55 |
| Offer distinct rewards for players watching interstitial ads | 3.79 |

| | |
|---|---|
| Only use product placement when you have a good relevant deal | 3.88 |

Table 15. Average Score of the Set of ARM heuristics for F2P Mobile Games (The Author)

Considering that, we keep only the heuristics that reach at least 4 in the average score. We also made some minor changes, considering an extra grammar review. As explained below:

- We changed “Allow players to skip waiting through the purchase of time acceleration and skips” to “Allow players to skip waiting by purchasing time acceleration and skips”;
- We changed “To reach viralization by word-of-mouth, focus on provide a good gameplay” to “To reach viralization by word-of-mouth, focus on providing a good gameplay”;
- We changed “After a currency sale, provide ways to player spend faster” to “After a currency sale, provide ways for players to spend faster”;
- We changed “Provide an extra incentive to players subscribe as a VIP” to “Provide an extra incentive for players to subscribe as a VIP”;
- We changed “Design predictable achievements to suggest what player should explore” to “Design predictable achievements to suggest what players should explore”;
- We changed “Do not use lengthy tutorials, instead that, present new mechanics though a progressive and intuitive learning process” to “Do not use lengthy tutorials, instead of that, present new mechanics through a progressive and intuitive learning process”;
- We changed “In competitive environments, make winning always meaningful, and the defeat doesn't punish low-level players” to “In competitive environments, make winning always meaningful, and the defeat so it doesn't punish low-level players”.

Therefore, the final version of the set of heuristics for F2P mobile games is presented in table 16, with twenty-eight heuristics.

| Category | Heuristic |
|---|---|
| Acquisition | When possible use cross-promotions through a closed network or your games |
| Acquisition | Provide rewards through invitation mechanics |
| Acquisition | To reach viralization by word-of-mouth, focus on providing a good gameplay |
| Acquisition | Use keyword optimization to acquire better rates of natural organic installs |
| Retention / Acquisition | Allow players to gift other players and non-players |
| Retention | Design predictable achievements to suggest what players should explore |
| Retention | Do not use lengthy tutorials, instead of that, present new mechanics through a progressive and intuitive learning process |
| Retention | Provide great rewards for great efforts |
| Retention | Design leaderboards able to provide the sense of competition and progress |
| Retention | Design the clan system in a way that creates social commitment return triggers |
| Retention | Reward frequently returning players better and progressively, to keep them returning |
| Retention | Allow players to interact while visiting other players |
| Retention | Make challenge invitation easy and simple to start |
| Retention | In competitive environments, make winning always meaningful, and the defeat so it doesn't punish low-level players |
| Retention | Be careful with potential exploits when designing gifting mechanics |
| Monetization / Retention | Allow players to eventually, taking more time, reach the same advantages as paying players |
| Monetization | Allow players to skip waiting by purchasing time acceleration and skips |
| Monetization | Create special customization content to be bought with hard currency |
| Monetization | Plan soft currency to be abundant (but balanced) and hard currency to be limited |
| Monetization | When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing |
| Monetization | Provide rewards for players watching videos |

| | |
|---|---|
| Monetization | Provide an extra incentive for players to subscribe as a VIP |
| Monetization | Provide lifetime rewards that improve as players keep the VIP subscription |
| Monetization | Avoid breaking the flow when using offer walls, since players might have to leave the app to complete them |
| Monetization | Offer better deals for bigger buying |
| Monetization | Announce your discounts loudly |
| Monetization | After a currency sale, provide ways for players to spend faster |
| Monetization | When using banner ads make sure they do not interrupt gameplay |

Table 16. Set of ARM heuristics for F2P Mobile Games (The Author)

It is also important to say that, based on the feedback provided by some interviewees, through the open question, at the end of this questionnaire, we could identify that some of the heuristics probably did not reach a better average score because they are not appropriate for any kind of market, or even because they are not good options for any type of game genre.

In addition, this version of our set of heuristics is the final version of this work, but we will keep developing it, after this work, based on the feedback of game market professionals, the related literature, and the new trends of the F2P mobile game market.

## 6. CONCLUSION

F2P games have been growing a lot in the mobile game market, representing a big slice of the top grossing market in the game industry. With that in mind, new techniques to understand the player behavior have been arising, allowing game design professionals to create F2P games better adapted to this specific market.

Related to that, acquisition, retention, and monetization compose a framework that allow professionals to understand how new players are acquired, how to keep them playing the game, and how to monetize them. In F2P games this framework, called ARM funnel, has some specific traits since the player can acquire this kind of game first and spend money on it later. It is important to F2P game designers to properly understand the ARM structure to maximize the chances to build better solutions.

However, there are not many academic, or even from the industry, theoretical works focused on helping the design of F2P mobile games, leaving considerable room for contribution. Thus, it is important to create formal specific solutions to help game designers when designing mobile F2P games.

