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MOBILE APPLICATIONS: AN EMPIRICAL ANALYSIS OF THE MAIN APPLICATION STORES IN BRAZIL AND TWO CASE STUDIES

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I dedicate this work to my parents and brother.

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First, I thank my parents Silvio and Celia and my brother Mauricio for the unconditional support and patience all these years. Second, I thank my family and friends, with whom I have spent incredibly special moments in my life. Third, I thank all professors I have had for showing me the rough but pleasant path of knowledge and guiding me through it. Finally, I thank my grandmother Celina, who passed away in the middle of my journey overseas, for all the special moments we shared.

– Marcelo Cirelli

EPIGRAPH

“Live as if you were to die tomorrow. Learn as if you were to live forever.”

(Mahatma Gandhi)

ABSTRACT

Since the launch of the first Mobile application store that broadly introduced third-party applications in 2008, the Mobile application industry has been growing exponentially in terms of available content and revenue generation. This new scenario has brought up the need for business models more suitable for Mobile application organizations, and for methods to monitor the performance, dynamics, and evolution of applications and application stores. Several approaches to address these issues, such as the empirical analysis, have already been applied in countries like Italy and Turkey. This thesis aim is to assess the fundamental principles of the Mobile industry in Brazil through an empirical analysis, with focus on the Mobile application environment. The empirical analysis targets the two main Mobile application stores–namely Apple's AppStore and Google's Google Play. The findings show that, first, average prices of Mobile applications are higher on Google Play than on AppStore. Second, most of download and revenue generated through the application stores go to large developers, showing that currently there are very few winners in the Mobile application industry. Third, in-app purchase model has established itself as the preferred revenue model among developers on both application stores. Fourth, two alternative methods to reckon the number of daily downloads of top downloaded applications are presented; the estimates suggest that the top paid downloaded application on AppStore have approximately 30 times more daily downloads than the top one on Google Play. Finally, a market assessment analysis is performed in order to yield factual information for two Italian Mobile applications that were to be introduced in Brazil.

Keywords: Mobile applications. Mobile application stores. Empirical Analysis Approach. Mobile Business Models. Brazilian Mobile Market.

ABSTRACT (ITALIAN)

A partire dal lancio, nel 2008, del primo store per Applicazioni Mobile, che ha introdotto applicazioni di terze parti, il settore delle Mobile Applications è cresciuto in maniera esponenziale sia in termini di contenuto che di generazione di ricavi. Questo nuovo scenario ha introdotto la necessità di creare business models più adatti alle organizzazioni di Mobile Applications, e di metodi per monitorare le performance, le dinamiche, e l'evoluzione di applicazioni e Applications stores. Sono già stati sviluppati e applicati molti metodi per affrontare queste problematiche in paesi quali l'Italia e la Turchia. Questa tesi ha l'obiettivo di determinare i principi fondamentali dell'industria Mobile in Brasile attraverso un'analisi empirica, con un focus sull'ambiente delle mobile Applications. L'analisi empirica è basata su i due maggiori Applications store, ovvero Apple Store e Google Play. I risultati mostrano che, da un lato, i prezzi medi delle applicazioni mobile sono più alti su Google Play rispetto ad App Store e, dall'altro lato, che la maggior parte dei download e dei ricavi generati dalle applicazioni vanno a pochi, importanti, sviluppatori, mostrando che allo stato attuale ci sono ben pochi vincitori nell'industria delle Mobile Applications. Inoltre, il modello degli acquisti in-app risulta essere diventato il metodo di guadagno preferito dagli sviluppatori in entrambi gli stores. Sono poi presentati due metodi alternativi per calcolare il numero di download giornalieri delle applicazioni più scaricate; le stime suggeriscono che le applicazioni a pagamento maggiormente scaricate nell'App Store hanno un numero di download 30 volte maggiore rispetto alle migliori su Google Play. Infine, è presentata un'analisi di mercato per ottenere informazioni pratiche riguardo a due applicazioni mobile italiane che devono essere lanciate in Brasile.

Parole-chiave: Mobile applications. Mobile application stores. Empirical Analysis Approach. Mobile Business Models. Brazilian Mobile Market.

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LIST OF ABBREVIATIONS AND ACRONYMS

CSF (Critical Success Factors)

OS (Operating System)

B2B (Business-to-Business)

SWOT (Strengths, Weaknesses, Opportunities, Threats)

ARPU (Average Revenue Per User)

CTR (Click-Through-Rate)

TIM (Telecom Italia)

DENATRAN (Departamento Nacional de Trânsito)

KPI (Key Performance Indicators)

MNO (Mobile Network Operators)

STOF (Service, Technology, Organization, Finance)

PAAS (Platform as a Service)

ICT (Information and Communication Technology)

CONTENTS

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1 INTRODUCTION

1.1 Objectives

The thesis objectives can be divided into primary, or operational objectives on the one hand, and secondary, or strategic objectives on the other.

1.1.1 Operational Objectives

The operational objectives of this thesis are fourfold:

a) To provide a general overview of the smartphone and Mobile application markets both in Brazil and in the world.
b) To perform a critical empirical analysis of the two main application stores in Brazil, Apple's App Store and Google's Google Play.
c) To assess the fundamental elements of the *App Economy*[1] in both Brazilian and global ambits.
d) To support the introduction of two Italian Mobile apps into the Brazilian market: QuizPatente and AllMyTv.

1.1.2 Strategic Objectives

The strategic objectives leverage on the operational level to:

a) Assess current business opportunities and issues of the Brazilian Mobile market and to evaluate the critical success factors (CSF) for a Mobile application in Brazil.

[1] The concept of App Economy will be described in the Literature Review

b) Provide Mobile actors – either incumbents or new entrants – with general strategic guidelines to operate and achieve competitive advantage in the Brazilian Mobile Applications market.

1.2 **Motivations**

An empirical analysis is a way of gaining knowledge through experimentation. It can be used to validate an existing theory or (the case of this thesis) to assess relevant variables in a novel field in which there are still few widely accepted theories. There is little research about the Mobile industry in Brazil, especially focusing on smartphones and Mobile applications, because the Mobile industry is a relatively new and very dynamic research area.

There are two main aspects that motivate this and other researches on the Mobile industry. First, the Mobile industry is becoming broader over time as technology breakthroughs arise and new Mobile businesses are brought to life. The rising strategic complexity in the broad Mobile industry challenges both professionals and scholars in terms of future trends, new opportunities, and strategic issues such as long-term investment decisions. Second, one of the emerging markets in the Mobile industry is the Mobile application market, with several heterogeneous players cooperating and competing against one another at the same time, arising complex strategic problems and causing an upheaval in the Mobile industry paradigms.

There are various questions regarding the new Mobile applications market that this thesis try to address, such as (1) How to tackle the emerging Mobile market segment? (2) How to create value for customers and companies through a Mobile app? (3) Which factors and key actors a firm should be related with so as to increase the chances of market success?

As one can see, the Mobile industry is clearly demanding a closer link between scholars and professionals, in order to assess operational figures of the current scenario, detect new opportunities and trends, and develop new business models and ideas. It is a very promising area both in terms of income generation and development of

new managerial theories. Currently, there are many interesting gaps in this research field, and this thesis tries to fill some of them.

1.3 **Rationale**

The rationale describes in detail how each step of the empirical analysis was performed. Given the messy dynamics of the Mobile application market, an empirical analysis is more appealing than *static* theories based solely on snapshots of the Mobile industry, since an empirical analysis is able to monitor the continuous evolution of the area, and respond accordingly. Moreover, the empirical analysis provides real qualitative measures with excellent timeliness.

In this thesis, the empirical analysis consisted of two two-month period censuses on publicly available data about the most important Mobile application stores in Brazil: Apple's AppStore and Google's Google Play. Data was acquired mainly from primary data sources, assuring high quality of information. In each of the census, data of the first 50 positions was acquired from the three available rankings (Top Free, Top Paid, and Top Grossing) on each store[2]. The choice of the threshold as the first 50 positions of each ranking is fundamental, because of the verified irrelevance of other positions in terms of visibility and performance (number of downloads, income generation, user retention, app usage, and so on).

The main goal of the empirical analysis is to assess important characteristics of the most successful apps, supposing similar strategies can be replicable to other apps, which might increase their chance of success.

The results obtained through the empirical analysis enrich the understanding on Mobile apps in Brazil, serving as guidance for future research to develop new theories on the subject and for Mobile app developers to improve their managerial capacity and app performance.

[2] The rankings were retrieved from www.appannie.com, a website that provides reliable data on the app store rankings.

1.4 Challenges

The choice of the app stores to be examined through the empirical analysis is not easy. Because each census is very time consuming, having more app stores under scrutiny may imply some time constraints. On the other hand, limiting the number of app stores leave several groups of customers, who could be significant for the overall results, out of the research. After this selection, the next steps could be carried out.

Still on the operational side, the selection of the right amount of quantitative measures brought up some questions. Because this is an unprecedented research in the Brazilian market, all possible indicators were extracted from publicly available data. The aim is to provide a broad range of measures so as to expand the range of possibilities of developers during the decision-making process.

Regarding the introduction of the two Italian Mobile apps in the Brazilian market, the biggest challenges relates to limitations on the marketing budget, secrecy of information, and doubts about whether the launching was worthwhile.

1.5 Organization

Apart from the introduction, this thesis is divided as follows.

In the Chapter 2, a literature review of the Mobile industry is performed, encompassing both operational and strategic aspects. The thesis is contextualized in this chapter.

The Chapter 3 contains the methodology of the empirical analysis, followed by the results and a discussion thereof in Chapter 4; Chapter 4 also contains the studies for the introduction of the two Italian apps in the Brazilian app stores.

Finally, Chapter 5 presents the conclusions of the research, and Chapter 6 presents the bibliography used throughout the thesis.

2 LITERATURE REVIEW

The literature review aim is to support the achievement of both strategic and operational objectives of this thesis.

Concerning strategy, the evolution of the Mobile Industry, which gave rise to the so called Mobile Applications market, is discussed, so as to frame the strategic environment investigated. Within this area, the literature about Mobile industry strategic landscape is reviewed, in terms of strategic evolution in the past decade, main actors, business, revenue models, and other academic findings on Mobile applications.

With reference to the operational level, a comprehensive view of the key elements forming the smartphone and Mobile app environments is provided. First, an introduction to the subject and some of the history of the industry are presented, focusing on the global scenario. Next, the focus shifts to Brazil, and all the important Mobile telecommunications aspects in the national scenario are addressed.

Finally, Mobile ranking algorithms are explained along with their importance and influence for the practical results of this study.

2.1.1 Overview of the global Mobile market

In this section, some concepts, definitions and a bit of history about the Mobile ecosystem are introduced. A Mobile ecosystem encompasses several aspects, such as Mobile phones, Mobile apps, app stores, Mobile users, and so on. Furthermore, the main revenue models of app stores and of Mobile applications are presented. Finally, the concentration in this market is briefly discussed.

2.1.1.1 Brief history and introduction to Smartphones

Mobile application markets have changed considerably in recent years (Ballon, et al., 2011). Nowadays, there are no doubts about the benefits, utility and value brought by Mobile communications, specifically by Mobile phones. Mobile phones have emerged as one of the most diffused goods in human history (Anthony, 2012) and, like many

other electronic products, have been through many technological changes over the past years. Today, Mobile phones are ubiquitous, and it is almost impossible to imagine people's lives without such a phone.

The focus of this thesis is on a special type of Mobile phone, the *smartphones*. Smartphones have gained substantial popularity in recent years. They have completely revolutionized the field of Mobile telecommunications, both with regard to companies, such as device manufacturers, software firms and carriers, creating new business opportunities and challenges every day, and to society, facilitating many aspects of people's lives. It is assumed that this trend of popularity and growth will continue and intensify in the coming years, mainly because of the increasingly affordability and variety of smartphone models.

In addition to smartphones, there are two other types of Mobile phones available, classified according to their features, as follows (Fraser, 2012):

- Mobile phones: these are the simplest and most affordable phones available in the market. They offer very good battery life but are not packed with high-end features. Generally, they are used just to make calls and write text messages.
- Feature phones: phones that are placed in between Mobile phones and smartphones. They have many more advanced features than a Mobile phone, but not quite so advanced as a smartphone.[3]
- Smartphones: phones that are capable of taking high resolution photos, recording and editing videos, accessing Internet, tracking your way through GPS, create documents, and much more.

The global market shares of Mobile, feature and smartphone are shown below.

[3] Feature phones are often less powerful than smartphones in terms of hardware capabilities. Moreover, their features are less integrated with other features of the phone, and they do not have the full connectivity of a smartphone. However, the difference between smartphones and feature phones are often subjective.

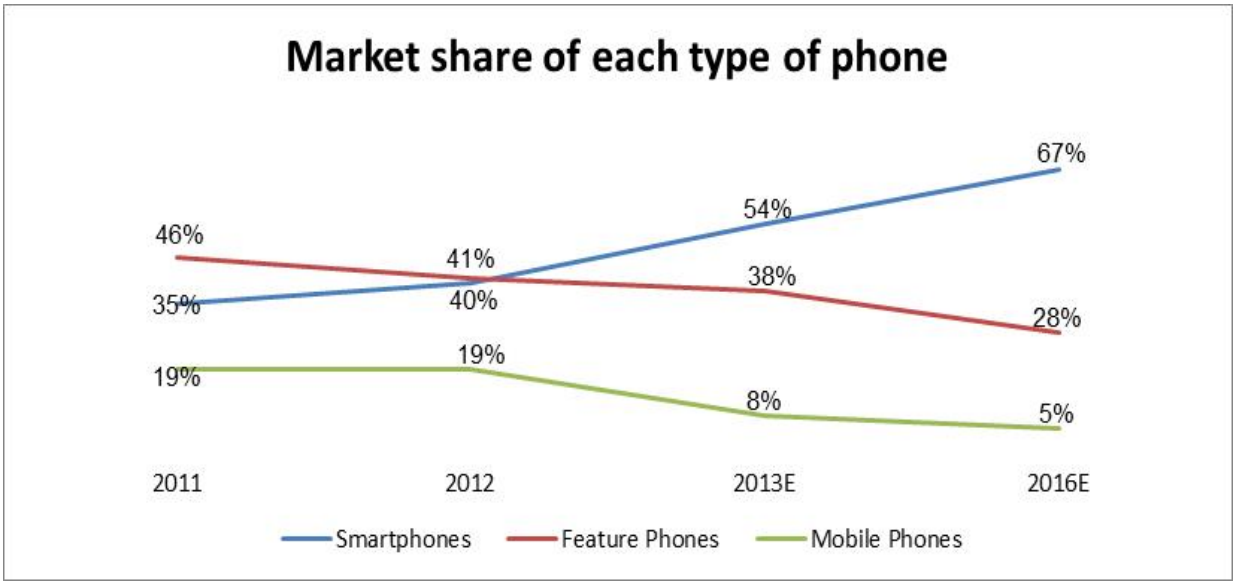

Figure 2-1: Market share of each type of phone **(Lam, 2012)**

Arguably the first smartphone, the Simon Personal Communicator, was launched in 1994 by BellSouth (Sager, 2012). Although the term *smartphone* had not been coined at the time of its release, Simon featured a touch screen, phone, fax and pager characteristics, which allows it to be referred as the first smartphone ever. Still, it was considered a failure and was removed from the market after six months (Sager, 2012).

In the late 90s and early 2000s, Mobile phones had only basic features, and so many people also had to carry a separate Personal Digital Assistant (PDA) device. First smartphones by that time combined a PDA with a Mobile phone and, sometimes, supported limited web browsing (Palm Info Center, 2001).

However, it is from the enormous success of RIM's BlackBerry and Symbian Mobile operating systems (OS) that smartphones began its domination of the Mobile market in the mid-2000s (Smith, 2005), a trend that is growing wider after the launch of Apple's iPhone and Google's Android-based devices and it will continue to grow in the future (Bertolucci, 2012). Both RIM and Nokia (leading Mobile company using Symbian OS in the mid-2000s) enjoyed market leadership and good profits for several years.

Apple, the giant computer and software company, saw a great opportunity in the smartphone market and, in June 2007, launched the first version of its world famous smartphone: the iPhone. One of the most important novelties brought by the iPhone was a great emphasis on building applications to overcome functions and features originally

not included in the phone. Previous smartphones also encompassed applications, but the emphasis was quite different. Apple allowed the development of third-party software for the iPhone, that is, anyone in the world is able to develop and launch an application for the iPhone, in a transparent, organized and standardized way, making the iPhone the number one smartphone in terms of number of apps and app revenue generation since then. The operating system running on iPhone devices is called iOS.

Google, the big company from online search engines and Internet, took a course similar to that of Apple and launched its Mobile operating system Android in 2007[4]. Unlike Apple, Google initially opted to develop only the operating system for the smartphone, not the hardware itself. Android is an open source OS that can be freely modified and distributed by smartphone manufacturers, wireless carriers and enthusiast developers (Google Android, 2013). Therefore, the Android OS is available on several smartphones from various manufacturers and in different price ranges.

Nowadays, Google and Apple are the market leaders in terms of number of apps available, number of smartphones shipped, and revenue generation through the apps, as it will be seen throughout the text.

2.1.1.2 Introduction to Mobile apps and app stores

A Mobile application, or Mobile app, is a piece of software that runs on a Mobile device (smartphone or tablet) and is able to perform a set of functions, selected and designed by its developer (PC Magazine Encyclopedia, 2013). A Mobile app is designed for a specific Mobile operating system[5] (for example: iOS or Android). It can be free or paid, that is, a Mobile app developer may or may not charge a fee in advance for users to download an app.

[4] Android was initially developed by Android Inc. and was then acquired by Google. It is a Linux-based OS. Despite of being an open source project, Android follows a BSD license, instead of the usual GPL. This means that Google may, at any time, close the software to the general public. It might represent a risk for device manufacturers using Android.

[5] Mobile OS is a platform supporting development on developers' side and execution on consumers' side (Ballon, et al., 2011).

The apps are available in the respective virtual market place, namely the Mobile application store (or app store). Each of the players in the smartphone market has its own app store, where thousands of apps are available for download. The app store is the digital distribution channel for Mobile apps. It is available on every smartphone and it is the place where users can search, view, and download apps into their smartphones.

Apple first introduced the concept of a Mobile marketplace in July 2008. By that time, iPhone's app store, namely AppStore, had available only 500 apps (Apple Press Info, 2008). Users downloaded more than 10 million applications from AppStore in the first three days after its launch (Apple Press Info, 2008), a tremendous success.

Before continuing with app stores, a brief comment on competitive advantages in the Mobile context. In the ICT (information and communication technology) industry, organizations need to develop the capability to continuously innovate and to maintain unique resources that are hard to be replicated by competitors (Ghezzi, et al., 2010), in order to create sustainable competitive advantage. Innovation here has a broad meaning: it involves not only launching breakthrough products and services, but also innovation in the organization's mission and vision, values, culture, behavior, and processes (Lafley & Charan, 2008). Opening its boundaries is one of the most important ways to overcome weaknesses, improve innovation capabilities, and achieve status and prestige within an industry (Gueguen & Isckia, 2011; Lafley & Charan, 2008).

With the launch of the iPhone and of the AppStore, Apple accomplished the mission to develop an innovative ecosystem (iPhone + iTunes + AppStore) (Ballon, et al., 2011) and reinforced its strong brand identity (unique resources) through a device-centric model. However, first entry alone is not sufficient to sustain the leadership position (and Apple itself was a latecomer in the Mobile market), but instead, a firm's competitive advantage lies on its processes, core resources, competences, and strategic course (Ghezzi, et al., 2010). Apple was able to maintain its competitive advantages over the years through increasing the number of available apps and the number of end-users, and through the continuous update of its Mobile ecosystem (core resources).

(Ghezzi, et al., 2010) propose a set of five tests a resource or asset must pass in order to be considered as core for a company, described below with the respective example for the case of Apple ecosystem:

1. Inimitability: it must be hard to copy (for example: iOS Mobile operating system is arguably one of the best Mobile OS presently available, and it is protected by dozens of patents).
2. Durability: it must last for a long time (for example: Apple committed itself by constantly updating its hardware and Mobile operating system).
3. Appropriability: firms must be able to easily absorb its value creation (for example: Apple gets a share of income from every non-free transaction in the AppStore. This income grows proportionally with the number of users and developers involved in the ecosystem).
4. Non-substitutability: the asset must be hard to replace (for example: Apple has arguably the best Mobile environment – including smartphone, operating system, and apps).
5. Competitive superiority: it must bring superior advantages compared to competitors' resources (for example: again, Apple has arguably a superior Mobile ecosystem).