After considering the main author's personal motivation, professional background as game designer and game producer, and interest for elements related to the design of F2P games, the research has delved into the literature regarding the insertion of design activity in such context of practice created by F2P mobile games. His objective was to uncover possible research opportunities as this way of designing F2P games has a particular approach to problem-solving and product development, which clashes directly with classical ways of designing games. It is expected that this also brings some implications to game design practice. The most relevant information we found from several other literature reviews in this context are: some non-organized potential elements of ARM in F2P games and mobile games; and, again, non-organized guidelines and best practices, for designing ARM in F2P games and mobile games.

Thus, our research has been focused on tooling the ARM design in F2P mobile games with structured theoretical assistance, to make game design teams more capable of addressing F2P mobile games. We did so by reviewing the related literature

and a sequence of questionnaires applied to game industry professionals. More specifically, we hypothesized that an ARM framework, and a set of ARM heuristics for F2P mobile games, would prove useful to this end. During our research, we have looked for a structured framework that provides ARM mobile F2P elements and a specific set of heuristics for F2P ARM mobile game design, without success.

In order to create specific tools and assess their capabilities to assist mobile F2P game designers our research was divided into two big studies.

Study 1 was focused on the creation and evaluation of an ARM framework for F2P mobile games to provide a relevant set of elements to be considered when designing this kind of game. We conducted this through a literature review and analysis, as well as two specific questionnaires applied to game industry professionals. What we found was an ARM Framework for F2P Mobile Games with three main categories, eight subcategories, and fifty-nine elements, as can be checked in figure 18. To conduct these investigations, we performed open interviews with open and Likert questions, in which we could identify new elements, as well as perceive new ways to develop the framework. We have conducted these interviews with professionals from many parts of the world to avoid some regional game design trends. From such results, we concluded that our developed ARM framework properly covered the ARM categories, elements, and techniques in F2P mobile games. Also, there are good indications that this framework could be useful when designing ARM elements in F2P mobile games.

Figure 21 illustrates the build process of the ARM framework for F2P mobile games, developed in Study 1. After the literature research we identified a baseline ARM framework with forty-five elements. Then, after a comprehension test, we got the second version of our ARM framework, with fourteen adjusted elements and a new element. As the final step, after the framework evaluation, we have the version 1.0 of the ARM framework, with an addition of thirteen new elements and removing a previous one.

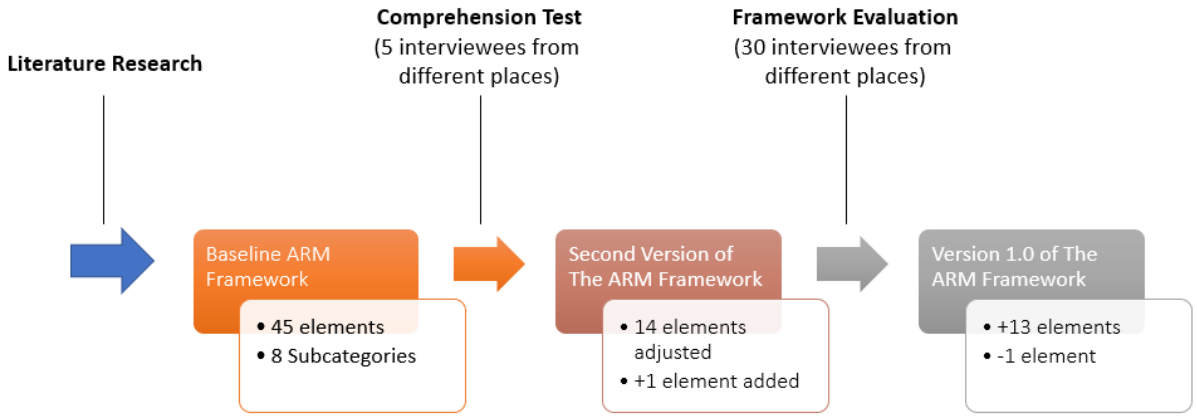


*Figure 21. The build process of the ARM framework for F2P mobile games (The Author)*

Study 2 was focused on the creation and evaluation of a set of ARM heuristics for F2P mobile games, to provide a relevant group of best practices to be considered when designing this kind of game. We conducted this through a literature review and analysis, as well as two specific questionnaires applied to game industry professionals. What we found was a set of twenty-eight heuristics, divided into three main categories, where there are two heuristics that are part of two categories at the same time. To conduct these investigations, we performed open interviews with open and Likert questions, in which we could identify new heuristics, as well as perceive new ways to develop our set. We have conducted these interviews with professionals from many parts of the world to avoid some regional game design trends. From such results, we concluded that our developed set is composed of only well-accepted ARM heuristics by game design professionals.

Figure 22 illustrates the build process of the set of ARM heuristics for F2P mobile games, developed in Study 2. After the literature research we identified a baseline set of ARM heuristics with thirty-seven heuristics. Then, after the first survey, we got the second version of the set of ARM heuristics, with fourteen changes, and an additional of twenty-two heuristics. As the final step, after the heuristics evaluation, we have the final version of our set of heuristics, with seven changes, and removing thirty-one heuristics.