The introduction of the app store can be considered a big shift in the way Mobile industry used to work. Before the introduction of the app stores, only certified developers could develop certain types of applications in partnership with smartphone manufacturers and Mobile network operators. It was a business-to-business (b2b) closed market. The number of developers was limited, and so was the number and variety of applications available.

App stores brought a bigger variety and more interaction for smartphone users. However, an app store was similar to other existing digital marketplaces, so it was not quite a technological breakthrough. The technological breakthrough lied on converting these marketplaces into a Mobile one, taking advantage of the new smartphones technology (Ghezzi, et al., 2010).

App stores work as a virtually ideal intermediary connecting developers and users. Because the owner of the app store gets a share on the revenues generated within the store, it can be said that app stores promote win-win situations for everyone involved: app store owner, developer, and user. This effect is one of the main reasons for the enormous success of the Mobile app industry.

The table below summarizes the main Mobile app store owners, their OS, app store name and current number of available apps in their app stores (Womack, 2012) (McCann, 2012) (Smith, 2012).

Table 1 – Smartphone market information

Store owner	**Operating system**	**App store**	**# of available apps**
Apple	iOS	AppStore	775,000
Google	Android	Google Play	700,000
Nokia	Symbian[1]	Nokia OVI Store	120,000
Microsoft	Windows Phone	Windows Store	130,000
RIM	BlackBerry OS	BlackBerry World	100,000

[1] In 2012, Nokia confirmed the demise of Symbian and a joint-venture with Microsoft to promote the Windows Phone.

The world of app stores is dominated by few big competitors that split the market among themselves. The app store is the digital content distributor, which links users to developers. It brings together two opposite sides of the Mobile world (hence it is often described as a two-sided network): developers and users. This effect is the reason why the app store owner demands a share of the revenues generated within the store.

As mentioned, one of the critical success factors of any app store is the relationship between developers and consumers, which create a two-sided *network effect* (see the figure below extracted from (Holzer & Ondrus, 2011)), ─ the value of the platform for each user depends on the total number of users and developers. More customers attract more developers, which mean more apps, which will likely attract more customers, and so on (Gonçalves & Ballon, 2011; Ballon, et al., 2011), often driving a large number of transactions (Holzer & Ondrus, 2011). It is a bilateral market, in which

the app store takes a central position, working as intermediary of transactions, leaving developers on one end and users on the other one (Almini, 2011).

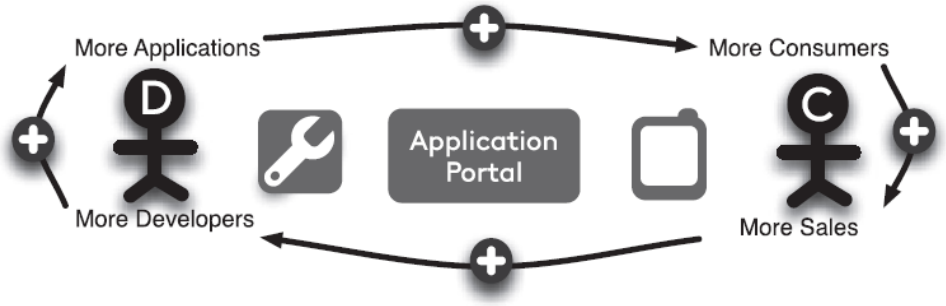

Figure 2-2: Network effect in the Mobile app market as a two-sided network. Extracted from **(Holzer & Ondrus, 2011)**

The demand on one side is connected to the demand on the other side, in a way that group participation in one side increases the value of participating to the other group. Thus, the larger one group is, the higher the value and attractiveness to participants on the other side of the network (Almini, 2011).

The nature of the interdependence in a network could imply positive or negative effects in the network. For instance, an increase in the number of developers may imply an improvement or a worsening of the product.

In reality, there is an improvement in the popularity of the platform as the number of users grows on both sides. Indeed, the network effect creates a virtuous cycle as the app store expands. Consumers will likely pay more to be part of a bigger network; this willingness to pay more might be one of the reasons why Apple is able to charge a premium price for the iPhone.

Nokia, on the other hand, had the highest user base some years ago, but it was not able to increase the developers' side of the network. Its app store did not work appropriately as intermediary, and Nokia did not attract more developers to keep the cycle spinning. Nokia failed by centralizing the development of apps and not providing a fair revenue share to developers. As a consequence, its domain simply ruined.

Regarding publishing and entry costs, Apple's AppStore and Google's Google Play do not charge any fee for publishing apps. However, there is a registration fee for developers. On AppStore, developers have to pay US$99 a year (individuals) or

US$299 a year (companies) (Apple, 2013). On Google Play, on the other hand, developers pay a one-time fee of US$25 to be able to distribute apps through Google Play (Google, 2013).

Regarding the time for a published app to appear in the app store, Apple and Google have different policies. Apple further analyzes the content of each app before publishing it in the store. Clearly, this process takes some time. Average iOS App Store review times have been within a range of 3-11 days over the past year and are currently roughly one week (ZDNet, 2012). In Google Store, the app is published immediately, or just a few hours after its upload. Thus, Apple has a preventive strategy while Google acts correctively. Google uses customers' feedback to evaluate whether an app is appropriate or not (Holzer & Ondrus, 2011). Google's lack of control results, in some cases, in worse applications and apps containing malware. These apps are nicknamed *crApps* (Almini, 2011). However, this choice also leads to a faster proliferation of apps on the Google Play store. Moreover, there might be income generation coming from these apps and there are no significant extra costs for the Mobile app store owner in letting these apps online (Holzer & Ondrus, 2011).

The fragmentation of the app stores represents a challenge for developers (Ghezzi, et al., 2010; Holzer & Ondrus, 2011), since each store has its own unique features, like specific affiliate programs, specific publishing costs and approval times, specific payment modes, and so on All these elements contribute to raise porting costs, namely the costs of porting an app from one platform to another one. High porting costs reduce, accordingly, the interest of companies in developing multi-platform apps.

A Mobile app store fits a two-sided market (the app store works as an intermediary platform between demand and supply sides), thus following a Platform-as-a-Service (PaaS) model (Gonçalves & Ballon, 2011). The app stores allow developers to provide a service (Mobile app) directly to end-customers (Mobile users).

Platform-as-a-Service models yield faster time-to-market, lower resources' usage, and a single environment for the developers. However, they are often closed platforms, in which developers are locked-in, resulting in very low or no portability among different Mobile ecosystems (Gonçalves & Ballon, 2011). Other CSF of Mobile app stores include

a clear market strategy and understanding of upstream and downstream customers' requirements (Ballon, et al., 2011).

Finally, some authors do not consider the app store as a core resource, once no player can rely solely on the store as a competitive advantage (Ghezzi, et al., 2010). Instead, the foundation of its success lies on the convergence of three industries previously apart – Mobile, Media and Web (including E-commerce) (Ghezzi, et al., 2013).

2.1.1.3 The *App Economy*

App Economy is a term that refers to all kinds of economic activities surrounding Mobile applications, including, but not limited to, sales of apps, smartphone devices, ad revenues, and so on (Janssen, 2011). It is a wide concept comprising the whole ecosystem involving the world of Mobile apps. The term was first coined in October 2009 (Douglas MacMillan, 2009).

Some entrepreneurs are making fortunes in the app economy, changing the way business is done (Douglas MacMillan, 2009). To get an idea of the size and growth of the app economy, *Zynga*, which makes popular game apps, became profit just after few months of its birth, with more than US$100 million in revenues. By comparison, Google did not start making money until its third year, and still had fewer revenues. Moreover, only within the USA, the app economy has created more than 450,000 direct jobs by 2012 (TechNet, 2012).

Noteworthy is the first app store have been released about the same time that the 2008 economic crisis began. While most sectors of economies have not fully recovered yet, the Mobile application industry has been growing exponentially, seeming not to care about the economic problems. Only a very powerful industry is able to cause this disruption in such a situation.

2.1.1.4 Mobile business models

For several years, the Mobile industry was primarily dominated by Mobile network Operators (MNO) (Peppard & Rylander, 2006; Kuo & Yu, 2006; Holzer & Ondrus, 2011). However, since early 2000s, Mobile network operators have been seeing a loss in the average revenue per user (ARPU), because of an increase in competition, tight control of new regulations and the expansion of the market to low-usage customers (Evens, et al., 2010). Thereupon, they started looking for new opportunities for revenue generation to cope with this decline (Wirtz, 2001; Ghezzi, et al., 2010).

MNO leveraged on their Mobile infrastructure, charging and billing systems, large customer base and strong brand identity, creating the *walled garden* business model (Ghezzi, et al., 2010; Holzer & Ondrus, 2011). However, the fast technological development and the necessity to address the networks of relationships existing among firms have turned proven business model such as the MNO's walled garden into something obsolete (Li & Whalley, 2002; Ghezzi, et al., 2013).

In spite of the decline of the walled garden business model, MNO still play an important role in the Mobile industry, once they are responsible for pushing new smartphones to customers (Ghezzi, et al., 2010). However, as a consequence of the evolution in the market, MNO have been forced to embrace the new paradigm as opposed to fighting against it. As a matter of fact, the walled garden business model currently does not seem to fit the needs of the MNO themselves (Ghezzi, et al., 2013).

In this period of change and uncertainty, new entrants were able to seize an important share of the Mobile industry in a very competitive fashion, because of their new, more appropriate business models (Ballon, 2007), while incumbents had to adjust their offers and strategies to face the new competition and the new Mobile paradigm. Internet played a decisive role in this process, enabling the decentralization of the operations, opportunities for newcomers, and lower prices for data and media transmission (Li & Whalley, 2002). The former Mobile paradigm consisted of MNO-centered Mobile portals, with a very restricted amount of developers and applications.

The new Mobile paradigm of mid 2000s introduced the Mobile application stores, which were first introduced by Apple (a newcomer in the Mobile industry) and promptly imitated by other newcomers as well as incumbents, including MNO themselves (Ghezzi, et al., 2010). It represented a move from a value-chain perspective toward a

value network perspective, consisting of various interlinked, multidirectional value chains (Ghezzi, et al., 2013).

The way each network is constructed differs according to the position of each firm in the industry (Li & Whalley, 2002). A value network encompasses all the different business actors from various different industries and defines how they, jointly, provide services to end-users (Li & Whalley, 2002). The main actors in the Mobile industry are the MNO, the Mobile service provider, the Mobile content provider, the Mobile technology provider, the device manufacturer, the advertisers, and the end users (Ghezzi, et al., 2013).

A value network extends the value chain model and addresses firms' boundaries and inter-organizational relationships (Peppard & Rylander, 2006; Ghezzi, et al., 2013). In a value network, each actor usually focuses his activities in a single stage of the process, the one in which he/she has competitive advantages; value is hence created through the interaction of different players operating in quite diverse – and sometimes apparently disconnected – layers of activities.

The process of moving from a value chain model to a value network model consists of, first, breaking up the process required to deliver a service into a sequence of elementary value adding activities, and second, splitting and regrouping these activities in new network architecture (Ghezzi, et al., 2013).

Although the current situation may seem to be a gray area, it is clear that it will not go back to its former condition (Holzer & Ondrus, 2011), because of the increased number of players coming also from other industries and the rise of more open and shorter-term relationships (Li & Whalley, 2002). Thus, the walls of the garden have been destroyed.

In the beginning, business model's objectives were two-fold: to describe the value proposition and the revenue model of a service offer (Ballon, 2007). The Mobile industry paradigm of mid 2000s represented a shift from a single value-chain to a value network approach. In practice, it represented a move toward cooperation and collaboration models, expanding firm boundaries and increasing the complexity of relationships for the service provision (Ballon, 2007; Gueguen & Isckia, 2011). Forming alliances and

establishing strategic relationships are decisive in the Mobile industry and in the ICT sector (Gueguen & Isckia, 2011).

A value chain is the sequence of value-added activities performed in order to deliver a service to end-customers (Sturgeon, 2009). Most often, these value-added activities were centralized and performed by a single organization, usually the MNO. "*A value network, on the other hand, consists of actors […], which interact and together perform value activities, to create value for customers and realize their own strategies and goals."* (Bouwman, et al., 2008) The transition from value chains to value networks strongly impact all the actors involved (Li & Whalley, 2002).

2.1.1.4.1 Content bundling in the Mobile Content Value Network

Nowadays, the most important strategic issue in the Mobile Industry regards the Mobile content market segment (Ghezzi, et al., 2013). The Mobile content market has recently experienced exponential growths, and it has barely felt the adverse effects of the global economic crisis of 2008. Content is crucial in the current Mobile paradigm, which puts users in the center and promotes collaboration (Evens, et al., 2010). Before the app stores, the content distribution was mainly placed on one-side networks, namely on the Mobile portals (Ghezzi, et al., 2010). The Mobile app stores, on the other hand, are two-sided networks, that is, they are platforms in which users and developers attract each other by leveraging the network effect.

(Ghezzi, et al., 2013) suggest Mobile content systems consist of four intertwined layers (see figure below): (1) Content Layer, which takes into account the service concept and the service design, (2) Device Layer, which addresses issues related to device design and device manufacturing, (3) Platform Layer, which portrays issues regarding the middleware, and (4) Network Layer, which takes into account the required technology and network infrastructure for the content provision. The layers may be occupied by different business actors, which could collaborate for the service provision, while simultaneously, compete against one another. This strategy model is known as the coopetition model (Gueguen & Isckia, 2011).

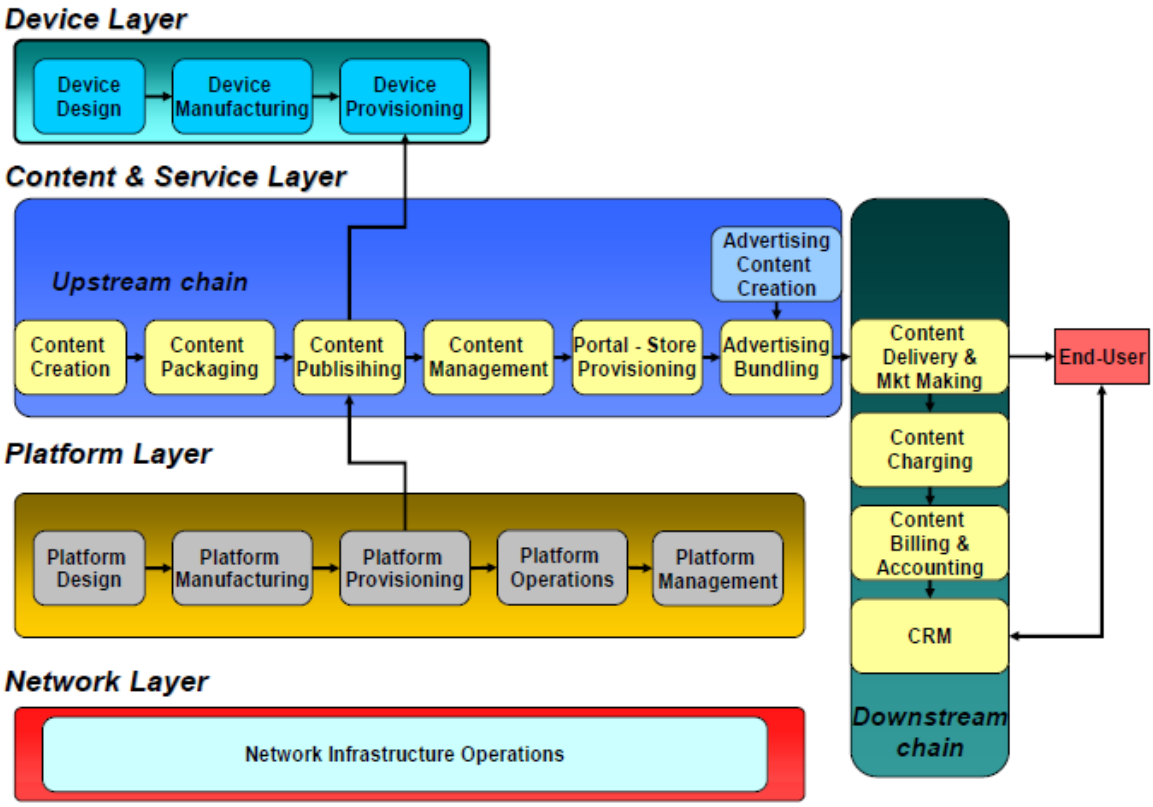

Figure 2-3: Value adding activities for Mobile Content market segment (extracted from **(Ghezzi, et al., 2013)**)

Several authors have argued that, in an integrated[6] two-sided network, firms are able to provide free products or services for customers, because there will be an increased demand in a complementary premium good or service, neutralizing the costs of the free offer and generating profits (Parker & Van Alstyne, 2005; Holzer & Ondrus, 2011). Such strategy is harder when there are various key players at stake. The critical point here regards the choice of the right market to subsidize and the right market to generate income. However, content producers are often unwilling to invest large amounts of money in new content and new platforms, such as Mobile, if a significant customer base is not yet in place. On the other hand, customers are often unwilling to adopt a new technology if there is uncertainty about a vast content availability.

[6] (Holzer & Ondrus, 2011) suggest three different levels of integrations for Mobile platforms: platform with no integration; device integration, and finally becoming fully integrated with a Mobile app store. They also suggest a trend towards fully integration in the near future.

If both situations occur simultaneously, the network effect ceases and it may represent the end of the platform (Evens, et al., 2010). To complicate the matter, traditional content providers are reluctant to provide Mobile and Internet content, fearing cannibalization of their usual, proven business models. In short, it is a vicious cycle in which the platform owner needs compelling content to attract customers, which in turn are only attracted to platforms offering appealing content, and amidst all are content producers afraid to lose their established markets. (Evens, et al., 2010) describe the issue as a *chicken-or-egg* problem, arguing that "*content bundling forms a critical part of the value proposition to consumers, but access to compelling content is seen as a bottleneck for the development of Mobile service platforms.*"

2.1.1.4.2 Business model framework: the STOF model

There are several business model frameworks available in the literature (Timmers, 1998; Bouwman, et al., 2008, Li & Whalley, 2002). (Ballon, 2007) asserts that a business model is the balance between control and value parameters within a particular innovation system. Business models are commonly depicted as a set of graphical and textual figures (Zoric, 2010).

Business models cannot be evaluated independently of current industry scenario (Porter, 2001), and they are related to the positioning of each individual firm within the value network (Bouwman, et al., 2008). In general terms, a business model is the description of the architecture of a business (Ballon, 2007), or a structure that describes the various business actors (partners and customers) and their roles, the potential benefits for the actors, the sources of revenues and costs, as well as the flow of goods and information amoong these actors (Bouwman, et al., 2008). Its viability depends on the ability to create value for customers and for business partners in the value network.

In this thesis, the STOF (Service, Technology, Organization, and Finance) model will be used as a framework for Mobile business models, because of its acceptance as a general business model framework in the literature (Evens, et al., 2010; Ballon, 2007), and it was developed focusing on Mobile services, such as Mobile app stores. As its name suggests, the STOF model includes four business model domains: Service,

Technology, Organization, and Finance. The concepts within the domains are not mutually exclusive. Pricing, for instance, is included in both the service domain and in the finance domain, because it influences both customer perceived value and revenue generation (Bouwman, et al., 2008).

Within the STOF model, the business model design should start with the demand side, that is, with the service concept and the customer value of the service, since from a customer perspective technology is just an enabler, which does not support the creation of competitive advantage (Bouwman, et al., 2008; Ghezzi, et al., 2010; Carr, 2003), that is, the STOF model follows a user-centred approach (Evens, et al. 2010; Ghezzi, et al., 2013). Content bundling plays a fundamental role in the service concept and in its value proposition.