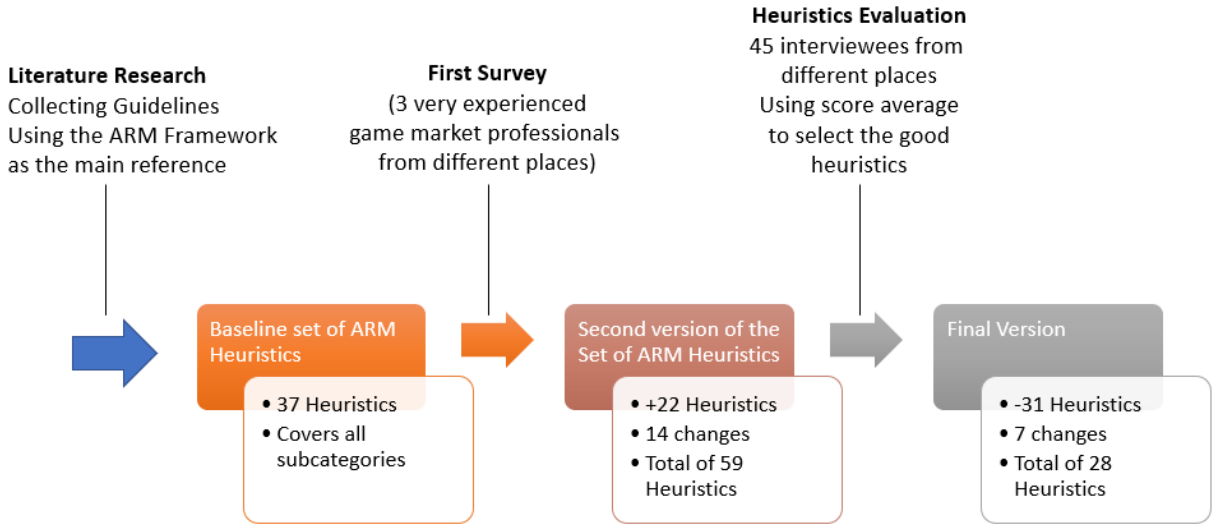


*Figure 22. The build process of the set of ARM heuristics for F2P mobile games (The Author)*

It is important to consider that, based on some feedback from the interviewees, some heuristics could work better, or worse, in different markets or in different game genres.

Neither the framework nor the set of heuristics were targeted to be used as the definitive way to create mobile F2P games. They are just tools that were constructed to help the game designer work, providing some common solutions and elements used in the mobile F2P game industry.

## 6.1 CONTRIBUTIONS

Considering all our results, we can conclude that our framework provides good coverage of ARM elements in F2P mobile games. We can also conclude that our set of heuristics delivers a group of recommendations for the design of F2P mobile games with which, on average, game market professionals agree on.

Based on our research and results, we believe our framework can be helpful for game designers as a checklist of possibilities in F2P mobile games, or as part of the creative process.

Furthermore, our developed set of heuristics can provide a structured and well-accepted group of guidelines, and best practices, to help new and experienced game designers when planning F2P mobile games. In addition, this set can be used as an academic reference, providing a structured way to organize heuristics specifically designed for ARM elements in F2P mobile games, since we didn't find anything similar during our research.

It is also necessary to consider that the academic room for contributions, about this specific field, is very large since we have extremely scarce academic literature about it. So, this work itself is directly contributing to creating the academic basis for ARM in F2P mobile games.

## 6.2 LIMITATIONS AND FUTURE DIRECTIONS

Although we did our best while applying the questionnaires, it would be interesting to directly apply and verify the results to the design process of real F2P mobile games. Furthermore, to be more precise, it would be interesting to apply these tools to companies from around the world to get a better feedback, avoiding regional trends. So, we have used an approach more focused on worldwide professional opinion.

Since we didn't test the use of the ARM framework for F2P mobile games as a design tool, and we were more focused on its use as a schematic map of possibilities in ARM F2P mobile game design, it is necessary to conduct further studies to more accurately verify how this framework can help the game design process in this kind of game.

We had a good feedback in which 50% of the interviewees agreed, and 20% of the interviewees strongly agree, that this framework is useful for mobile ARM game

design, but we are looking for better results, i.e. reaching the average score of 4 as in the method proposed by Greenacre (2017). We had a better approval rating when talking about how much interviewees agreed that this framework properly covers the ARM elements, in which 60% agreed and 20% strongly agreed.

Maybe some tests, where professional game designers use this framework, or a more evolved version of it, as a checklist, or part of the creative process, can help us to have better insights about its specific use and how to better adapt it. Furthermore, we will keep this framework under development, based on future literature reviews and new specialized professional feedback.

About our proposed set of heuristics for F2P mobile games, we are only keeping well-evaluated heuristics that obtained at least 4 as the average score in each one of them.

However, some of the deleted heuristics were indicated as good for some markets and bad for others. The same thing was indicated considering game genres. Therefore, as a future research, new sets of heuristics must be developed focusing on specific markets or game genres. This would be very useful, considering some markets are extremely important but present specific barriers that could be broken using a good and appropriated game design.

As the trends of F2P mobile games are constantly arising, new techniques are emerging, and related elements are always being discovered. Considering that, to keep our set of heuristics updated, the game development community feedback can help us to pay attention to better ways of improving future updates and consider possible elements or guidelines that, in another way, would go unnoticed.

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## APPENDIX A - QUESTIONNAIRE OF UNDERSTANDING - ARM FRAMEWORK FOR F2P MOBILE GAMES

# Introduction

Hi! Thank you for collaborating with our evaluation.

The aim of this study is to improve a classification of an ARM framework for F2P Mobile Games, according to game design, producing, leading, and marketing professionals, with the objective of improving new mobile game's development process.

ARM refers to an analytic framework, often used to describe a business model, in mobile game industry. As an acronym, it means Acquisition, Retention, and Monetization, and it could be useful as an aid to understanding the business models related, and know how to design them. The acquisition is to attract new users to play the game, the retention is about keeping users playing the game, and monetization is how the game makes revenue

We ask you to answer these questions based on your professional opinion.

Answering this questionnaire takes about 20 minutes.

* Required

Email address *

Your email

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## Let's talk about Yourself

What's your name? *

Your answer

What's your gender? *

- ○ Male
- ○ Female

I have been working on the following areas in game industry... *

- ☐ Production
- ☐ Game Design
- ☐ Project Managament
- ☐ Game Programming
- ☐ Game Art
- ☐ Game & Data Analysis
- ☐ Business Development & Marketing
- ☐ Game Testing
- ☐ Sound Design
- ☐ Academic & Research

I work... *

- ○ in a Company
- ○ as a freelance professional

If you marked "work in a company in the last question"... what company are you working in?

Your answer

For how long time have you been working in the gaming industry? *

- ○ less than a year
- ○ between 1 and 3 years
- ○ between 3 and 5 years
- ○ more than 5 years

Do you have experience working on F2P Mobile Games? If yes, for how long time have you been working in F2P Mobile Games? *

- ○ none
- ○ less than a year
- ○ between 1 and 3 years
- ○ between 3 and 5 years
- ○ more than 5 years

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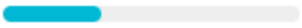

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## Let's talk about the proposal of an ARM Framework for F2P Mobile Games

Description: Below is the ARM Framework for F2P Mobile Games, proposed.

Then, in the first inner circle, there are the ARM main categories (Acquisition, Retention, Monetization). In the second inner circle (between the first inner circle and the extern circle) there are the subcategories: Viral; Non-Viral; Progress Systems; Social Aspects; Space and Time-Based Limitations; In-app Purchases; Advertising; Merchandise. In the last one, the external circle, there are all the elements proposed.

In the next sessions we are verifying your comprehension about these elements, based on the nomenclature used. We also provide the subclasses that each element belongs to, as well their descriptions.

You have to write a short description (1 or 2 sentences) for each element, based only on your knowledge and perception. You can also leave an example, if you want to illustrate it.

### ARM Framework for F2P Mobile Games


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## ACQUISITION

We are considering two main categories for acquisition: Viral; Non-Viral.

Note: write a short description for each element, based only on your knowledge and perception (You should explain what you understand as the meaning of these elements in this context, considering their categories).

## VIRAL

It brings new players which have been generated by existing users.

Invitation Mechanics *

Your answer

Timeline Social Features Sharing *

Your answer

Word of Mouth *

Your answer

Chart Position in Market Places *

Your answer

## NON-VIRAL

User sources are those that do not are generated by existing users.

Natural Organic Installs *

Your answer

Cross-Promotions *

Your answer

Offer Walls *

Your answer

Off Game/App Advertising *

Your answer

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# RETENTION

We are considering three main categories for Retention: Progress Systems; Social Aspects; Space and Time-Based Limitations.

Note: write a short description for each element, based only on your knowledge and perception (You should explain what you understand as the meaning of these elements in this context, considering their categories).

## Progress Systems

It is about the common elements used to manage progress, and how this progress is communicated to the player

### Achievements *

Your answer

### Points *

Your answer

### Leaderboards *

Your answer

### Levels *

Your answer

### Tutorial *

Your answer

### Objective *

Your answer

## Social Aspects

These are elements that support social interactions, allowing players to interact with each other

Leaderboards *

Your answer

Sharing of Achievements *

Your answer

Socializing *

Your answer

Help Request *

Your answer

Gifting *

Your answer

Challenges *

Your answer

Competition Sense *

Your answer

Cooperation Sense *

Your answer

## Space and Time-Based Limitations

A set of techniques and game dynamics used in to control the length of game sessions

Energy System *

Your answer

Time to Complete *

Your answer

Cooldown *

Your answer

Reward for Replay *

Your answer

Punishment for Absence *

Your answer

Limited-Time Events *

Your answer

Come Back Message *

Your answer

Location Triggers *

Your answer

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# MONETIZATION

We are considering three main categories for Monetization: In-app Purchases; Advertising; Space and Time-Based Merchandise.