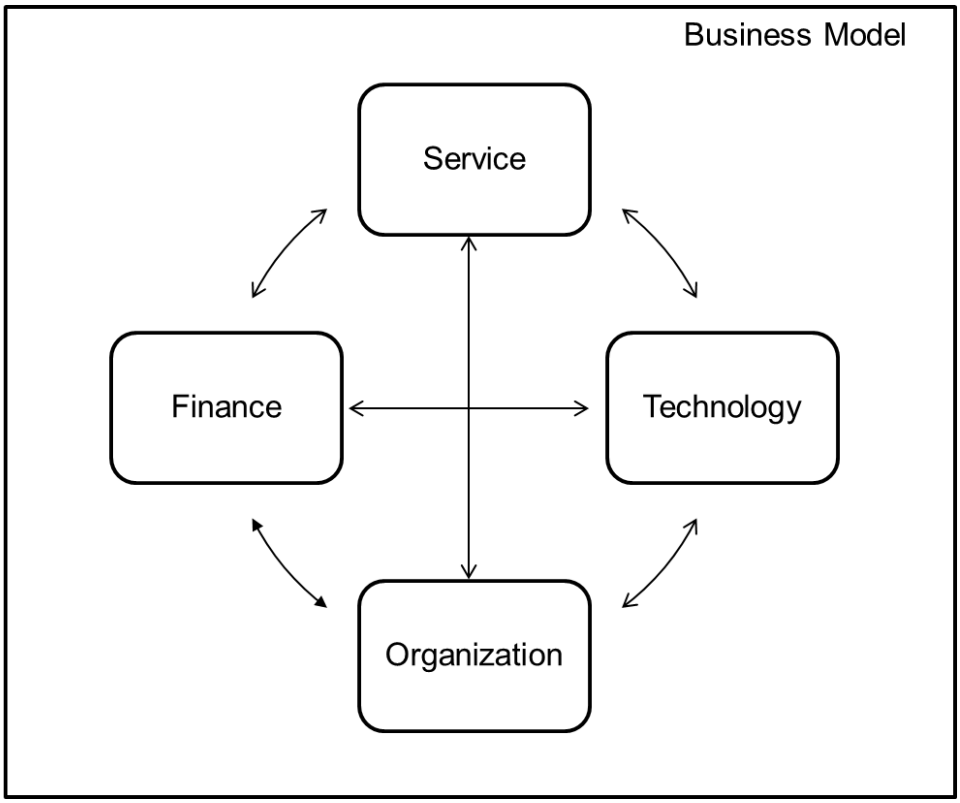

Figure 2-4: STOF business model domains

Service: In the service domain, the central issue of the business model design regards value: the delivered value proposition by the service provider (intended value) and the perceived value proposition by customers (perceived value) (Bouwman, et al.,

2008). Therefore its complexity arises from the fact of dealing with both concrete and abstract variables, such as the innovation and quality of the service and customers expectations. For Mobile app stores, the Service domain design must include, among others, the costs to join the platform, the revenue sharing model, the number of current and potential end-customers, and the availability of code examples and APIs. A drawback of a two-sided network is that the service design must address two different customers requirements, instead of just one. Critical design issues in the service domain include: targeting, branding, customer retention, and value creation (Haaker, et al., 2004).

Technology: The technology domain is drawn on the service domain, since the latter defines the requirements and specifications of the technnological infrastructure (Bouwman, et al., 2008). Technology is only an enabler, facilitating the business processes for the service development, provisioning, and control. It includes middleware, web-services, cloud services, network infrastructure, and others. Critical design issues in the technology domain include: security, quality of service, accessibility, and management of user profiles (Bouwman, et al., 2008; Haaker, et al., 2004).

Organization: This domain is related to the internal processes of the company, that is, the internal capabilities of the firm to provide the service, including technology, marketing and finance capabilities (Bouwman, et al., 2008). It works as the back-office of the service provisioning. In most cases, companies have to collaborate with others in order to properly deliver the service to the market (Bouwman, et al., 2008). The increase in collaboration represents the move toward a value network, in which several business actors play specific roles and cooperate to deliver the service. Critical design issues in the organization domain include partner selection and network openness (Bouwman, et al., 2008).

Financial: It is one of the most important domains of every business model (Bouwman, et al., 2008). The financial domain ultimately defines the bottom line of the service provisioning. It encompasses investment decisions and revenue generation models. The value of a business model increases when it is grounded by adequate

financial valuation (Zoric, 2010). From a transaction costs point of view[7], the most important issue regards the *make-or-buy* decision making process ─ which tasks are going to be performed within the firm (in-house or insourcing) and which are going to be outsourced. The trade-off arises from the choice of having lower transaction costs and higher control over the processes (make) or having higher economies of scale and lower (or no) production costs (buy) (Li & Whalley, 2002).

Pricing is key again, and an appropriate sharing of revenues and costs are fundamental to create a win-win situation for all the involved actors, though it is not an easy task to accomplish because of the conflicting strategic goals of the business partners in the value network (Bouwman, et al., 2008).

There is also the need to balance network benefits and individual partners' benefits (balance between competition and cooperation). Sometimes, some of the activities required by the service are not profitable, but the overall performance of the service provision should be positive for each actor in the network (Zoric, 2010). In the case of Mobile app stores, revenues come from the costs producers face to join the platform and to make apps available in the plataform, and also from the revenue sharing model wherein the platform owner charge developers a percentage of sales[8] (Gonçalves & Ballon, 2011). The revenue sharing is the most important income source for mobile app store owners, since subscription and deployment fees represent mostly a fraction of the total revenue generated (Gonçalves & Ballon, 2011).

2.1.1.4.3 Application stores' revenue models

Revenue model, in the context of this thesis, refers to the way each app store owner competes in the Mobile business area in order to create value. In other words, it is the component of the business model which explains the way each company

[7] The transaction cost theory is also used to reason why the walled garden logic has become unsustainable, once transaction costs had become lower than the costs of producing internally (Li & Whalley, 2002).

[8] Further discussion about the revenue sharing models for Mobile app stores is presented in the next section.

generates revenues in its Mobile application ecosystem, or the way they compete in the app economy. A particular attention is paid to the revenue share model, because it is one of the main reasons for the creation of the network effect, since it attracts developers to the value network, and consequently, attracts customers, creating a positive feedback loop (Holzer & Ondrus, 2011). The revenue model is so important that it is often mistaken for business model, while it only constitutes one of its components (see the STOF model section). There are plenty of examples of Mobile services and platforms that have failed or have experienced difficulties because of monopolistic strategies and flawed revenue sharing models (for example Nokia, BlackBerry, WAP) (Gonçalves & Ballon, 2011).

Revenue sharing models are the means platform owners reward one side of the network ─ most often the developers' side – for producing high quality content which arguably attracts more customers and feeds the network effect loop. Currently, the most common revenue sharing model on the app stores is based on the division of revenue known as *70-30*, that is, 70% of the revenues generated within the store or within Mobile apps is intended for the application developer, while 30% goes to the store owner. These revenues can derive from the sale of the app, ads, and/or premium content sold inside the app. Likewise Mobile app stores, this model was first introduced by Apple in 2008, and, after some time, all competitors adopted the same values, except for Microsoft's Windows Store.

As a late mover in the market, Microsoft opted to take for itself a lower share of revenue, in order to attract more developers to its environment. Hence, the Windows Phone store is the only one based on an *80-20* share model, in which developers take 80% of all revenues generated by their applications and Microsoft takes only 20% of them. Increased competition among platforms could lead to more opportunities for developers and better apps for users (Holzer & Ondrus, 2011).

To get an idea of the size of the Mobile app stores, Apple claimed in January 2013 that it had paid out US$8 billion to developers since the beginning of its AppStore (Reyburn, 2013). This value is twice the value Apple had paid until January 2012 (a year earlier) and 8 times the value it had paid to developers until June 2010 (Dilger, 2012). Based on the *70-30* share model, it is possible to say that, since 2008, apps from

Apple's smartphones and tablets have generated the impressive amount of 11.5 billion dollars.

Apple is by far the biggest revenue generator in the market, primarily because of its first mover position. It is the creator of the innovation that took place in the Mobile sector. In fact, a recent report stated that Apple's AppStore revenue is four times bigger than Google Play's, the runner up in revenue generation (Koetsier, 2012), which means that Google Play's market size is now reaching US$ 3 billion. Another report stated that Apple generated roughly US$500 million with AppStore in November 2012, while Google generated US$105 million in the same period with Google Play store (Distimo, 2012), confirming both the bigger size of Apple's market and the relative position of Google. Nevertheless, Google Play's revenue growth was much higher in the same period; about twenty four times that of Apple.

Concerning number of downloads, in October 2012, Apple's AppStore had had more than 35 billion downloads since its launch in 2008 (Sloan, 2012). Google Play, likewise, had reached 25 billion downloads since its launch until October 2012 (Oliver, 2012).

These are indicators of dominance that these two companies are currently exerting. They serve as a basis to justify the choice of analyzing only these two main stores in the empirical analysis of this study. Nevertheless, both Google and Apple shall expand their boundaries in the near future in order to capture new ideas and trends, and mostly important, to sustain their dominant position over the Mobile app market (Gueguen & Isckia, 2011).

2.1.1.4.4 Revenue models for Mobile apps

The possible revenue models for a Mobile app are listed in the table below. They are not mutually exclusive, that is, some apps may contain more than one revenue model.

Table 2: Mobile app revenue models

Revenue model	Description
Free *branded* apps	Non-Mobile companies would like to be present in the Mobile app market, in order to enrich customers' experience, to improve customer relationship, and to boost its brand awareness. They outsource the development and maintenance of the app.
Free app + ads	These apps generate income only from internal advertisement.
Free light + full paid	A free light app allows users to experiment itself partially. If the user is satisfied and willing to have further features, he/she can pay to download the full app.
Paid	This model encompasses the pay-per-download apps. Users have to spend an amount of money in order to install it in their smartphones. A paid app may also include ads and in-app purchases. It is also called premium app model.
Free app + in-app purchase	A free app with in-app purchase sells premium content within itself. It can be subscriptions, premium features, elimination of ads, and so on It is also called *freemium* app model.

A Mobile app can either be free ─ that is, it can be downloaded at no expense, or paid ─ that is, it charges an amount of money prior to the download. In 2008, at the launch of the Apple's App Store, many free apps worked as a *light version* of a full, paid app. Users could experiment some of the features of the app before spending money, and then decide if it was worthwhile to buy the full version. With this strategy, Apple believed to fulfill both users' and developers' expectations. In such case, a free app could generate revenue through ads within the app, and a paid app would generate revenue through its sale.

The table below shows estimates of the worldwide Mobile app stores downloads; divided between free and paid downloads, from 2011 to 2016. The growth in downloads of free apps is much faster than of paid apps (Gartner Inc., 2012).

Table 3: Mobile app stores downloads, 2011-2016 (millions of downloads) **(Gartner Inc., 2012)**

	2011	2012	2013	2014	2015	2016
Free Downloads	22,044	40,599	73,280	119,842	188,946	287,933
Paid Downloads	2,893	5,018	8,142	11,853	16,430	21,672
Total	**24,937**	**45,617**	**81,422**	**131,695**	**205,376**	**309,605**
Free Downloads %	88.4%	89.0%	90.0%	91.0%	92.0%	93.0%

2.1.1.4.4.1 Free *branded* apps

When a developer makes an app on behalf of third parties, that is, when the app development is outsourced, this app is a branded app. This model is typically used by brands and companies, whose core business lies outside the Mobile app world, that want to be present on one or more app store.

The objectives of these apps can be simply increasing brand awareness, raising user engagement with the brand, or even diversifying and increasing revenue generation.

Banks, public bodies, hardware companies, newspapers, and many more type of companies fit this model. It is estimated that more than 90% of the global top brands are present in the Mobile app market with one or more branded apps (Almini, 2011).

iOS is the operating system of choice for most large companies for their branded applications, followed by Android and BlackBerry. Besides, most of these companies have their apps in more than one platform, aiming at creating a more complete communication strategy (Almini, 2011).

Branded apps have a positive convincing impact, increasing interest in the brand. More informative and creative apps that focus on the user and encourage personal connections with the brand are more effective at converting users into purchasing customers (Steven Bellman, 2011).

2.1.1.4.4.2 Free app + ads

This model represents free apps, whose only source of income comes from internal advertisement, namely banners and ad content within the app.

To generate income through advertisement, developers have to subscribe to a Mobile ad network platform. There are many of them available in the market, including the ones from Apple and Google, iAd and AdMob respectively. The platform provider inserts banners in the subscribing app (Almini, 2011).

The service is completely free for developers, and the income is generated in a Click-Through-Rate basis ─ whenever a banner is clicked by a user (Almini, 2011). Providers' income comes from advertisers. There are some multiplatform ad networks, which are ad networks able to put banners on different devices (iOS, Android, Windows, BlackBerry, and so on) (Almini, 2011).

2.1.1.4.4.3 Free app *light* + full paid app

In this model, the user can download an incomplete version of an app for free. In other words, the light app blocks some of the available features and content. Next, if the user is satisfied with the app, he/she may purchase the full version, which makes all features and content available.

This revenue model was one of the most important in the past (Almini, 2011). Most users preferred to try the app before acquiring it, thus, the distribution of a trial version was the most effective solution.

The conversion rate of free to premium was around 20% (Almini, 2011), which made this model considerably successful.

After the introduction of the *in-app purchase* model, the use of this model decreased significantly, because it is somehow an evolution of the light + full model. Nevertheless, still there are developers applying this model in their apps.

2.1.1.4.4.4 Paid app (or Premium app)

The premium app model is the pay-per-download model, also called premium model. Users have to spend an amount of money in order to install it in their smartphones. Once it is installed, all its features are available indefinitely. Paid apps may also contain ads and in-app purchases.

The average price of these apps vary a lot according to the app store they are offered and the content they provide. Paid apps are less common than free apps.

A recent report estimates that lower-priced apps, that is, apps priced from US$0.99 to US$2.99, account for the majority of paid downloads, roughly 88% in 2012 and 96% by 2016 (Gartner Inc., 2012).

The important feature of this model is that revenues are generated prior to the use of the application. Therefore, even if users do not like or even hate the application, the revenue is guaranteed. This feature can be problematic for firms seeking long-term competitiveness, since app performance is and will always be the most important factor when attracting new users and keeping them satisfied.

Large part of users is wary about buying an application, either because they do not trust their bank information to the storeowner, or because they might regret after purchasing an app. A recent study confirms this assumption, stating that, in 2012, paid apps accounted for only 11% of total downloads (Gartner Inc., 2012).

2.1.1.4.4.5 Free app + in-app purchase

Apple launched its AppStore in 2008. After a while, in the second half of 2009, Apple introduced for the first time the concept of in-app purchase in its store. It consists of the sale of premium content within the application after installation. The premium content can be periodic subscriptions (for example newspapers), game currency, premium version of the app, elimination of ads, and so on At first, it was only available for paid apps, because Apple wanted to keep free apps entirely free. After some pressure from developers, it also allowed free apps to offer in-app purchases. It virtually represented the end of the *free light + full paid* model, since developers could offer the light app for free, and then sell premium content in various ways within the app, including a full version of it.

In fact, the potential of the in-app is not limited to the upgrade of the app to a more powerful and complete version. For instance in Mobile games, users can use in-app purchases to acquire digital currency or goods in order to progress faster in the game or to score higher.

After a while, other app stores (Google Play, BlackBerry World, Nokia OVI store) also introduced the in-app purchase option, because it is a very interesting model also for app storeowner and developers, because it eliminates the need of two apps (one light and one full). Moreover, the impact in the overall App Economy was positive, since the owner of the app store also has a share in the income generated within the app (20% or 30% depending on the store), and there is the possibility to buy premium content directly inside an app makes the purchasing process seamless for the user.

It is estimated that the percentage of the total revenue generated by in-app purchase in all app stores was 30% in 2010 (the other 70% was generated by paid apps) and 72% in 2011.

A recent study shows that some *freemium* apps, that is, free apps that have in-app purchases, are experiencing impressive revenue growth worldwide, reaching the top spot in revenue generation among all models listed above (App Annie , 2012). While premium or paid apps revenues remained virtually flat for AppStore and Google Play in 2011 and 2012, *freemium* revenues more than quadrupled in the same period. In September 2012, *freemium* revenues represented more than two-thirds of total revenue on AppStore, and three-fourths on Google Play. According to the study, the main responsible for this growth are China and Japan, whose *freemium* revenues grew by 2400% in the same period (App Annie , 2012).

One could ask: "If this model is more profitable, why should developers use a different one?" The answer is as simple as the question: not all apps suit the *freemium* model (Farago, 2012). This model is particularly better for apps with very intense usage in a short window and for users who come back to the app repeatedly over a long period of time, while a premium model is more suitable for apps that do not hold users over a long time. Anyway, the *freemium* model seems to be a better option in general, because it allows people to come in for free, expanding the user base, and then monetize some of the users through in-app purchases. It is a more effective method of monetizing

casual app users, and then retaining them with good user experience and frequent updates (Gartner Inc., 2012).

2.1.1.5 OS Global Market Share

Market share is a valuable piece of information that is carefully protected by organizations. It provides useful insights about performance and growth about all main players in a market. While it is virtually impossible (or at least very expensive) to acquire market share information from primary sources, that is, original and official sources, it is relatively easy to find these pieces of information in technology consultancy firms reports spread over the Internet. Usually, a secondary source interprets and analyzes data from primary sources in order to produce its reports.

Although it is not possible to be absolutely sure on this information, these reports do not deviate much from each other, so it is possible to assume they represent a good approximation of reality. The chart below shows the evolution of the market share from 2007 to 2013 of the most important Mobile operating systems, in terms of sales of devices.

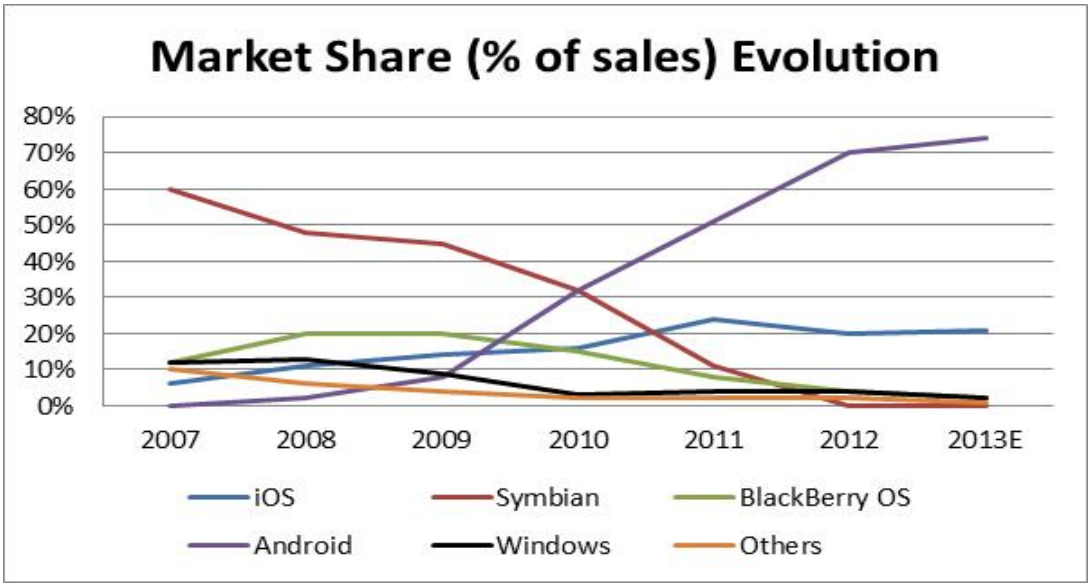

Figure 2-5: Market share evolution of Mobile operating systems **(Gartner, 2012)**

From the chart, it is possible to draw some important findings.

Regarding Symbian OS (Nokia devices), it used to be the number one operating system, with more than 60% of market share before the introduction of the iPhone, in 2007. Since then, its share has dropped considerably until 2012, when it was withdrawn from the market after Microsoft and Nokia teamed up to compete together in a venture, using Microsoft's operating system. Still, Symbian has left strong market positions in some countries such as Italy and Brazil (Almini, 2011; Our Mobile Planet 2012, 2012), but they will surely fade away in the following years, because Symbian is no longer available.

RIM's operating system, the BlackBerry OS, followed a similar route. Taking advantage of its first mover condition in the Mobile smartphone market in the early 2000s, and of its dominance in the corporative market, BlackBerry enjoyed several years of prosperity (Hansa Iyengar, 2005). At first, mostly businessmen needed on-the-go access to webmail and online messages, with high level of security. This was the main reason why, although BlackBerry was not the market leader, it enjoyed a very comfortable position for several years. From the moment that other technology companies mastered the webmail application development and introduced it to conventional mass-market smartphones, BlackBerry started losing sales and market share. The biggest (and fatal) mistake of BlackBerry was to believe its technology was unique, and competitors could not (or at least it would take long time) reproduce it (Hansa Iyengar, 2005). As soon as some actors—previously unrelated to the smartphone business—implemented several different technologies, including BlackBerry's flagships such as *push-mail*, the market moved toward consumers and RIM saw its shares collapse.