Note: write a short description for each element, based only on your knowledge and perception (You should explain what you understand as the meaning of these elements in this context, considering their categories).

## In-app Purchases

Also known as microtransactions, they are purchases made by a player to acquire virtual goods or virtual currencies, items or usable resources in a game

### Virtual Currencies *

Your answer

### Content *

Your answer

### Play Accelerators *

Your answer

### Competitive Advantage *

Your answer

### Customization *

Your answer

### Collectibles *

Your answer

### Gifts *

Your answer

### Store Cards *

Your answer

## Advertising

Provided ads by third-party suppliers that pay publishers on the number of impressions (interactions or exhibitions)

Banner ADS *

Your answer

Interstitial ADS *

Your answer

Video ADS *

Your answer

Offer Walls *

Your answer

Affiliate Linking *

Your answer

Product Placement *

Your answer

## Merchandise

That is the selling of physical goods associated with the game

Merchandise *

Your answer

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## APPENDIX B - QUESTIONNAIRE OF EVALUATION

# Introduction

Hi! Thank you for collaborating with our evaluation.

The aim of this study is to enhance a classification of an ARM framework for F2P Mobile Games, according to game design, producing, leading, and marketing professionals, with the objective of improving the free-to-play mobile games design process. This is the second survey related to this research, and might help to make more refined adjustments to the proposed framework.

ARM refers to an analytic framework, often used to describe a business model, in mobile game industry. As an acronym, it means Acquisition, Retention, and Monetization, and it could be useful as an aid to understanding the business models related, and know how to design them. The acquisition is to attract new users to play the game, the retention is about keeping users playing the game, and monetization is how the game makes revenue

We ask you to answer these questions based on your professional opinion.

Answering this questionnaire takes about 15 minutes.

* Required

Email address *

Your email

NEXT

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## Let's talk about Yourself

What's your name? *

Your answer

What's your gender? *

- ○ Male
- ○ Female

I have been working on the following areas in game industry... *

- ☐ Production
- ☐ Game Design
- ☐ Project Managament
- ☐ Game Programming
- ☐ Game Art
- ☐ Game & Data Analysis
- ☐ Business Development & Marketing
- ☐ Game Testing
- ☐ Sound Design
- ☐ Academic & Research

I work... *

- ○ in a Company
- ○ as a freelance professional

If you marked “work in a company in the last question”... what company are you working in?

Your answer

What country are you currently working in?

Your answer

For how long time have you been working in the gaming industry? *

- ◯ less than a year
- ◯ between 1 and 3 years
- ◯ between 3 and 5 years
- ◯ more than 5 years

Do you have experience working on F2P Mobile Games? If yes, for how long time have you been working in F2P Mobile Games? *

- ◯ none
- ◯ less than a year
- ◯ between 1 and 3 years
- ◯ between 3 and 5 years
- ◯ more than 5 years

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## Let's talk about the proposal of an ARM Framework for F2P Mobile Games

Below is the ARM Framework for F2P Mobile Games, proposed.

Then, in the first inner circle, there are the ARM main categories (Acquisition, Retention, Monetization). In the second inner circle (between the first inner circle and the outer circle) there are the subcategories: Viral; Non-Viral; Progress Systems; Social Aspects; Space and Time-Based Limitations; In-app Purchases; Advertising; Merchandise. In the last one, the external circle, there are all the elements proposed.

Below the framework, there is a link with a short explanation of each one of its elements, as well its subcategories.

Based on this framework, and its elements, you should answer the questions of this section.

### ARM Framework for F2P Mobile Games


## Framework Elements Explained

https://drive.google.com/open?id=1y39TiiPHkLkMaIFuCWd6tFZSMYMwDw7W

How much do you agree with this statement: "The way it is now, this framework seems to properly covers the ARM categories, elements and techniques"? *

- ○ Strongly Agree
- ○ Agree
- ○ Undecided
- ○ Disagree
- ○ Strongly Disagree

How much do you agree with this statement: "The way it is now, this framework seems to be very useful for design ARM for F2P mobile games"? *

- ○ Strongly Agree
- ○ Agree
- ○ Undecided
- ○ Disagree
- ○ Strongly Disagree

Do you believe that the proposed framework has elements or subcategories that should be adjusted? If yes, what should be done?

Your answer

Do you believe it's necessary to add some new element(s)? If yes, what? Where should it be placed?

Your answer

Do you have any other suggestion or commentary to say about the proposed framework?

Your answer

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## APPENDIX C - HEURISTIC SET IMPROVEMENT

# Introduction

Hi! Thank you for collaborating with the develop of our heuristic set.

The aim of this study is to improve a set of ARM heuristics for F2P Mobile Games, according to experienced game design, research, producing, and leading professionals, with the objective of improving the free-to-play mobile games design process. This is the first survey with professionals, related to this research, and might help to increase new heuristics to the proposed set.

ARM refers to an analytic framework, often used to describe a business model, in mobile game industry. As an acronym, it means Acquisition, Retention, and Monetization, and it could be useful as an aid to understanding the business models related, and know how to design them. The acquisition is to attract new users to play the game, the retention is about keeping users playing the game, and monetization is how the game makes revenue

We ask you to answer these questions based on your professional opinion.

Answering this questionnaire takes about 30 minutes.

* Required

Email address *

Your email

NEXT

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## Let's talk about Yourself

What's your name? *

Your answer

What's your gender? *

- ○ Male
- ○ Female

I have been working on the following areas in game industry... *

- ☐ Production
- ☐ Game Design
- ☐ Project Managament
- ☐ Game Programming
- ☐ Game Art
- ☐ Game & Data Analysis
- ☐ Business Development & Marketing
- ☐ Game Testing
- ☐ Sound Design
- ☐ Academic & Research

What country are you currently working in?

Your answer

For how long time have you been working in the gaming industry? *

- ◯ less than a year
- ◯ between 1 and 3 years
- ◯ between 3 and 5 years
- ◯ more than 5 years

Do you have experience working on F2P Mobile Games? If yes, for how long time have you been working in F2P Mobile Games? *

- ◯ none
- ◯ less than a year
- ◯ between 1 and 3 years
- ◯ between 3 and 5 years
- ◯ more than 5 years

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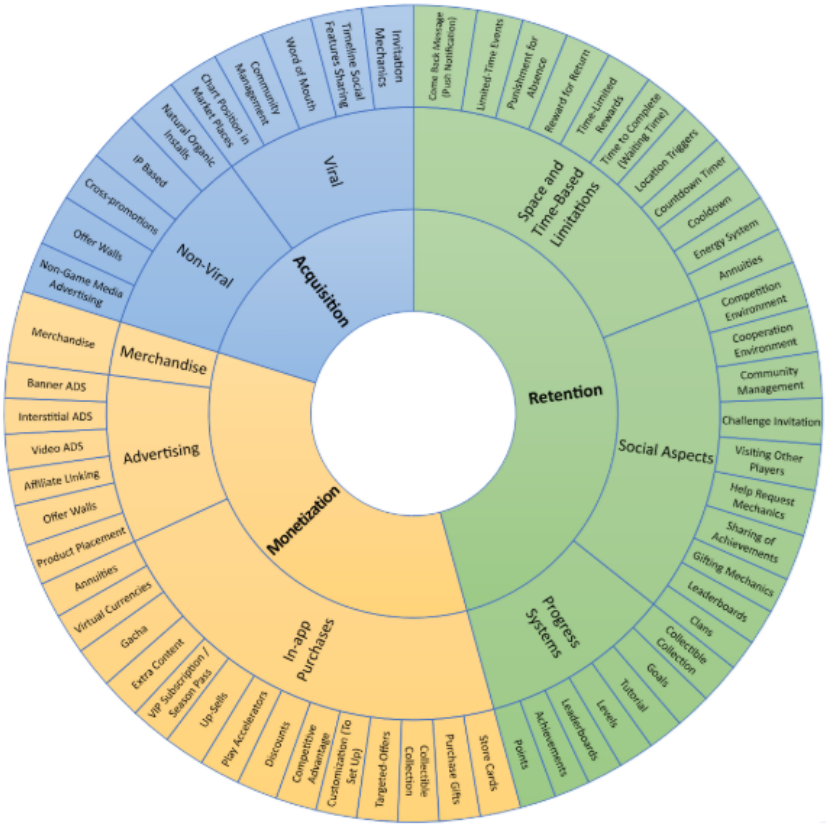
## Let's suggest some ARM F2P Mobile Guidelines

In this session we are asking you to suggest some guidelines, hints, or best practices, related to the design of ARM in F2P Mobile Games.
We are going to ask your to suggest guidelines for specific elements that are part of our ARM Mobile F2P framework, following bellow.

### ARM Framework for F2P Mobile Games V.1.0




Note: For consulting, the elements of this framework are explained in the table presented at the following link:
https://www.dropbox.com/s/cppbsuv2tnf4cyc/Set%20of%20ARM%20Heuristics%20for%20F2P%20Mobile%20Games.pdf?dl=0

**Then... What ARM guidelines can you suggest to design the following elements for F2P Mobile Games?**

Note: It is not necessary to provide suggestions to each one

Points (Progress Systems)

Your answer

Sharing of Achievements (Social Aspects)

Your answer

Visiting Other Players (Social Aspects)

Your answer

Challenge Invitation (Social Aspects)

Your answer

Community Management (Social Aspects)

Your answer

Competition Environment (Social Aspects)

Your answer

Cooldown (Space and Time-Based Limitations)

Your answer

Countdown Timer (Space and Time-Based Limitations)