Up to now, Microsoft has been struggling in the smartphone market, with its several different Mobile operating systems: Windows Mobile, Windows CE, Windows 7, and now Windows 8 (Windows Phone). The high number of non-compatible operating systems launched by Microsoft gives an idea that the company has always been late in the market, and without consistent strategies. In 2012, Microsoft and Nokia teamed up to launch the new Windows 8 OS for Mobile devices, ending the long and successful era

of Symbian OS. However, this launch occurred at exactly the same moment Windows app store was growing up, leaving many developers and users irritated (Sullivan, 2012).

The fall of BlackBerry OS, Symbian, and Windows Phone can be explained by substantial saturation of their Mobile offer, and more intriguing, by the obsolescence of these systems. BlackBerry OS for instance, did not improve its main characteristics since its inception in early 2000s, despite several software updates during the years.

Apple's iOS, on the other hand, has been showing steady growth since its inception until 2010. Today it is the second most used Mobile operating system in the world, far behind Google's Android. Nevertheless, iOS has the largest number of available applications, and Apple generates the highest income from its app store. iOS has gained market share relative to users with greater purchasing power, since the iPhone very often costs more than Android-based smartphones, because of its perceived higher quality (Almini, 2011). Additionally, Apple is the largest generator of income through its app store, even though it has a lower share of the market compared to Android. Therefore, its income per user (ARPU) must be higher Android's.

Apple will probably not increase its market share in 2013. However, it does not mean Apple's sales will not grow at all ─ it just means that its growth is following the average market growth. Apple is, thus, reinforcing its competitive position, placing itself in a comfortable second place, and enjoying higher revenues.

Android is now the major Mobile OS in the world in terms of device sales. Its market share went from virtually 0% to over 50% in just three years. The reasons are twofold: first, Android is an open source OS. Google distributes it for free, and encourages smartphone manufacturers to adopt it. Second, Android has a big developers' base, which in turns attracts more customers.

Looking closely at the chart, it is possible to see that Android grew at the same pace BlackBerry OS' and Symbian's shares sank. Meanwhile, iOS and Windows's shares did not vary substantially, leading to the assumption that Android captured users from Symbian and BlackBerry OS, in addition to the organic growth of the market. One explanation to this phenomenon lies on the big variety of Android models available (there are over 20 smartphone manufacturers employing Android), which results in greater competition, and therefore lower prices. Android is the leader in the low-end

smartphones category (Armasu, 2011). Moreover, carriers push Android smartphones to their customers, especially for those who want inexpensive contract plans (Armasu, 2011). Research shows that Android will remain the market leader in the coming years (Koetsier, 2013; Jones, 2013).

2.1.1.6 Concentration of the stores: few winners take all

Taking into account the two largest app stores, Apple's AppStore and Google's Google Play, most of the revenue generated within the stores goes to few, large developers, the large number of developers and apps available notwithstanding. Therefore, there is a very high market concentration, which significantly reduces its attractiveness for new entrants. On the other hand, high concentration is great for companies that are already part of this small, winner group. Attractiveness of a business area is directly proportional to its average profitability and the growth of the companies operating in that area (Porter, 2008).

According to a recent study, it is estimated that the top 25 USA developers account for half of app revenue generated in the USA on the leading app stores (AppStore and Google Play) (Canalys, 2012). Together, they generated roughly US$60 million over the first twenty days of November 2012 (Canalys, 2012).

Most of these big developers are game companies. Therefore, the main competitors are very homogeneous, reducing the intensity of rivalry and competition within the market (Porter, 2008). The winning companies include Zynga, Electronic Arts, Disney, Kabam, Rovio, Glu, Gameloft and Storm8's TeamLava. These developers have several titles in the app stores, so they have multiple apps generating revenue at the same time (Canalys, 2012). Moreover, they can use their own apps to cross-promote their app portfolios (Canalys, 2012), creating a virtuous cycle of income generation.

Two other studies confirm this *dark side* of the app stores. The first one, a survey with app developers, found out that over 50% of the respondents make less than US$500 a month from their paid apps, and 75% of them make less than US$2000 a month (Molla, 2012). The same study shows that only 5% of the respondents make US$20,000 or more a month from their paid apps, which leads to two implications: first,

as described above, the market is highly concentrated. Second, most developers are forced to be hobbyists or at least non full-time professionals, which could imply lower quality of their apps and the continuity of dominance by large developers in the future.

The second study shows that two thirds of Mobile apps presented in the Apple's AppStore do exist, but have no downloads (Longhitano, 2012). Thus, only on AppStore, more than 500,000 apps are rarely or never downloaded. These applications were nicknamed *Zombie Apps*. According to the authors, the villain is the store's search engine, because it does not enhance small developers and their applications. Moreover, the same study suggests that only few thousand apps have a decent number of downloads, and the only way to become a successful app is to spend millions of dollars in order to reach the top. Apple claims it is continuously updating its search engine algorithm in order to provide users with a more transparent store in which it is easier to find all the 775,000 apps.

As it will be discussed in the empirical analysis, the Mobile app market has places for independent or small developers. However, these places are few and they tend to be fewer in the future.

2.1.2 Overview of the Brazilian Mobile market

In this section, the Brazilian Mobile market will be described. Important general indicators related to Mobile telecommunications will be presented to demonstrate the potential that Brazil has in this area.

2.1.2.1 General information about Brazil

Brazil is an emerging country located in South America, with a population of roughly 195,000,000 people, divided into 26 states and one federal district. Brazil can be considered a young country, since more than 65% of its population is between 15 and 59 years old (about 127 million people). Its political capital is Brasília; however the two biggest cities are São Paulo and Rio de Janeiro, respectively. The Brazilian currency is

the *Brazilian Real* (BRL) that valued US$0.491 and €0.378 on October 15th, 2012. In 2011, Brazil reached the rank of 6th largest economy in the world, with a GDP of US$2.4 trillion. The unemployment rate has consistently decreased in the last 10 years, reaching 6% of the population in October 2012. Despite the recent improvements in the economic situation of the country, most people still do not have access to good education, health systems and high wages.

Table 4: Brazil's macroeconomic indicators (monetary values in US$)

Population	GDP Current Prices (million)	GDP growth (CAGR 2002-2012)	GDP per capita	Unemployment Rate	Monthly minimum wage	Inflation Rate
194,947,000[1]	2,475,066[1]	3,6%[1]	12,696[1]	6.0%[2]	325	5.5%[2]

[1](Brazilian Central Bank, I.51 Gross Domestic Product, October 2012 – http://www.bcb.gov.br/?INDICATORS)

[2](International Monetary Fund, World Economic Outlook Database, October 2012 – www.imf.org/external/pubs/ft/weo/2012/01/weodata/index.aspx)

2.1.2.2 General information about Brazilian telecommunications market

According to the main Brazilian telecommunication portal, in January 2013 there were 262.3 million active Mobile phone lines in Brazil (+7% year-over-year), that is, there were 1.33 phones for each inhabitant in Brazil (Teleco, 2013). More than 80% of them (about 210 million) are no-contract phones. Just out of curiosity, landline phones were 44 million in the same period (22.6% of the total population) (Teleco, 2013).

There are four main carriers in Brazil: Vivo, Tim, Claro, and Oi, controlled respectively by Telefonica (Spain), Telecom Italia (Italy), América Móvil (Mexico), and Portugal Telecom (Portugal). Together, they own 99.7% of the Mobile market share. All four carriers generate approximately US$10 a month as average revenue per user

(ARPU). Together, their monthly revenues are as great as US$2.63 billion (Teleco, 2013).

The following charts show the market share and average monthly revenue per user from each of the four operators.

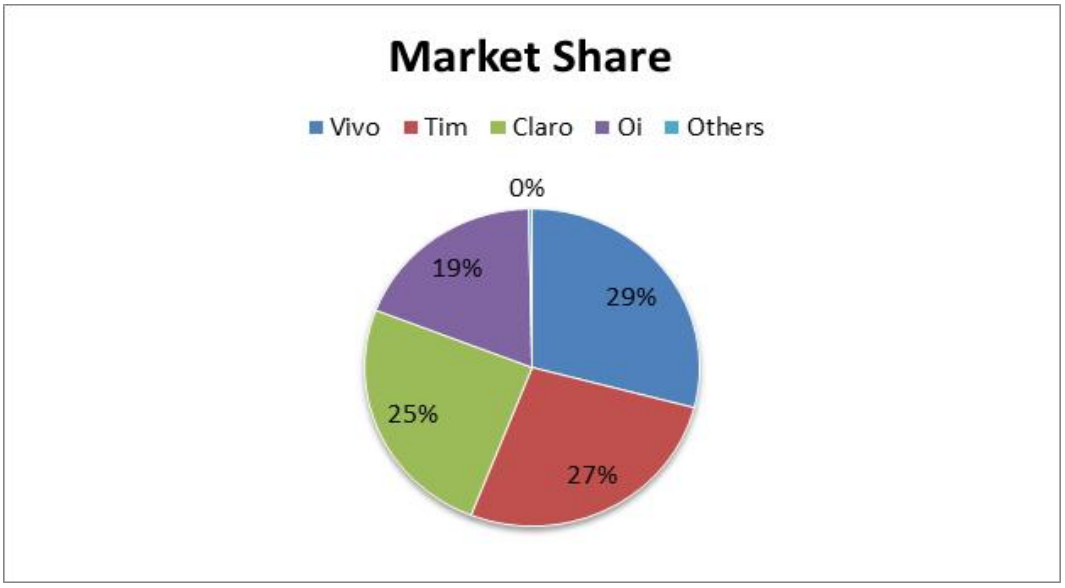

Figure 2-6: Market share of Mobile carriers in Brazil **(Teleco, 2013)**

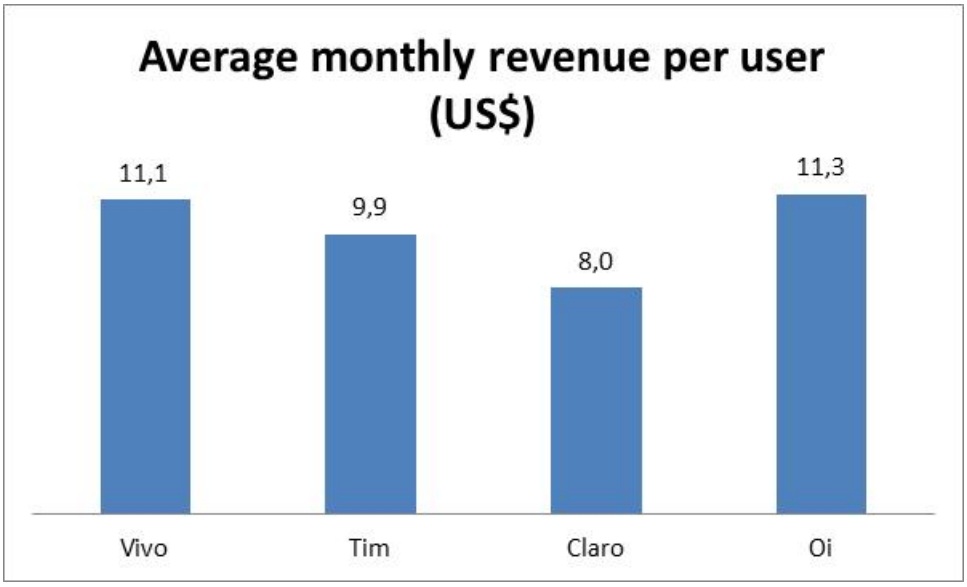

Figure 2-7: Average revenue per user (ARPU) - US$

Regarding Mobile Internet access, 3G coverage reaches over 85% of the Brazilian population. In the biggest states, such as São Paulo and Rio de Janeiro, 3G coverage is

close to 100% (Teleco, 2013). All Mobile carriers, except Vivo, offer pre-paid Internet plans for roughly US$0.25 a day (10Mb) or US$6.00 / month (300Mb) with a reduced speed of 500 kBps. Despite of the lower speed, this service has become very popular, once it costs less than regular data plans, and users have to pay only when they actually use the service. The table below shows some sample prices of data plans for the four major cellular operators in Brazil.

Table 5: Data plans prices in Brazil (speed: 1MBps - February 2013)[1]

Mobile Network Carrier	Plan 1 - Data usage (MB / month)	Plan 1 - Price (US$/month)	Plan 2 - Data usage (MB / month)	Plan 2 - Price (US$/month)
Vivo	250	17.50	500	30.00
Claro	300	15.00	500	25.00
Tim	300	15.00	NA[2]	-
Oi	250	10.50	500	21.00

[1] Source: carriers' websites

[2] Vivo did not have a 500MB/month plan available

2.1.2.3 Brazilian smartphone market

With respect to the smartphone market, the local scenario differs a little bit from the developed world. In Brazil, smartphone penetration is about 14% (Think with Google, 2012), which represents 36.5 million smartphones. This penetration is much lower than the western developed countries, such as USA ─ 47% penetration (Lunden, 2012) and countries from Western Europe (UK, Spain, Germany, Italy, and France) ─ with an average penetration of 55% (Lunden, 2012). However, it is comparable to the penetration in the BRICs[9] (Nielsen, 2012; New Media Trend Watch, 2012; Yuan, 2012). In contrast, in absolute numbers, Brazil was the fifth largest smartphone market in the world in 2012 (CIOL, 2012). See the table below for further details.

[9] BRICs is an acronym that stands for Brazil, Russia, India, and China.

Table 6: Smartphone penetration

Country	Smartphone penetration
Brazil	14%
USA	47%
UK	62%
Italy	51%
Spain	63%
Germany	48%
Russia	21%
India	9%
China	10%

The national OS market share distribution is quite peculiar. While iOS currently enjoys a very comfortable position in the global market, in Brazil it has a small share of the market (Kantar World Panel, 2012), despite of its considerable growth in 2012. One reason is the high price charged for an iPhone in Brazil. In February 2013, an iPhone 4S could be found for US$600 or less in the USA and even cheaper in Europe, but in Brazil it would cost no less than US$1,000. Other reasons include the delay in the launch of new iPhone models in Brazil compared to the rest of the world, and the low number of devices available for sale, which sometimes creates long waiting times for customers willing to buy it. In fact, it seems that Apple's strategy is to maintain itself positioned as premium brand in Brazil, in order to enjoy greater margins and create a *buzz* around the brand.

As in the rest of the world, Android is the leading operating system in the Brazilian market, and it enjoyed the fastest growth among all operating systems in 2012. However, in Brazil, its advantage over the competitors is lower than abroad (Kantar World Panel, 2012). Android is the most disseminated operating system, primarily because it is the most available OS in the country, and Android-based phones are the cheapest ones in the category. In Brazil, the largest social class is the Class *C* (more than 50% of the population), which has income constraints to afford expensive devices.

Symbian followed its international downward trend also in Brazil. It still has a significant market share of more or less 20% (Kantar World Panel, 2012), but this share will definitely fade away soon. It is the end of a long era of prosperity and high profits also in Brazil for the Finnish Mobile operating system.

Windows Phone presented a surprisingly positive growth, establishing itself as the third OS in Brazil (Kantar World Panel, 2012). Since 2012, Nokia and Microsoft teamed up to compete in the smartphone business area, marketing Microsoft operating system on Nokia devices. Even though Symbian does not exist anymore, Nokia is still a well-respected brand in Brazil, which could be one of the reasons explaining the high growth of the Windows platform last year.

BlackBerry OS's market share did not vary much from 2011 to 2012. Its Brazilian market share is similar to its global market share (around 4.5%).

Possible reasons for the discrepancies between the Brazilian and global markets were price advantages and first mover benefits. The second and third position, occupied respectively by Symbian and Windows, can be linked to their first mover advantages in the Brazilian market, and because they were provided in relatively low cost devices. Nevertheless, current scenarios point the continuous deterioration of Symbian's market share, and the growth of Android, iOS, and Windows. One can assume that these three OS will dominate the national market in the coming years, with better advantage to the first two.

A 2012 survey in Brazil showed that 24% of the interviewed people did not know the operating system they were using (Think with Google, 2012), showing that many users in Brazil are lay. More details can be seen in the following chart.

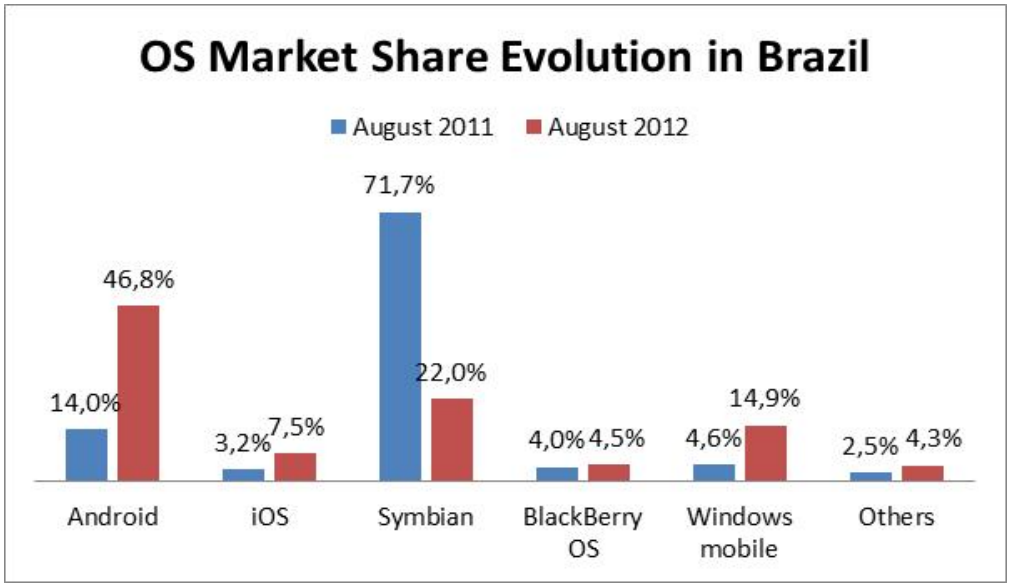

Figure 2-8: OS market share in Brazil (2012) **(Think with Google, 2012)**

2.1.2.4 Peculiarity of the Brazilian app market

A specificity of the Brazilian market is the decree 4.991/04 and the ordinances 899/01 and 1035/01, which claim that all games should be evaluated by the Department of Justice, Rating, Titles and Qualifications of the Ministry of Justice before being commercialized in Brazil. This decree is the reason why Apple was not offering gaming apps in Brazil until April 2012. From that date on, Apple started following Google's policy, commercializing games claiming that its servers were located outside Brazil. It must be said, though, these games risk to be removed from Brazilian stores. Windows Phone, on the flip side, decided to classify the games, attending the regulations, but developers shall face higher costs. It has been more than a year after Apple's decision and so far no governmental restriction has been applied.

2.1.3 App stores ranking algorithms

In this thesis, an empirical analysis of the two main app stores (App Store and Google Play) is performed in order to deeply investigate their details, behavior,

evolution, and patterns. This analysis is heavily based on the rankings of the applications in these stores. Apps are ranked in several different ways, but the most relevant for this project are: Top Free ranking, Top Paid ranking, and Top Grossing ranking. Understanding how these rankings work and how the algorithms that lie behind the app stores work are key points to understand the dynamics of the Mobile app ecosystem. Besides, immediacy of access to content is an important requirement to make the user download an app, thus positioning an app at the first screen of the store gives tremendous benefits in terms of visibility, and therefore leads more easily to the download. Achieving the top of these rankings substantially increase the exposure of the app to users, helping the dissemination of the app and possibly improving income generation.

Intuitively, one could think that the rankings are simply based on the number of downloads obtained by the application. This is utter common-sense. Raw number of downloads is the first and basic criteria to evaluate the performance of a Mobile application. Indeed, app stores worked this way at the beginning. Changes in applications' positions in the store were very intense, almost real time. However, the current reality of the rankings is quite different.

App stores rankings are based on secret and complex algorithms developed by the app store owner (Almini, 2011). They have to be secret and complex, because otherwise developers would manipulate them to climb up positions and reach the top. In fact, there are several reports available on the web suggesting manipulation of rankings by developers and applications (Millward, 2012; Kim, 2012; Biyani, 2009). Thereupon, app store owners often change the algorithms to make them stronger against this violation.

Apple, in a first attempt, began to consider as valuable the positive and negative ratings that the app had in the store. It may have worked for a while, but just after a short time developers started paying people to post positive comments on their applications, and negative comments on rival apps (Biyani, 2009). Other attempts were also tested, such as the inclusion of the number of downloads in the previous days. Anyway, it is important to keep in mind that these algorithms are periodically reviewed

and updated, always trying to improve their efficacy and performance, and of course, to reward the best apps and avoid cheaters.

Although no one can be absolutely sure about the algorithms, many believe that the main criteria for the rankings are:

- Raw number of downloads in the past 3 days (a weighted average giving higher importance to the previous day). This is likely more relevant on AppStore.
- Ratings performance. This is probably more relevant on Google Play.
- Active usage of the app (for example: daily/monthly number of active users). This is likely more relevant on Google Play.

The last criterion, active usage of the app, enhances the performance of more engaging apps, such as Facebook or Angry Birds. On the other hand, it makes life very harsh for new apps to grow in rankings, because old apps have a bigger and consolidated user base, while new apps take more time to reach a comparable value (Almini, 2011). Active usage measures the longevity of the app.

Some people argue that there are several classification algorithms, depending on the category of the application (Almini, 2011). The reason would be to broaden the diversity of categories in the general rankings. Still, no one outside Apple and Google is 100% sure about it. Further research on how these algorithms work might be valuable for both developers and scholars.

2.1.3.1 How to estimate the number of downloads of an app

One of the most valuable indicator regarding Mobile app performance is the daily number of downloads, or app demand. It is a top-secret piece of information. App store owners as Apple and Google do not provide demand information on any individual app. Instead, they provide only aggregated data, even to app developers. Moreover, app store analytics firms, such as AppAnnie, Distimo, Flurry, and so on also provide only aggregated, indexed and relative data, such as the total number of downloads per day in

the store. Additionally, app developers are reluctant to share any details on demand for competitive reasons.

Actual download data is very useful for app developers and researchers, and they can be used in several different management areas, including Strategy, Innovation, CRM, and Marketing. For developers, for instance, it would be great to determine the cost of moving up few ranks by increasing marketing efforts and to determine the expected return in terms of an increase in the number of downloads.

The only alternative is to infer demand from publicly available data, such as rank and price of an app. In a 2012 study, (Garg & Telang, 2012) attempted to infer rank-demand relationship for paid apps on Apple's AppStore. They began reviewing the literature. Before their study, some researchers were able to estimate demand from the rank data in the case of Amazon's book sales. To get demand data, these researches collaborated with publishers or somehow manipulated sales rankings. For example, they bought large quantities of some books and monitored the evolution of these books in the rankings.

All these papers assumed a power law (or Pareto distribution) to relate demand and rank. The assumption that sales follow a power law is consistent with the available public information concerning the relationship between app sales volumes and app ranks. The typical Pareto distribution is:

$$demand = \beta * rank^{-\alpha}$$

Where β is the scale parameter and α is the shape parameter.

The Pareto distribution implies that a small portion of apps are responsible for the majority of downloads, which is in line with what has been previously discussed about few apps having most downloads.

Research has also shown that the shape parameter α tends to decrease over time, meaning that to achieve the same rank over time, a product (book, app, and so on) needs higher sales.

Garg and Teland use solely publicly available data to infer demand. According to them, the model is also accurate to estimate top downloaded apps, which sell

disproportionally more. They assume a Pareto distribution for the demand-rank relationship, and they are able to establish some practical formulas by assessing the values of α and β. They gathered the top 200 Paid and Grossing lists in the USA's iPhone AppStore from April 2011 to May 2011.

The authors assumed that the income generated by a paid app came solely from the sale of the app, disregarding in-app purchase and ad revenues. It was a fair assumption during the periods of their analysis, because upfront prices were the dominant source of revenue for paid apps in the second quarter of 2011. However, nowadays the weight of in-app purchase revenue has grown dramatically.

The table below illustrates their results for their data.

Table 7: Garg and Telang's results for American AppStore from April 2011 to May 2012.

Ranking	Demand-rank relationship
Top Paid	$demand = 52{,}958 * rank^{-0.944}$
Top Grossing	$demand = 126{,}666 * rank^{-0.860}$

The results show that the top ranked app in the US market had roughly 53,000 daily downloads and generated approximately US$126 thousand dollars in revenues from the sale of the app, from April 2011 to May 2011. The 50th app had 1,300 daily downloads and generated US$4,300 in revenue. Likewise, the top 100th app and the top 200th app had 700 and 350 daily downloads, respectively.

The curves of the two demand-rank relationships are displayed below, for the top 50 positions. Both curves are very skewed. They strongly diminish in the first 10 positions, and then have long and almost flat tails. Again, few winners have most downloads and revenues.

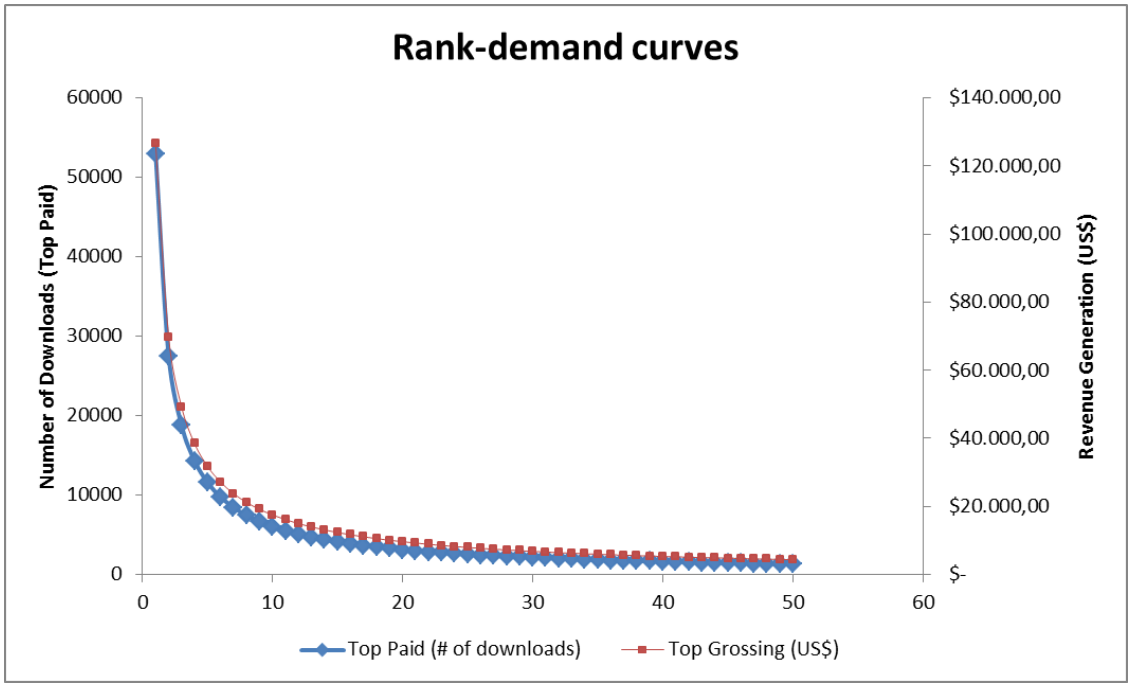

Figure 2-9: Rank-demand curves based on Garg and Telang's study

Some important findings of their work are:

- The top ranked paid app gets almost 40 times more downloads than the 50th ranked app, and 150 times more downloads than the 200th ranked app
- The top ranked paid app grosses 1.8 times more revenue than the second ranked app, and 95 times than the 200th app
- The top ranked paid app is downloaded roughly 53,000 times a day
- Their method can be easily adapted to Google Play store, to Top Free rankings, and can also include the effect of in-app purchase revenues, which cannot be taken for granted nowadays.

2.1.3.2 Past-future demands and price-rank relationships

Another interesting study was conducted by (Carare, 2012). The author used data from the top 100 United States AppStore (from January 2009 to June 2009) to show a causal relationship between past and future app demand. Carare showed that past purchasing experiences of other consumers affect current consumer demand.

The paper provides empirical evidence that the rank of an app strongly affects the willingness to pay of consumers. Carare estimated that this willingness to pay was US$4.50 greater for a top ranked app than for the same unranked app (data is from 2009). This information can be very useful for developers or store owners to adjust product's price according to their position in the rankings. The reason is that consumers, when choosing a product, tend to follow other consumers. People have the tendency to imitate and follow the majority. Therefore, reaching the top ranks is the best way to increase visibility of apps.

During the study, 15 apps remained in the top rankings for the whole observation period (about 6 months). According to Carare, this is a clear indication that popularity brings more popularity. Moreover, the author found high correlations between current and past ranks of the apps.

Carare's results also indicate that the value attributable to the highest rank is almost twice the value attributable to the second highest rank. It is in line with the value found by Garg and Telang, of 1.8.

Some other relevant conclusions of this study are:

- Demand is lower for apps that are not regularly updated
- Rank effect on demand is higher for the top 50 apps, and negligible for apps from 50 to 100 ranks
- There are other factors other than rankings affecting demand. Otherwise, top apps would remain longer in the top

More research is needed in this area. Making important data like app demand available does not seem to be the interest of app store owners and app developers. However, app demand is crucial for researchers and other developers in order to compete more efficiently in this tough market.

Regarding the impact of price changes on download volumes and revenue, a recent report by app analytics firm Distimo (Agten, 2013) addressed this issue through real app data[10]. Distimo analyzed the apps in Apple's AppStore in the 10 largest

[10] See the results of the empirical analysis in this thesis for a similar test.

countries[11] that reached the top400 overall ranking in December 2012, and had at least one price change during this period. Distimo found out that more than 75% of price changes are within the range of US$1 and US$3, and only 8% of the price changes are higher than US$5.

The study tried to answer a simple question: will a price drop increase the number of downloads in such a way that the impact on total revenues is positive? One of the outcomes of the study was that downloads on the iPhone react heavily on any price changes.

The effect of price rises on downloads is negative. On average, after five days of a price rise, downloads decreased by 46%. A rise often occurs after a sales period. This price increase means that apps do not maintain the download level of the sales period after its end.

On the other hand, the effect of price drops on downloads is very positive. Download volumes grew, on average, by more than 1600% on the AppStore, five days after the beginning of the promotion. This delay is caused by the promotion effect. The app attracts more attention, thus, it generates more downloads and revenues, because users that are willing to try a paid app rush to download it before the price rises again. The study suggests that the surge in paid downloads could compensate the loss in price. Distimo's results also suggest that the overall effect of promotions in the short-medium run is positive.

Moreover, the study also claims that income generation grows because of a promotion. It shows that, on average, revenue grows 95% after three days of promotion, 130% after five days, and almost 160% after 7 days of promotion. The revenue growth rate increased the longer the app was on sale. This lagged growth can be explained by income generated by in-app purchases, since it takes a while for some users to decide to spend money within the app.

Finally, regarding price elasticity, the report states that a 1% price drop on the AppStore led to a 1.2% increase in revenue after 5 days, and to 1.4% increase after 7 days. The results were similar to Google Play, but in a less powerful way. The

[11] Australia, Canada, France, Germany, Italy, Japan, Korea, Russia, United Kingdom and United States

explanation is that it is harder to reach the top ranks on Google Play, thereby reducing the ranking effect in this store. The ranking effect is the relative increase in visibility and revenue generation by moving up in the rankings.

It is clear that efforts to climb up the rankings are valid, and very often pay out the investment. There are several ways to implement strategies to move up in the rankings, including advertisement, price drops, frequent updates and promotions. Developers must be aware of these strategies in order to figure out which one is the best fit regarding company's size, characteristics and strategic goals.

3 METHODOLOGY

This thesis is, ultimately, a deep empirical analysis of the two main Mobile application stores in Brazil: AppStore and Google Play. Based on the literature review, the relevance of such a work has become clear. Likewise, it has become clear that these app stores are the most relevant for such an analysis, because Apple and Google are the worldwide market leaders in terms of market share of smartphones (75% for Android and 20% for iPhone) (Gartner, 2012), revenue generation (US$11.5 billion on AppStore and US$3 billion on Google Play) (Reyburn, 2013; Koetsier, 2012), and available apps (700,000 on Google Play and 775,000 on AppStore) (Womack, 2012). Moreover, this situation is likely to continue in the coming years (Gartner, 2012).

Although Apple has low market share in the Brazilian market, there are several factors indicating it will continue to reinforce its presence in the future. First, Apple has recently shown strong and consistent growth in Brazil (from 3.2% market share in 2011 to 7.5% in 2012) (Think with Google, 2012). Second, its main manufacturer, the Taiwanese company FoxConn, has built a big plant in São Paulo state. This plant will be responsible, among other products, to manufacture the iPhone line. Third, with increased competition and rumors about a low-cost iPhone (Daily Mail, 2013), the iPhone might increase its competitiveness against Android (and others) devices.

3.1 Development

This project gathered real-world data in order to assess some qualitative and quantitative aspects of the Mobile application environment. It is divided into two parts. First, an empirical analysis of the two biggest app stores (AppStore and Google Play), and a second part consisting of market assessment analysis, focusing on two Italian Mobile applications that were to be introduced in the Brazilian market: QuizPatente and AllMyTv.

3.1.1 Empirical Analysis

The first and major part is an empirical analysis of the two main digital marketplaces for smartphones: AppStore (for iOS based smartphones) and Google Play (for Android-based smartphones). Together, iOS and Android smartphones encompassed roughly 90% of the worldwide market share in the first quarter of 2013, with Android leading the way with over 70% of market share, as shown in the literature review.

Looking at the total revenues of several app store owners, it seems clear that there is a great disparity among players. Apple has the biggest share of the worldwide revenues, yet this share is in a downward trend. Apple's shares are being transferred primarily to Google, but the latter is still far from overtaking Apple for the first position (Almini, 2011).

Indeed, AppStore and Google Play are the rulers of app stores. AppStore has the highest revenues, and, still, the largest amount of available apps. Google, instead, has higher number of daily downloads and the fastest growth in the market (Almini, 2011).

This research aimed to investigate in depth these two app stores, in order to understand the ins and outs of its functioning and monitor its evolution. The scope of this study is the Brazilian Mobile applications stores from Apple and Google. The empirical analysis provides an interesting view of these two Mobile ecosystems.

3.1.1.1 Analysis Model

The empirical analysis was based on the first 50 ranks of apps in the three rankings (Top Free, Top Paid, and Top Grossing) of the General Category on each app store in Brazil.

One of the most important measures of success of a Mobile app is whether the app reaches the top positions on the app store (Almini, 2011). Mobile apps that reach the top 50 positions in their respective rankings (Free, Paid, and Grossing) can be considered successful. The empirical analysis sheds light on the average behavior of such

successful apps. The censuses provide a general framework to analyze the average condition of a successful Mobile app, in order to provide guidelines for developers in terms of adequate business choices, platforms (Android + iOS, only iOS, or only Android), revenue models, and many other important features.

3.1.1.2 Period of observation

The rankings Top Paid, Top Free, and Top Grossing (most profitable apps) were monitored for several months (November-December 2012 and April-May 2013), totaling 4 months, through the daily registration of the top 50 positions defined by the ranking algorithms of each store. For each day of the sampling periods, the first 50 positions of the Top Paid, Top Free, and Top Grossing rankings were retrieved, both on AppStore and on Google Play. Thus, for each day, 300 Mobile apps were added to a database, including additional information such as nation of the developer, price, presence of in-app purchase, and so on.

From November to December 2012, and then from April to May 2013 (namely Period I and Period II, respectively), two censuses were performed on the stores, analyzing their characteristics and details, such as average price of apps, turnover rate, number of apps developed by Brazilian firms, and so on.

The second census, from April to May 2013, was also used to assess the dynamics and evolution of the stores. It has increased the statistical significance of the data, and has also eliminated period-specific noises, such as seasonality and new regulations or policies. Comparing two non-consecutive time spans is interesting, because it shows the evolution of such dynamic ecosystems. The amplitude of the analysis has allowed, thus, to properly framing the complexity of a phenomenon in constant evolution, rather than providing a simple snapshot of the Mobile offer, which would have been affected by possible contingencies related to the specific period and would not have guaranteed full statistical validity.

3.1.1.3 Sources of data

The analysis of the two app stores was based mainly on primary sources, that is, on the rankings provided by the app stores, ratings, and information about in-app purchases for each application. Meanwhile, firms' websites provided information about the nature and nation of each developer[12]. By the end of the sampling period, an extensive database was ready to provide some knowledge about the app stores. The database contains the following pieces information for each app in the top rankings:

- App name
- App developer
- Country of developer (the country of the headquarters of multinational organizations)
- Type of company: companies were segmented in three different clusters according to size.
    - Small/Medium Company: fewer than 150 employees and/or less than US$3 million turnover. Typology: Mobile startups or small/medium software houses.
    - Big Company: more than 150 employees and/or more than US$3 million turnover. Typology: big software houses, Mobile studios, or brands.
    - Independent: developers listed in the ranking with their own personal names instead of company names. Typology: students, hobbyists, or contracted developers.
- Type of ranking
    - Top Paid
    - Top Free
    - Top Grossing
- Price of the app
- Category of the app
- Company category
    - Mobile Company: developers focused on Mobile app development.

[12] The sources for the country and nature of the companies were official websites and social network webpages.

    - Software Company: developer whose core business is general software development (PCs, consoles, web, or any other platform that is not smartphone or tablet).
    - Brand: companies with different core businesses but also with a footprint in the Mobile market (for example: Disney, banks, NBA, Amazon, and so on).
- Rating of the app: data on the ratings were retrieved on the exact date the app showed up in the top 50 rankings for the first time.
- Days in the top 50 during the two months analysis
- Platform: iOS or Android
- Presence of in-app purchase

3.1.1.4 Analysis objectives

The analysis intended to provide a better understanding of the functioning of the stores, in terms of ranking algorithm and app distribution within the rankings. Moreover, it allowed assessing, in qualitative and quantitative figures, the most important drivers for developing successful apps. The results from the survey on app stores allowed the identification of the current scenario of development and production of Mobile apps in Brazil.

Comparing both app stores is also necessary. Startups and small companies competing on this business area often face budget issues, and deciding the right app store to launch a new app can determine the success or failure of an entire firm[13]. In fact, it is extremely important for companies to grasp the features of different stores, so as to be able to choose the one that is more in line with their business strategy.

[13] Small companies tend to focus on a single Mobile ecosystem, since apps developed for iOS devices are not directly portable to Android devices, and vice-versa. In fact, the empirical analysis showed that in Period I only 6.6% of Small and Independent developers had apps in both AppStore and Google Play rankings. In Period II the same figure decreased to 2.1%.

Nowadays, two questions are relevant for companies willing to assess the Mobile market:

- *Is it important for us to be present in one or more app stores with a Mobile app? What role do our customers have in the Mobile ecosystem?*
- *What are the appropriate features for our Mobile app, regarding price, design, content, and so on?*

Therefore, knowing in depth the Mobile ecosystems is a source of competitive advantage for a company that wants to thrive in the Mobile market. The Mobile app market is innovative by nature, requiring the understanding of all actors' roles in the network, such as customers' needs and competitors' strategies. Even a simple parameter such as the category of the app may impact the firm overall performance, once some categories require higher daily downloads to reach the top positions in the ranking, whilst some others are easier to climb up the rankings[14]. These pieces of information enable companies to play a more active role in the app economy.

3.1.1.5 Key Performance Indicators

The empirical analysis is a macro-analysis that consists of evaluating quantitative and qualitative elements of the app stores, namely Apple's AppStore and Google's Google Play, in Brazil. Given the novelty of this research about the Brazilian market, all variables that could be extracted from publicly available data was measured, aggregated and standardized for Period I and Period II. In a real company scenario, after further research on performance management for the Mobile app industry, an optimal set of KPI (Key Performance Indicators) for each actor in the value network should be defined.

The selected KPI selected for the empirical analysis are referred – and applied – to the app store as a whole, in order to evaluate each store individually and also to

[14] For example, a Mobile game related to health and fitness could be placed in the Games category or in the Health and Fitness category. However, reaching the top rankings in the Health and Fitness category requires much lower daily downloads than the Games category. Therefore, placing these apps in the Health and Fitness category might considerably increase its visibility and success.

benchmark different app stores. The structure provides a standardized way to display the most relevant indicators related to app stores that is easy to understand, and from which developers can benefit in various phases of the developing process.