Your answer

Community Management (Viral)

Your answer

Chart Position in Market Places (Viral)

Your answer

Natural Organic Installs (Non-Viral)

Your answer

Offer Walls (Non-Viral)

Your answer

Non-Game Media Advertising (Non-Viral)

Your answer

Up-Sells (In-app Purchases)

Your answer

Discounts (In-app Purchases)

Your answer

Targeted-Offers (In-app Purchases)

Your answer

Collectible Collection (In-app Purchases)

Your answer

Purchase Gifts (In-app Purchases)

Your answer

Store Cards (In-app Purchases)

Your answer

Banner ADS (Advertising)

Your answer

Interstitial ADS (Advertising)

Your answer

Affiliate Linking (Advertising)

Your answer

Product Placement (Advertising)

Your answer

Do you have any other guideline to suggest, for any other element, listed or not, related to design ARM on F2P Mobile Games?

Your answer

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## Our set of heuristics until now

Bellow we present some heuristics we've created, only based on literature review. We'd like you just check if they are clear or not and also suggest changes to make it more clear (if necessary). For this time, we are not asking you to evaluate if these heuristics are valid or not.

### 1) When possible use cross-promotions through a closed network or your games

1.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

1.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

### 2) Provide rewards through invitation mechanics

2.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

2.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

### 3) Allow player sharing leaderboards and achievements through their timeline

3.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

3.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 4) To reach viralization by word-of-mouth, focus on provide a good gameplay

4.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

4.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 5) If possible use a popular IP to increase acquisition

5.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

5.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 6) When utilizing Location Triggers create a meaningful connection between the game world and the real world

6.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

6.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 7) Use hidden achievements and provide good surprises to your player

7.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

7.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 8) Design predictable achievements to suggest what player should explore

8.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

8.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 9) Allow sharing of achievements to provide more competitive and exposure interactions

9.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

9.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 10) Limited-Time Events should not happen very often or in big gaps

10.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

10.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 11) Allow players to request help to other players and non-players

11.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

11.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 12) Allow players to gift other players and non-players

12.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

12.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**13) Do not use lengthy tutorials, instead that, present new mechanics through a progressive and intuitive learning process**

13.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

13.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**14) Push Notifications should be used as an additional resource, but you should not have high hopes on it**

14.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

14.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**15) Do not provide items with power level far beyond players' level**

15.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

15.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 16) Provide great rewards for great efforts

16.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

16.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 17) Design leaderboards able to provide the sense of competition and progress

17.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

17.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 18) Design the clan system in a way that creates social commitment return triggers

18.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

18.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 19) Release new content with some frequency

19.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

19.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 20) Design the energy system to help control player game sessions

20.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

20.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 21) Design the time need to build new game resources to help control player game sessions

21.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

21.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 22) Reward better and progressively, players that keep returning with some frequency

22.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

22.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 23) Provide punishment or missing rewards for absent players

23.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

23.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 24) Use time-limited rewards to increase revenue and control progression

24.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

24.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**25) If you are designing a narrative game, consider use content purchases**

25.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

25.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**26) Allow players to skip waiting time buying play accelerators**

26.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

26.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**27) Allow players to reach same advantages, paying or not, at different paces**

27.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

27.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**28) Create special customization content to be bought by hard currency**

28.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

28.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**29) Balance soft currency to be abundant and hard currency to be limited**

29.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

29.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**30) When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing**

30.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

30.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 31) Consider using offer walls as an alternative to IAP

31.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

31.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 32) Consider using print-on-demand services to sell physical goods by demand

32.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

32.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 33) Provide rewards for players watching videos

33.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

33.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 34) Provide an extra incentive to players subscribe as a VIP

34.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

34.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 35) Provide lifetime rewards that improve as players keep the VIP subscription

35.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

35.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

## 36) Design annuities to deliverer incrementally, offering a great deal for the final sum

36.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

36.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

**37) Use a gacha system to provide the excitement of the unknown and increase revenue**

37.1- Is this heuristic clear enough? *

- ◯ Yes
- ◯ No

37.2- If you answered "No" to the last question, please, suggest a more clear explanation for the same idea, keeping it in a small sentence.

Your answer

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# APPENDIX D - HEURISTICS EVALUATION

## Introduction

Hi! Thank you for collaborating with the develop of our heuristic set.

The aim of this study is to improve a set of ARM heuristics for F2P Mobile Games, according to experienced game design, research, producing, and leading professionals, with the objective of improving the free-to-play mobile games design process. This is the second survey with professionals, related to this research, and might help to identify what heuristics should be taken out of the proposed set.

ARM refers to an analytic framework, often used to describe a business model, in mobile game industry. As an acronym, it means Acquisition, Retention, and Monetization, and it could be useful as an aid to understanding the business models related, and know how to design them. The acquisition is to attract new users to play the game, the retention is about keeping users playing the game, and monetization is how the game makes revenue

We ask you to answer these questions based on your professional opinion.