First, benchmarking different stores is a fundamental activity to be performed by developers prior to the design of a new application. Different stores provide different benefits and challenges, thus it is important for developers to define the most suitable one(s) based on firm's strategy. When performing this activity, a company might even decide to abandon the idea of a new app, if the expected returns are not adequate. Moreover, understanding the intrinsic features of an app store from the beginning may avoid relevant issues and high costs (financial and non-financial) in the future.

Second, publicly available data from app stores provide powerful benchmark valuations on competitors' strategies and performance. The data serves as guidelines for new entrants looking for well-established practices in the Mobile app market, as well as for incumbents seeking better results.

In this section, the available quantitative indicators obtained through the empirical analysis are briefly explained in the following table. In the coming sections, the indicators are further described and the results obtained through the empirical analysis are presented.

Table 8: Description of the quantitative measures (KPI) used in the empirical analysis

KPI	Perspective	Rationale
Average Number of Apps in the top 50 per Developer	Learning and Growth	Reflects the developer's position in the learning curve and its velocity regarding time to market.
Categories Distribution	Customer	Displays the characteristics of the offer pursued by customers.
Average Price	Financial	Impacts directly on firm's revenues.
Turnover Rate	Customer	The turnover rate may reflect customers' satisfaction and willingness to switch apps, but it is also very dependent on app store's ranking algorithm.

Presence of In-app Purchase	Financial	In-app purchases might increase the total income generation of an app.
Companies Characteristics (in terms of industry of origin, and company size)	Customer	This KPI shows that all kinds of developers may have the chance to succeed in the Mobile app market, because of its openness and low entry and switching costs. Thus new comers can surpass incumbents through quality and innovation of their offer.
Brazilian Participation	Customer	Measures the quality and the competitive position of the national Mobile industry.
Estimated Daily Downloads	Learning and Growth / Customer / Internal Processes	The daily number of downloads may reflect the current position of the developer in the learning curve and the customer satisfaction regarding the app, as well as the efficiency of the marketing department and other internal processes.
Days in the top 50	Customer / Internal Processes	It shows the acceptability of the app by customers and the efficiency of the company in maintaining its offer constantly among the best.

From the table below, it is possible to see that customers' perspective has the biggest share of KPI. All other perspectives are, to greater or lesser extent, balanced. Therefore, customers seem to have a strong power in the Mobile app market, which is aligned to the literature. They are virtually free to switch to new apps and new developers at low or no expense, and even to new devices (albeit with higher switching costs). Obtaining and sustaining a large customer base has been one of the most difficult challenges brought by the Mobile apps market. Developers must keep in touch with their customers in order to monitor the KPI and adjust their offers to improve customers' satisfaction.

3.1.2 Market assessment analysis

Regarding the market assessment analysis, two Italian start-ups were to be introduced in the Brazilian Mobile app market: QuizPatente and AllMyTv. They are successful apps in the Italian market looking for overseas expansion. The analysis focuses on marketing strategies for the introduction of these apps in Brazil.

First, a macro analysis is performed, using well-known tools such as PEST analysis and Porter 5-forces model, in order to build a SWOT matrix (strengths, weaknesses, opportunities, and threats). Next, the main competitors are detailed. Data from the empirical analysis will substantiate marketing choices and entry strategies.

4 EMPIRICAL ANALYSIS

4.1 Results of the Empirical Analysis

The results, together with a discussion, for the quantitative figures obtained through the empirical analysis are presented hereafter.

4.1.1 App stores facts

To begin, some general pieces of information about app stores are presented in this section. Next, Period I and Period II are compared.

Both periods of analysis (Period I and Period II) have 61 days each. The maximum number of possible entries in the database is given by the formula below. Each entry corresponds to a different app (or the same app in a different ranking).

$$61\ days * 50\ \frac{apps}{ranking, day} * 3\ rankings * 2\ OS = 18300\ apps$$

However, many apps appear more than once in the rankings. In the next two sections, further details about this topic will be disclosed.

4.1.1.1 Period I

In Period I, the actual number of entries in the database was 1264 (Of which 61.5% were on AppStore and 38.5% on Google Play), representing only 6.9% of the maximum amount (8.5% of the maximum amount for AppStore 5.3% for Google Play). From these 1264 entries, 1032 were single entries (645 on AppStore and 387 on Google Play). The differences are due to some apps that appear in more than one ranking. For example, a

paid app can make a limited-time sale and become free for a while, thus, appearing in two different rankings (for example paid and free, or grossing and free). The 1032 single apps during Period I were developed by 741 different developers. Therefore, on average, each single developer had 1.39 apps in the top 50 in Brazil (this average is similar for both AppStore and Google Play).

This average serves as a proxy for measuring competitiveness in the Brazilian app stores. Most developers had only one or two applications in the top rankings in the first sampling period. This number is also in line with the *few winners take all* theory, seen in the literature review, since only six large developers reached 10 or more different apps in the rankings: Gameloft (54 different apps in Period I), Electronic Arts (32 apps), Rovio Mobile (26 apps), Halfbrick Studios (15 apps), Disney (15 apps), and Apple (12 apps). Five out of these six are game developers. Interestingly, these game companies have attained leadership very quickly, since until April 2012 games were not available in the national Apple's AppStore. Moreover, most of these large companies' strategy seems to be launching as many apps as possible at the same time to increase revenues in two distinct ways: first, by accumulating the income generated by each individual app; second, by exploiting synergies obtained through the internal ad network[15]. The chart below illustrates the scenario for Period I. It also shows that 97.8% of the developers reached one of the top 50 rankings during Period I with only 5 or fewer apps.

As seen in the literature review, few, large companies take the majority of revenues and profits in the app stores. In fact, during Period I, only 12.8% of the apps stayed in the rankings for more than 70% of the time (43 days or more), of which 60% were big companies; meanwhile almost 65% of the apps stayed 10 or fewer days, of which 55% were small or independent developers. In the Top Grossing rankings, only 8% of the apps reached the top 50 more than 70% of the time (43 days or more), of which 80% were big companies; and more than 68% were there for fewer than 10 days, of which 60% were small or independent developers. The numbers suggest that the high-revenue concentration phenomenon of also occurs in Brazil.

[15] According to Osservatorio Mobile from Politecnico di Milano, ad revenues are responsible for nearly 30% of the total revenues of Mobile apps, on average. Disney's second quarter financial statements present nearly the same value.

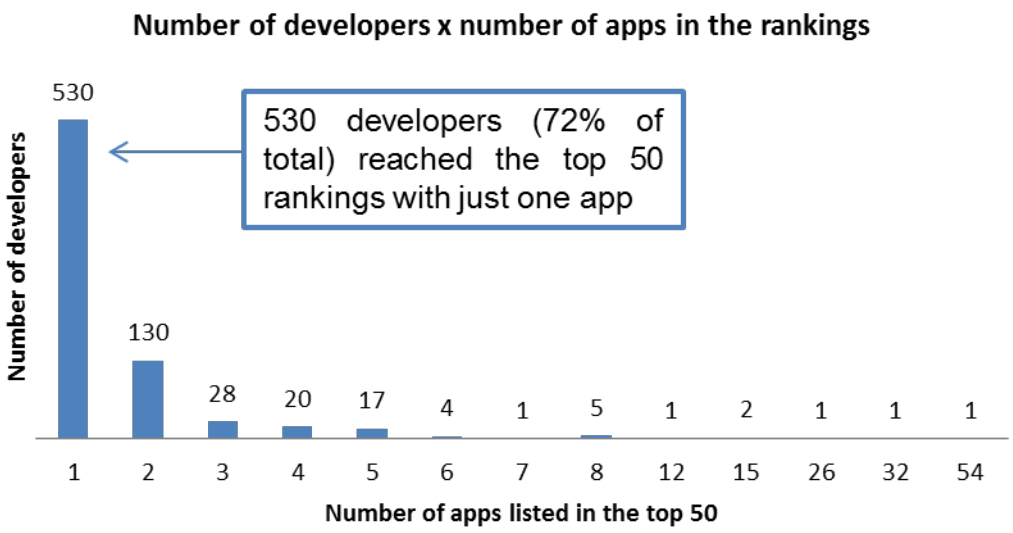

Figure 4-1: Histogram: Number of apps in the top 50 lists (hidden numbers did not show up)

4.1.1.2 Period II

In Period II, the actual number of entries on the database was 1063 (71% from AppStore and 29% from Google Play), 15.9% less than the first period. In other words, from the 18300 possible entries in the database, only 5.8% were actual different entries (single app entries or the same app in different rankings) in Period II, against 6.9% in Period I. Individual values in Period II are 8.2% for AppStore and 3.4% for Google Play, against 8.5% and 5.3% in Period I, respectively. The results suggest a decrease in the volatility of rankings (especially on Google Play), and an increase in the concentration of the Brazilian Mobile app stores.

From the 1063 entries, 845 were single app entries (634 from AppStore and 211 from Google Play), developed by 612 different developers. Therefore, on average, each single developer had 1.38 apps in the top 50 in Brazil during Period II, which is almost the same value found for Period I (1.39). Remarkably, the significant decrease in the number of actual entries notwithstanding, the ratio kept constant.

Likewise Period I, most developers had two or fewer applications in the top rankings in Period II, and only four developers reached 10 or more different apps in the

rankings (against 6 in Period I): Gameloft (54 different apps in Period I), Electronic Arts (27 apps), Rovio Mobile (13 apps), Disney (21 apps). The chart below illustrates the scenario for Period II. It also shows that 97.5% of the developers reached one of the top 50 rankings during Period I with only 5 or fewer apps, virtually the same value found in Period I.

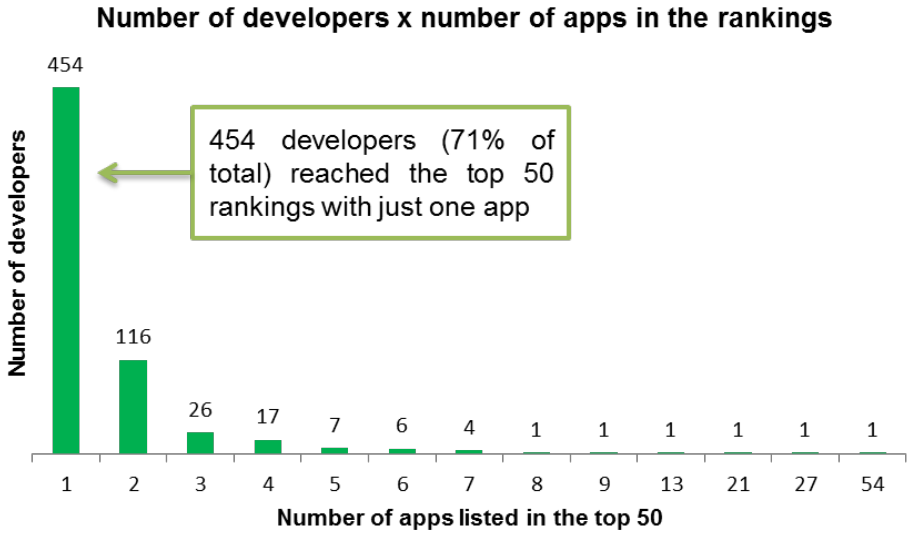

Figure 4-2: Histogram: Number of apps in the top 50 lists (hidden numbers did not show up)

During Period II, 18.1% of the apps stayed in the rankings for more than 70% of the time (43 days or more), against 12.8% in Period I. Meanwhile, 60.5% of the apps stayed 10 or fewer days, against 65% in Period I.

In the Top Grossing ranking, the number of apps that reached the top 50 more than 70% of the time (43 days or more) increased from 8% to 22.9%, suggesting lower app revenue concentration in the Brazilian Mobile app stores.

Generally speaking, the Brazilian Mobile app stores did not change much in terms of the *few winners take all* theory from Period I to Period II. Instead, this phenomenon intensified since the database was filled with fewer entries, and only four developers were able to allocate 10 or more apps in the top rankings during Period II.

4.1.2 Categories division on each app store

Although AppStore and Google Play have some similar characteristics, they are quite different in terms of number and distribution of categories. For instance, Google Play divides apps as Games or Applications (non-games), and then divides them into subcategories. AppStore, instead, has only one level of categories, and Games is one of them.

Users have to know and understand the distribution of apps in the categories, in order to find the exact content they are looking for, though it is not an easy task given the big variety of categories and subcategories existing in the stores and the ambiguity among app categories.

The following table shows the categories for each of the two app stores. Google Play has 34 subcategories (8 Games subcategories and 26 Applications subcategories), while AppStore splits its apps among 23 categories.

Table 9: App categories on AppStore and Google Play

AppStore	**Google Play**	
Category	**Category**	**Subcategory**
Books	Games	Arcade & Action
Business		Brain & Puzzle
Catalogs		Cards and Casino
Education		Casual
Entertainment		Live Wallpaper
Finance		Racing
Food & Drink		Sports games
Games		Widgets
Health and Fitness		
Lifestyle	Applications	Books & Reference
Medical		Business
Music		Comics
Navigation		Communication
News		Education

Newsstand		Entertainment
Photo and Video		Finance
Productivity		Health & Fitness
Reference		Libraries & Demo
Social Networking		Lifestyle
Sports		Live Wallpaper
Travel		Media & Video
Utilities		Medical
Weather		Music & Audio
		News & Magazines
		Personalization
		Photography
		Productivity
		Shopping
		Social
		Sports
		Tools
		Transportation
		Travel & Local
		Weather
		Widgets

The heterogeneity in the number and names of categories causes difficulty in comparing the two stores. To solve this problem, the categories of both stores were grouped into nine broad categories. Each of them groups similar categories/subcategories. They are:

- **Games:** groups AppStore's Games category and Google Play's eight games subcategories (Arcade, Puzzle, and so on).
- **Photo and Video:** groups AppStore's Photo and Video category and Google Play's Media & Video and Photography categories.
- **Entertainment:** groups AppStore's Entertainment and Health and Fitness categories and Google Play's Entertainment, Health & Fitness, and Live Wallpaper categories.
- **Utilities:** groups AppStore's Business, Finance, Productivity, and Utilities categories and Google Play's Business, Communication, Finance, Productivity, Shopping, and Tools categories.

- **Music & Audio:** groups AppStore's Music category and Google Play's Music & Audio category.
- **Social Networking:** groups AppStore's Social Networking category and Google Play's Social category.
- **Maps:** groups AppStore's Navigation category and Google Play's Travel & Local category.
- **Books & Reference:** groups AppStore's Books, Catalogs, and Reference categories and Google Play's Books & Reference and Comics categories.
- **Others:** groups all other remaining categories.

4.1.2.1 Period I

Looking at the results of Top Free, Top Paid, and Top Grossing rankings, it is possible to see a big variety of category representation. On AppStore, during Period I, 22 out of 23 categories appeared in the rankings (only Newsstand did not have a representative). Alike, on Google Play, during Period I, 29 out of 34 subcategories had, at least, one representative in the top50 rankings. This diversity allows developers from minor categories to obtain visibility in the store, which is something precious and utterly required to generate revenue.

The chart below shows the overall presence of categories (grouped into the 9 broad categories) for each app store during the first period of analysis, considering all apps from Top Paid, Top Free and Top Grossing rankings.

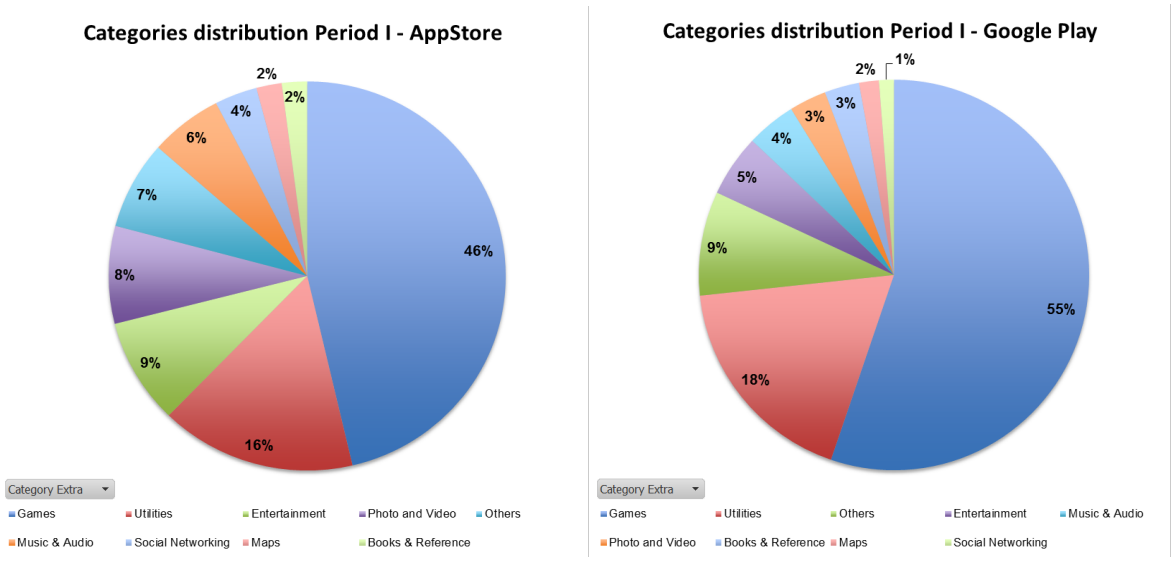

Figure 4-3: Categories distribution during Period I (all rankings)

During Period I, Games and Utilities are the categories that appeared the most in the rankings. Together, they accounted for 62% on AppStore and 73% on Google Play. In third position, there is Entertainment category on AppStore and Others on Google Play, both with 9%. Entertainment and Photo and Video seem to be more important for iOS users than for Android users. On the other hand, Brazilian Android users seem to give a higher importance to Games. It is quite interesting to notice that, despite of the long time spent by Internet users on social networks, these apps are one of the least downloaded in both stores. Few, large companies, such as Facebook and WhatsApp, dominate the Mobile social networking environment. Among Utilities, there are apps from Business, Finance, and Productivity categories, implying that there are also many professional smartphone users in Brazil. They use smartphones not only for entertainment purposes, but for working too.

Considering only the Top Paid ranking, Games (38%) have lower presence, and Utilities (19%), Entertainment (11%), and Photo and Video (12%) categories have higher participation on AppStore. On Google Play, the distribution is similar to the general one displayed above in the chart, except that Utilities has higher share (23%).

Considering only the Top Free ranking, there are no substantial differences in the distribution of categories on AppStore. On Google Play, instead, the share of Games decreased to 50%, against an increase in the presence of Entertainment apps (12%).

Considering only the Top Grossing ranking on AppStore, there is substantial increase in Games participation (64%), making Utilities lose a large part of its share (9%). On Google Play, the distribution is very similar to the one displayed above in the chart.

The following charts display the distribution of categories for Top Paid, Top Free, and Top Grossing rankings.

Understanding what categories perform better is an important factor in the planning phase of a Mobile app. For instance, it is very clear that games have greater visibility within the stores. An analogy that represents the importance of visibility inside the store can be made with online search engines, such as Google.com. Few users continue the search after the third or fourth pages. Thus being among the first results is crucial to increase the number of downloads and revenue generation.

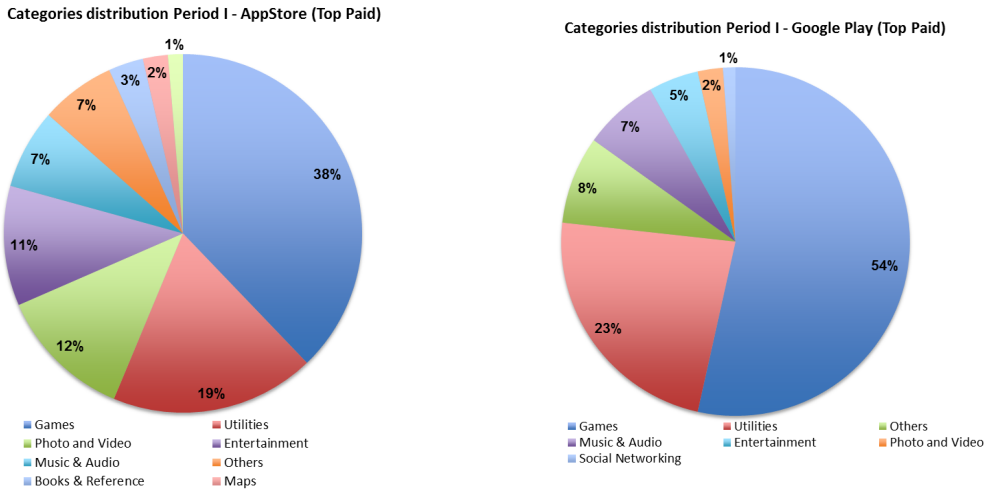

Figure 4-4: Categories distribution during Period I (Top Paid)

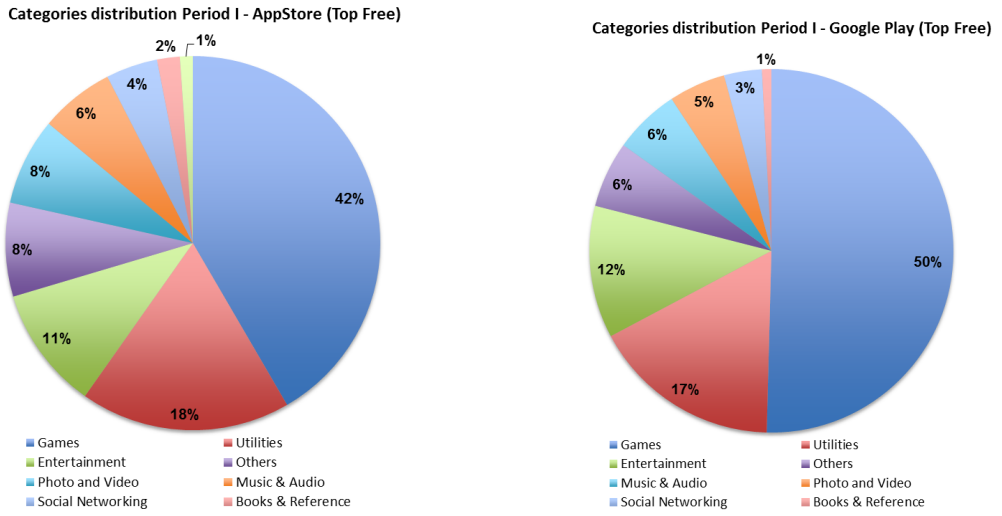

Figure 4-5: Categories distribution during Period I (Top Free)

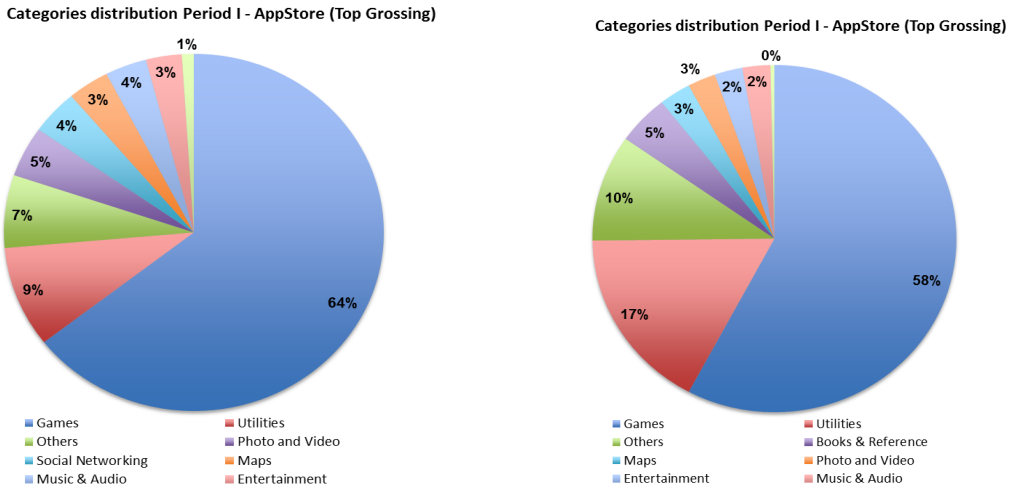

Figure 4-6: Categories distribution during Period I (Top Grossing)

4.1.2.2 Period II

On AppStore, during Period II, 22 out of 23 categories appeared in the rankings (only Newsstand did not have a representative), the same number found in Period I. On Google Play, instead, during Period II, only 23 out of 34 subcategories had, at least, one representative in the top50 rankings, against 29 in Period I. While AppStore continued to

show significant diversity, Google Play showed narrower success possibilities of developers from minor categories.

The chart below shows the overall presence of categories (grouped into the 9 broad categories) for each app store during the second period of analysis, considering all apps from Top Paid, Top Free and Top Grossing rankings.

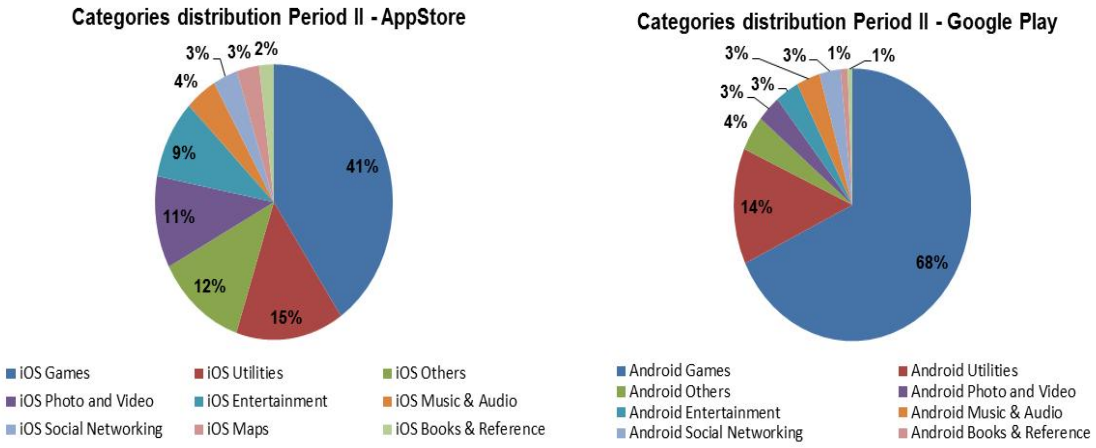

Figure 4-7: Categories distribution during Period II (all rankings)

During Period II, Games and Utilities are the categories that appeared the most in the rankings. Together, they accounted for 56% on AppStore and 82% on Google Play. There was a significant increase of 13% in the participation of Games on Google Play, suggesting that Android devices are targeted to customers more focused on leisure. On the other hand, the increase in participation of Utilities category suggests a more intense usage of smartphones for professional activities. The increase in participation of Others on AppStore (from 7% to 12%) suggests that developers are giving more attention to these categories since they are less competitive, thus easier to climb up the rankings and easier to get more visibility.

Considering only the Top Paid ranking on AppStore, Games had lower participation (31% in Period II vs. 38% in Period I), and Others had higher presence, meanwhile the remaining categories did not vary much. On Google Play, there are no significant differences between Period I and Period II.

Considering only the Top Free ranking on AppStore, Others category almost doubled its share compared to Period I, while Games has lost part of its share chiefly to

Utilities. The distribution on AppStore is more concentrated in Period II. On Google Play, Games increase its participation in 12 percentage points, while Entertainment lost 7% of its share. Remaining categories did not vary significantly from Period I to Period II.

Considering only the Top Grossing ranking on AppStore, there is little change from Period I to Period II. On the other hand, Google Play presented a 26% increase in Games participation (from 58% to 84%). Therefore, games developers grabbed most of revenues generated by Android devices in Brazil in Period II. Utilities and Others were the main losers, with 10% and 7% losses, respectively.

Regarding app store evolution, Games and Utilities are still the most important apps for smartphone users. Therefore, apps placed in these categories face higher competition, but are also more likely to get more visibility and generate good profits.

The following charts display the distribution of categories for Top Paid, Top Free, and Top Grossing rankings for Period II.

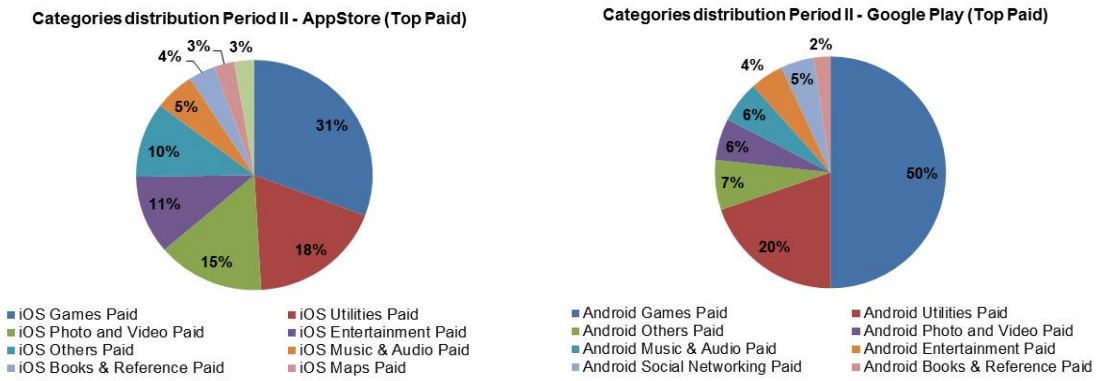

Figure 4-8: Categories distribution during Period II (Top Paid)

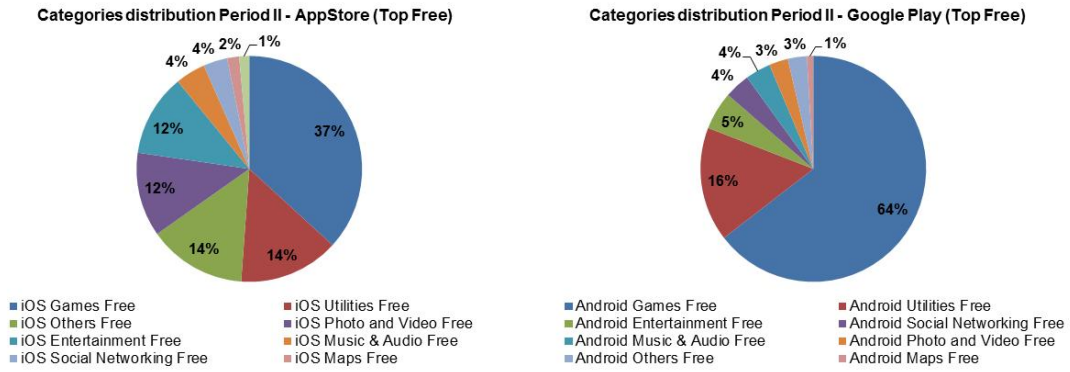

Figure 4-9: Categories distribution during Period II (Top Free)

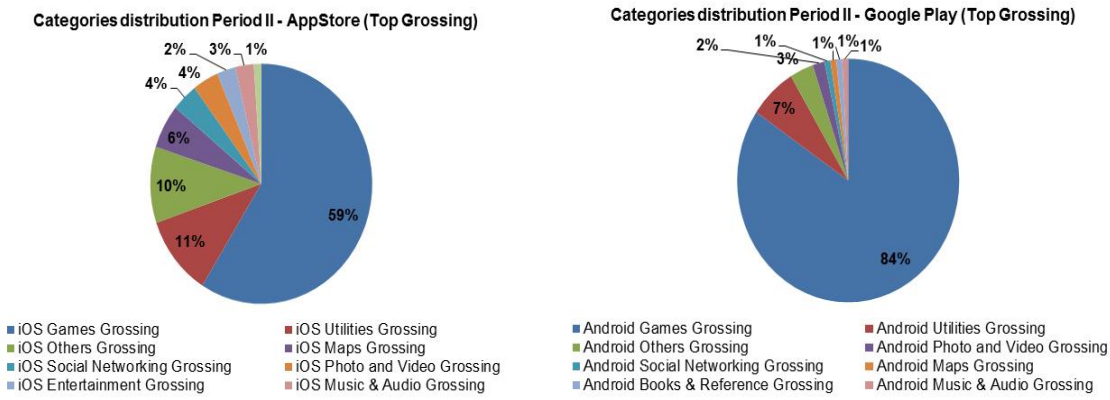

Figure 4-10: Categories distribution during Period II (Top Grossing)

4.1.3 Average price

The objective of this section is to determine the average price of paid apps, on each of the app stores, for both Period I and Period II. The average price is calculated every day, and then an overall average of all days is computed.

As for general goods and services, pricing an app is usually one of the first activities firms do while developing its marketing mix and value proposition.

4.1.3.1 Period I

During Period I, the average price of paid apps was US$2.55 on AppStore and US$4.43 on Google Play. The higher average price on Google Play can be explained by the higher number of utilities apps in the ranking, such as anti-virus systems and office suites, usually priced over US$10[16]. Considering that the minimum price for a paid app on AppStore is US$0.99, there is still some margin for developers on this store. Mature markets as USA and Western Europe have average prices closer to the minimum price of US$0.99, because of two possible reasons: first, strong competition might push prices

[16] Google Play's Utilities apps include Productivity, Tools, Business, Finance, and Communication apps. Their price averages US$7.78 including free apps, and US$11.05 considering only paid apps.

down; second, iPhone users might be more inclined to purchase apps than Android users, allowing for lower prices that are compensated by higher volumes.

However, developers may face a different, but tough problem in Brazil. While the empirical analysis is not capable of measuring the number of downloads necessary to achieve the Top50 in each ranking (Paid, Free, Grossing), in general the numbers are much lower for paid apps than for free apps, as seen in the literature review. Some independent developers claim that the Brazilian market is bad for paid apps. To quote one of them on email exchanges, "*Brazilians do not like to pay for anything, not even for a simple application on a mobile phone priced over a thousand dollars."* (Chohfi, 2013)

In the Top Grossing rankings, the average price was, on AppStore, US$5.19 (considering both free and paid apps) and US$12.94 (considering only paid apps). On Google Play, the average price was US$5.03 (considering both free and paid apps) and US$8.39 (considering only paid apps). Disregarding apps priced over US$100, which are rare exceptions and distort the results, the average Top Grossing price on AppStore is US$3.10 (considering both free and paid apps) and US$5.15 (considering only paid apps). On Google Play, average prices go to US$3.99 (both free and paid apps) and US$6.71 (only paid apps). Again, Google Play offers high prices for developers, suggesting that price competition on AppStore is stronger and/or that Android developers must compensate lower paid downloads with higher prices, in spite of the larger market share of Android in Brazil.

Finally, most applications are developed by foreigners and for several app stores around the world, albeit, in general, prices do not vary from store to store. Therefore, national prices tend to follow international trends. The chart below shows that there was a slightly growing trend in average prices during Period I, both on AppStore and on Google Play.

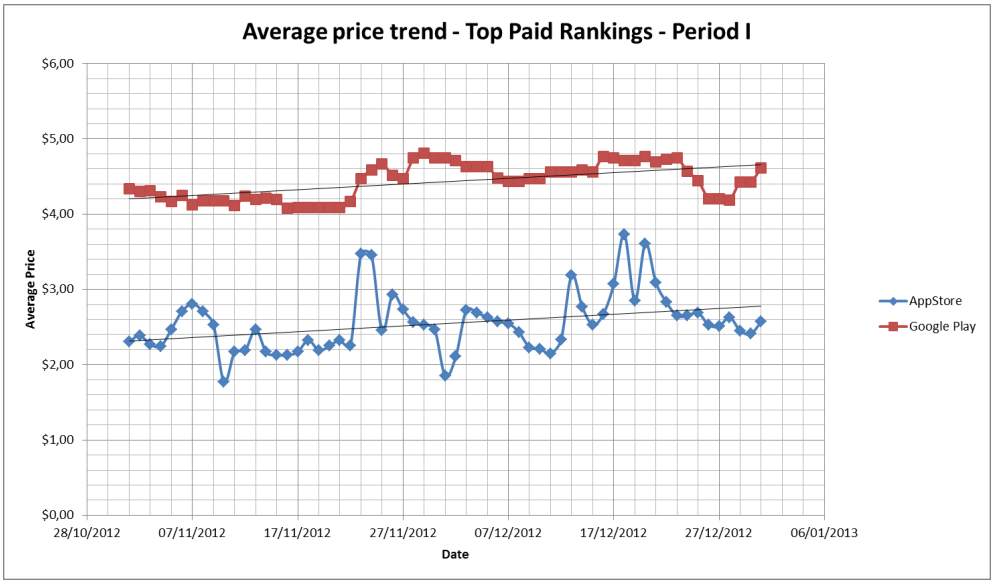

Figure 4-11: Average price trend - Top Paid Rankings – Period I

4.1.3.2 Period II

During Period II, the average price of paid apps was US$2.05 on AppStore (19.6% less than in Period I) and US$4.17 on Google Play (5.9% less than in Period I). Therefore, prices decreased in both Brazilian app stores, following current scenarios of bigger and more mature markets such as US and Western Europe. Google Play still offers higher average prices than AppStore, for the same reasons discussed previously.

In the Top Grossing rankings, the average price was, on AppStore, US$3.34 (considering both free and paid apps) and US$8.65 (considering only paid apps). On Google Play, the average price was US$1.90 (considering both free and paid apps) and US$6.13 (considering only paid apps).

In Period II, Google Play showed a sharp decrease in the average price of grossing apps. The reason is that most of the top grossing apps on this store during Period II were free, and therefore generated income only through internal ads and in-app purchases.

In all cases, there were significant decreases on average prices from Period I to Period II. This result implies two different views: first, paid apps are suffering stronger price pressures, because of intensified competition and customers' preferences, and

second, in-app purchases are becoming even more dominant in the general revenue generation. The table below summarizes the comparison between average prices in Period I and Period II for paid and grossing apps on AppStore and Google Play.

Table 10: Average price comparison between Period I and Period II

	Period I	Period II	Difference
AppStore Paid Apps	$2.55	$2.05	-19.6%
Google Play Paid Apps	$4.43	$4.17	-5.9%
Top Grossing apps (free + paid) - AppStore	$5.19	$3.34	-35.6%
Top Grossing apps (paid only) - AppStore	$12.94	$8.65	-33.2%
Top Grossing apps (free + paid) - Google Play	$5.03	$1.90	-62.2%
Top Grossing apps (paid only) - Google Play	$8.39	$6.13	-26.9%

In Period II, the share of paid apps in the database entries sharply decreased from 60% to 30% for iOS apps, while slightly decreased from 30% to 27% for Android apps.

The chart below shows that, unlike Period I, average prices were stable throughout Period II, both on AppStore (with a slight decrease trend) and on Google Play (with a slight increase trend).

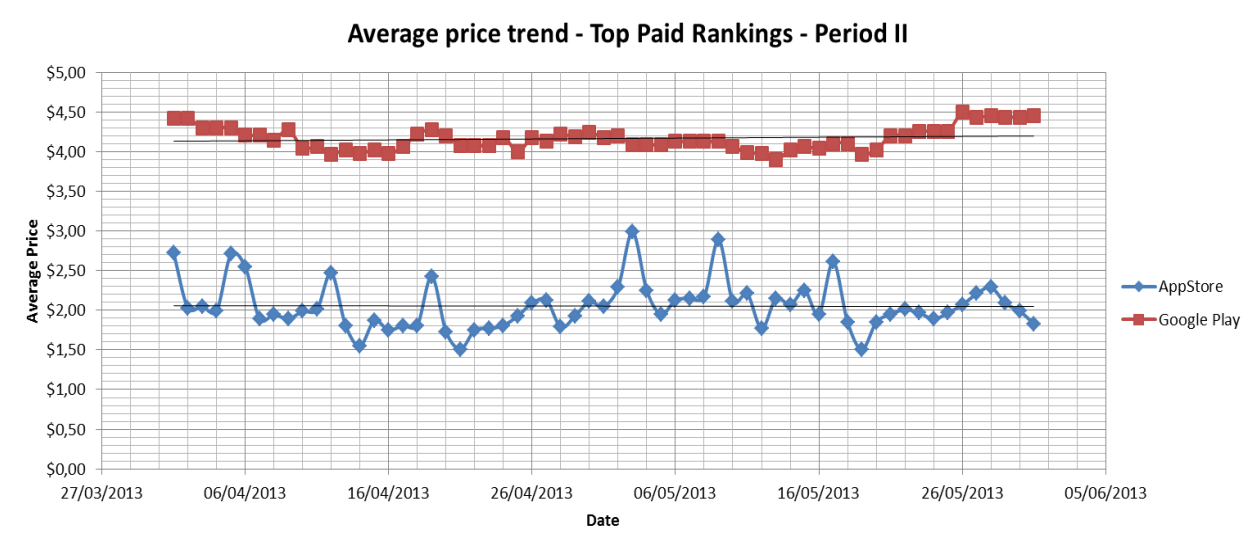

Figure 4-12: Average price trend – Top Paid Rankings – Period II

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4.1.4 Turnover rate

The turnover rate intends to measure how many new applications enter, on average, in the top 50 rankings every day. It is important for developers to know it, since a low turnover rate makes the life of new entrants exceptionally hard. Likewise, a high turnover rate implies that the threat of new entrants is critical, because there is high volatility in the app stores rankings.