Answering this questionnaire takes about 10 minutes.

* Required

Email address *

Your email

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## Let's talk about Yourself

What's your name? *

Your answer

What's your gender? *

- ○ Male
- ○ Female

I have been working on the following areas in game industry... *

- ☐ Production
- ☐ Game Design
- ☐ Project Managament
- ☐ Game Programming
- ☐ Game Art
- ☐ Game & Data Analysis
- ☐ Business Development & Marketing
- ☐ Game Testing
- ☐ Sound Design
- ☐ Academic & Research

What country are you currently working in?

Your answer

For how long time have you been working in the gaming industry? *

- ○ less than a year
- ○ between 1 and 3 years
- ○ between 3 and 5 years
- ○ more than 5 years

Do you have experience working on F2P Mobile Games? If yes, for how long time have you been working in F2P Mobile Games? *

- ○ none
- ○ less than a year
- ○ between 1 and 3 years
- ○ between 3 and 5 years
- ○ more than 5 years

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## Evaluating our Set of ARM Heuristics

In this session we are asking you to evaluate how much you agree with the following presented heuristics related to F2P mobile games.

When possible use cross-promotions through a closed network or your games *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide rewards through invitation mechanics *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow player sharing leaderboards and achievements through their social media timeline *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

To reach viralization by word-of-mouth, focus on provide a good gameplay *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

If possible use a popular IP to increase acquisition *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Use keyword optimization to acquire better rates of natural organic installs *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

When advertising in non-game media, focus on what media your target demographic consumes, anywhere else is to waste money *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow sharing of achievements to provide more competitive and exposure interactions *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow players to request help to other players and non-players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow players to gift other players and non-players *

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

Build a trustful group of volunteer moderators from the community and give to them tools to do good community management work *

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

Use hidden achievements and provide good surprises to your player *(Achievements which the player does not have prior knowledge) *

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

Design predictable achievements to suggest what player should explore *(Achievements which the player have prior knowledge) *

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

When utilizing Location Triggers create a meaningful connection between the game world and the real world *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Limited-Time Events should not happen very often or in big gaps *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Do not use lengthy tutorials, instead that, present new mechanics through a progressive and intuitive learning process *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Push Notifications should be used as an additional resource, but you should not have high hopes on them *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Do not provide items with power level far beyond players' level *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide great rewards for great efforts *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design leaderboards able to provide the sense of competition and progress *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design the clan system in a way that creates social commitment return triggers *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Release new content at least at the rate it is being consumed by top players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design the energy system in a way it helps to control player game sessions *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design the time needed to build new game resources in a way it helps to control player game sessions *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Reward frequently returning players better and progressively, to keep them returning *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide missing rewards to absent players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide more points as the way player levels up, however, the thresholds needed to level up should increase even faster *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design any type of score to be also a social aspect, allowing players to share, compare and use it in any other vanity way *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Create achievements as a meaningful social proof, to make it more effective as a social mechanism *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow players to interact while visiting other players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Make challenge invitation easy and simple to start *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Be careful rewarding through challenge invitation, it can lead to exploits *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

In competitive environments, make winning always meaningful, and the defeat doesn't punish low-level players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design cooldowns in such a way as to minimize windows of inaction to the player *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

When designing a countdown timer make sure it is visible to the player, the more visible it is, the tenser it will make them *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Be careful with potential exploits when designing gifting mechanics *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Use time gated rewards to increase revenue and control progression *Rewards limited by time, where players need to wait until be able to receive more (like chests in Clash Royale) *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Design annuities to deliver incrementally, offering a great deal for the final sum *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow players to eventually, taking more time, reach the same advantages as paying players *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Increase the player odds to get a very rare item, every time they get a non-rare item *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Do not force players to watch ads *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

If you are designing a narrative game, consider using content purchases *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Allow players to skip waiting through the purchase of time acceleration and skips *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Create special customization content to be bought with hard currency *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Balance soft currency to be abundant (but balanced) and hard currency to be limited *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

When utilizing a single currency system, remember to place some items out of easy reach, to encourage purchasing *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Consider using offer walls as an alternative to IAP *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Consider using print-on-demand services to sell physical goods by demand *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide rewards for players watching videos *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide an extra incentive to players subscribe as a VIP *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Provide lifetime rewards that improve as players keep the VIP subscription *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Use a gacha system to provide the excitement of the unknown and increase revenue *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Avoid breaking the flow when using offer walls, since players might have to leave the app to complete them *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Offer better deals for bigger buying *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Announce your discounts loudly *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

After a currency sale, provide ways to player spend faster *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

When using banner ads make sure they do not interrupt gameplay *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Offer distinct rewards for players watching interstitial ads *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Only use product placement when you have a good relevant deal *

- ◯ Strongly Agree
- ◯ Agree
- ◯ Undecided
- ◯ Disagree
- ◯ Strongly Disagree

Do you have any specific suggestion (change, correction...) to any of the presented heuristics?

Your answer

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