Every day during the censuses, new entries were registered, and a daily proportion ratio was calculated; then an overall average of all days was calculated. Therefore, the turnover rate encompasses all hundreds of apps registered during the research.

An important remark: the turnover rate is intrinsically linked to the ranking algorithm of each store. These algorithms are often updated by Apple and Google in order to promote higher turnovers and avoid ranking manipulation. The results presented in this section are valid only for the two periods of analysis, since new algorithms can be implemented anytime without prior notification.

4.1.4.1 Period I

As mentioned before, during Period I there were 1032 single entries in the database. Of these, 645, or 62.5%, belonged to AppStore and 387 to Google Play (37.5%). Right away one sees that Google Play had fewer new entrants on its lists. It is a first indicator that Google Play has lower turnover rates than AppStore.

It is very common for an app to alternate its position within and without the top 50 ranking. In this case, this app will not add a new entry in the database, but it will count in the calculation of the turnover rate.

Throughout Period I, AppStore has shown a downward trend in the turnover rate, for all rankings (Paid, Free, and Grossing). Google Play, instead, showed the opposite trend for Top Paid and Top Grossing rankings, while turnover rate slightly decreased in the Top Free ranking throughout the first two months of analysis.

Finally, the two charts below show the actual turnover rate calculated for each app store in each of the three rankings: Top Paid, Top Free, and Top Grossing. For instance, in the Top Paid ranking on AppStore, on average, 6.85 new apps appear in the top50 every day, while in the same ranking on Google Play, on average, there are only 1.28 new apps on each day. Numbers confirm previous expectations: AppStore has much higher turnover rates than Google Play, in all three rankings. Besides, the turnover rate on Google Play's Top Paid and Top Free rankings might discourage new developers to enter the Brazilian market, since it is quite hard to beat existing competitors. Virtually only one new application enters the top 50 every day in these two rankings. Google's ranking algorithm supports a virtuous cycle, in which well-ranked apps increase their visibility, and, thus, increase their number of downloads and user retention, keeping these in the top for long time.

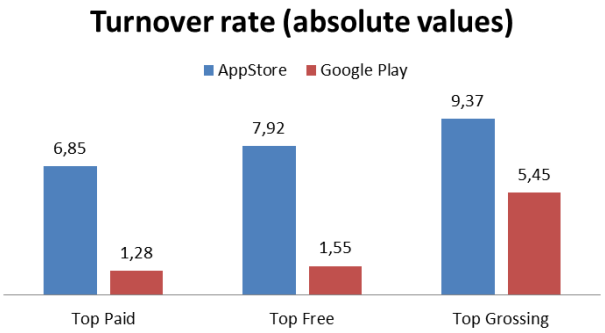

Figure 4-13: Turnover Rate in absolute values for each ranking (top50 positions) – Period I.

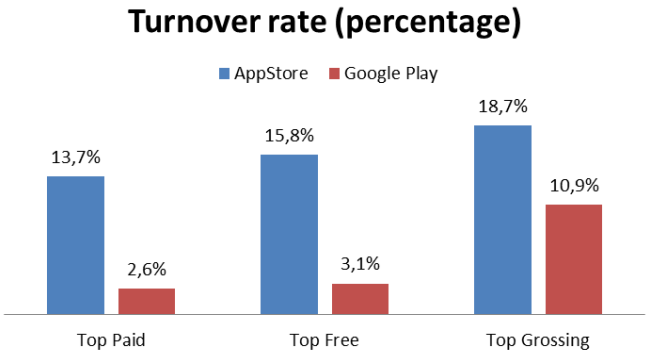

Figure 4-14: Turnover Rate in percentage for each ranking (top50 positions) – Period I.

4.1.4.2 Period II

During Period II, from 845 single entries in the database, 248 were Google Play's apps and 597 were AppStore's (70% of total, vs. 63% in Period I). As in Period I, Google Play had lower turnover rates than AppStore. Because there were no changes in the ranking algorithms from Period I to Period II, the results are reinforced.

Throughout Period II, AppStore has shown a slightly upward trend in the turnover rate, for Top Paid and Top Grossing rankings, and an opposite trend for the Top Free ranking. The same was true for Google Play rankings.

The two charts below show the actual turnover rate calculated for each app store in each of the three rankings: Top Paid, Top Free, and Top Grossing in Period II. Again, actual numbers confirm previous expectations: AppStore has much higher turnover rates than Google Play, in all three rankings.

Interestingly, all the turnover rates decreased from Period I to Period II. Therefore, it has become harder for new entrants to move up in the rankings. The results of the comparison between Period I and Period II are displayed in the table below. All turnover rates declined, even in the Top Paid and Top Grossing rankings, in spite of the decline in average prices of the apps.

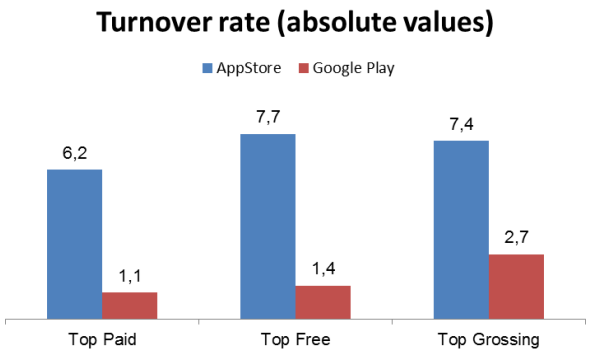

Figure 4-15: Turnover Rate in absolute values for each ranking (top50 positions) – Period II.

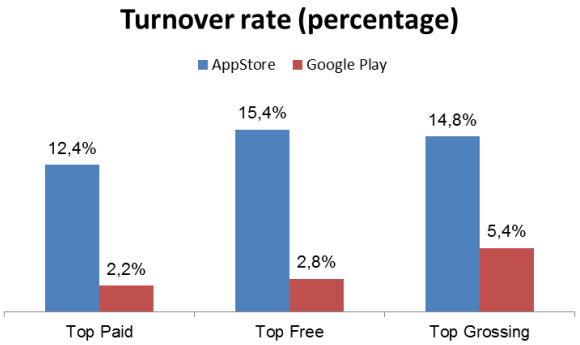

Figure 4-16: Turnover Rate in percentage for each ranking (top50 positions) – Period II.

Table 11: Turnover rates comparison between Period I and Period II

	Period I	Period II	Difference
Top Paid – AppStore	13.7%	12.4%	-9.5%
Top Free – AppStore	15.8%	15.4%	-2.8%
Top Grossing – AppStore	18.7%	14.8%	-21%
Top Paid – Google Play	2.6%	2.2%	-14.1%
Top Free – Google Play	3.1%	2.8%	-9.7%
Top Grossing – Google Play	10.9%	5.4%	-50.5%

4.1.5 In-app purchase

In-app purchase is the purchasing of premium content directly within a Mobile app installed in a smartphone. Premium content includes periodical subscriptions, game currency and goods, advanced features, elimination of ads, and more.

The Top Grossing ranking is composed of the highest revenue generating apps, both free and paid, on the app stores. Therefore, these apps must have, at least, one direct source of income. Direct sources of income are: sale of the app or in-app purchase[17]. Top Grossing ranking is the most relevant one in terms of in-app purchases, because it directly shows the performance of in-app purchases and app sales.

[17] Ranking algorithms do not capture advertising revenues.

4.1.5.1 In-app purchase results

In the specific case of free apps, revenue predominantly comes from in-app purchases, as seen in the literature review. The app stores rankings do not take into account income generated through ads. The table below displays the amount of free and paid apps with and without in-app purchases in the AppStore and Google Play's Top Grossing rankings for Period I and Period II.

Table 12: Presence of in-app purchase in Top Grossing ranked apps on AppStore and Google Play

	AppStore			Google Play		
	Period I	Period II	Difference	Period I	Period II	Difference
Free apps with in-app purchase	59.9%	60%	-0.2%	39.0%	66.4%	70.3%
Paid apps with in-app purchase	18.8%	14.6%	-22,3%	7.1%	10.3%	45.1%
Total apps with in-app purchase	**78.7%**	**74.6%**	**-5.2%**	**46.1%**	**76.7%**	**66.4%**
Free apps without in-app purchase	0%	0%	-	1.1%	2.6%	136.4%
Paid Apps without in-app purchase	21.3%	25.4%	19,2%	52.8%	20.7%	-60.8%
Total apps without in-app purchase	**21.3%**	**25.4%**	**19.2%**	**53.9%**	**23.3%**	**-56.8%**

Regarding free apps in both periods, it is virtually impossible to reach a top50 position in the Top Grossing ranking using revenue sources other than in-app purchases. Only 3 free apps in each period (1.1% of total grossing apps in Period I and 2.6% in Period II) succeed without in-app purchases on Google Play. In Period I they were *Top Eleven* by Serbian firm *Nordeus*, *Photo Sketch* by German *Spicesoft GmbH*, and *Vivino Wine Scanner* by Danish firm *Vivino*. In Period II they were *Top Eleven* by

Nordeus, *Marvel War of Heroes* by *Mobage*, and *Millionaire City* by *Digital Chocolate Inc*. On AppStore, however, simply none of the free apps could make it without in-app purchase in both periods (this does not mean that these free apps did not have ads, though).

Free apps with in-app purchase were virtually 60% of the total Top Grossing apps on AppStore during both Period I and Period II. On Google Play, the number was almost 40% in Period I and 66% in Period II. The results are certainly impressive and corroborates to the literature review hypothesis that free apps with in-app purchases are becoming more profitable than plain paid apps.

As seen before, paid (or premium) apps on Google Play have, on average, higher prices than on AppStore. However, these apps have nearly 20 times less download on Google Play than on AppStore, as it will be discussed in the section 3.2.8.3. On the other hand, paid apps accounted for roughly 50% of the top grossing apps on Google Play store in Period I. Therefore, revenue generation from in-app purchase was not significantly more powerful in Android devices in Period I than app sales, since paid apps were often beating free apps in income generation. This result was overturned in Period II, in which Google Play reached numbers similar to those of AppStore.

Looking further at the Top Grossing rankings on AppStore and Google Play, interesting data has emerged. Nearly 80% of the top grossing apps had in-app purchase. This is totally in line with the literature review, which estimated that roughly 72% of the app stores revenue generation comes from in-app purchase. During Period I, Google Play was still somewhat lagged behind that number, at least in Brazil, with only 46% of the top grossing apps applying in-app purchase. However, in Period II, Google Play moved on and caught up AppStore. It is remarkable that both app stores had so similar results in Period II, showing stabilization of revenue models between Android and iOS developers.

The results also suggest the importance of combining various revenue generation models: in-app purchase is a vital resource not only for free apps, but also to increase the profitability of paid apps.

4.1.6 Companies Profile

The *boom* of the App Economy is responsible for the expansion of the profession of Mobile app programmer. Programmers, or developers, are now one of the most requested workers by companies (Monster , 2013). Together with designers, they are at the core of any successful Mobile app.

There is a plethora of different developer profiles, developing apps for all Mobile platforms. They range from students to big multinational studios. App development knowledge is widespread and everywhere, and for this reason, there is great diversity of developers in the analyzed rankings.

In this research, companies were classified in two different ways. The first one concerns the size of the company: Big Company, Small/Medium Company, or Independent developer (Indies). The second one concerns the core business of the firm: Mobile developer, Software developer, or Brand.

An analogy can be made with the Age of Discoveries, from 15th to 17th century, in which many adventurers and professional travelers rushed together to discover the new world. In the context of Mobile apps, independent and small developers are the adventurers, while big companies are the professional travelers, who have clearly better structure and conditions to succeed.

Firms must understand against whom they will compete and in what conditions. Understanding the profile of the competitors is a powerful tool that assists the planning phase of a Mobile app and enables better outcomes in the decision-making process.

Important remark: several companies develop both software and Mobile apps. For instance, *Gameloft* and *Halfbrick Studios*, two of the most important app distributors in the world, started their business in early 2000s developing software for video games, like *PlayStation* or *Game Boy*. Though, they have shifted their core business to Mobile app in the last few years. In this research, companies' current core business is taken into account. Therefore, they are considered Mobile companies.

4.1.6.1 Results

The charts below illustrate the results regarding companies' size for Period I and Period II.

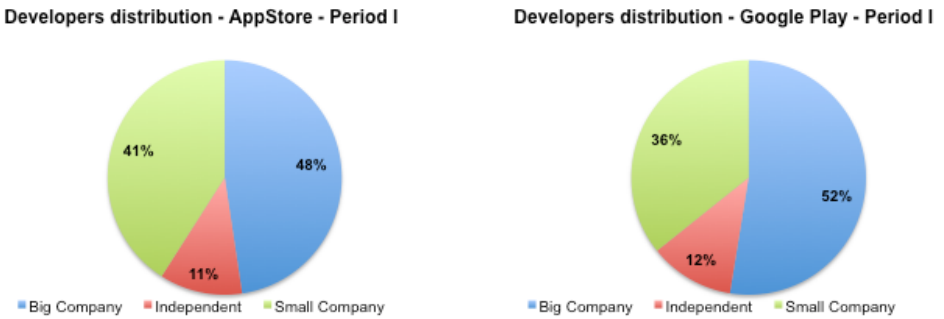

Figure 4-17: Developers distribution by size: AppStore and Google Play – Period I

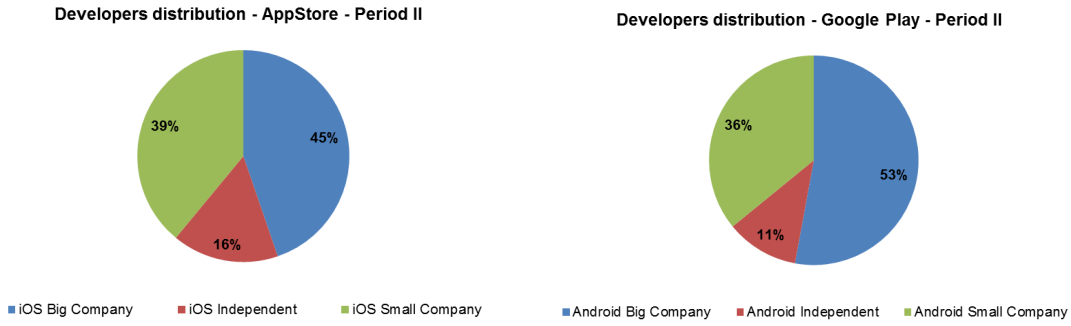

Figure 4-18: Developers distribution by size: AppStore and Google Play - Period II

Both AppStore and Google Play had similar distributions in the first two-month period, from November 2012 to December 2012, showing homogeneity among stores. Big Companies accounted for nearly half of the entries in the top50 rankings, while Small and Medium Companies were roughly 40%. Indies accounted for only 10%-15% of the top ranked apps. The numbers suggest medium level of professionalization of the Mobile ecosystem, with considerable spaces for small, entrepreneurial firms, and even a small portion for independent developers.

Independent developers were able to grasp a bigger portion of the market on AppStore in Period II (45% increase). It may suggest that there are more indie developers taking a chance in the Apple's ecosystem.

Perhaps that is the reason why Mobile apps attract all kinds of developers. Even those people working alone and in the dawn can achieve the top. It does not mean, though, that these small and indie players are making enough money to live from their apps. Actually, some of the small and indie developers try to reach the top in order to gain visibility, and then get a good contract to develop a branded app for a big company, which is, in most cases, more profitable.

Regarding the core business of the developers, the charts below display the overall results for the Brazilian app stores in Period I and Period II. They consider all three rankings: Top Free, Top Paid, and Top Grossing. Results of separate rankings do not differ significantly from the general ones.

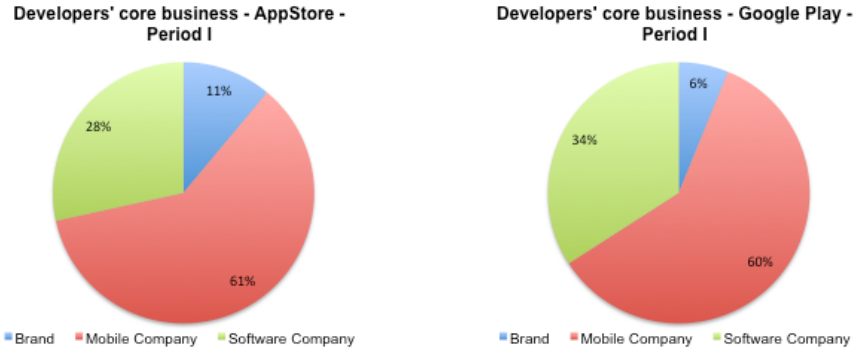

Figure 4-19: Developers distribution by core business: AppStore and Google Play – Period I

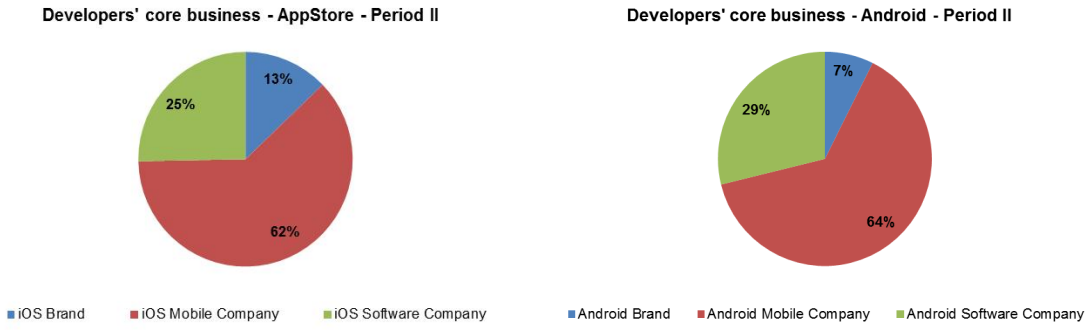

Figure 4-20: Developers distribution by core business: AppStore and Google Play - Period I

The majority of developers are Mobile native developers, reaching 60%-65% in both stores, led by *Gameloft*, *Halfbrick Studios*, and *Rovio Mobile*. It shows that, despite the possibility of adventurers and outsiders to play in this market, the biggest share remains with specialized firms. Again, the numbers suggest medium level of

professionalization of the Mobile ecosystem, with full-time dedicated players achieving the best results. The numbers of the second period are very close to the ones in the first period, countering the intuitive hypothesis that the Mobile industry is moving toward high professionalization and specialization.

Brands have the smallest share among top apps, but they have on AppStore twice as much the share on Google Play, what could indicate iOS as the preferred operating system for these organizations (as suggested by the literature). The leading brand in Period I and Period II was *Disney*. *Disney'*s apps play a role quite different than other usual branded apps. *Disney* uses the Mobile channel to increase brand awareness and consumer engagement with its brand, but the Mobile channel is also a strong and powerful revenue generator, since *Disney*'s apps are very often among the most profitable ones. Media Networks and Amusement parks remain its core businesses, but *Disney* is using Mobile apps to diversify its activities in an innovative fashion[18].

The most interesting data comes from software companies. Software companies have half the share of Mobile companies. A Mobile app is essentially software, designed specifically for smartphones/tablets. Even though software companies have the same or better knowhow about programming and software development, they are not able (or not willing) to compete equally with Mobile native developers, who seem to better understand the specificities of the Mobile ecosystem, such as system requirements and customers' needs. Software houses are still struggling to move from their domain to an unknown new world. French firm *Gameloft* and Australian *Halfbrick Studios* are the two best examples that this transition is not only possible, but it can also be extremely profitable.

Top software companies were *Electronic Arts*, *Apple*, and *Google*. *Electronic Arts* followed a path similar to *Gameloft* and *Halfbrick Studios*, but it is still giving much attention to consoles and PC games, thus, it is considered a software company in this analysis.

[18] In its second quarter 2013 10Q Filing, Disney reported US$194 million in revenues from its Interactive business unit, US$137 million (71%) coming from Games sales and subscription ─ a 5% increase compared with Q2 2012. In the same period, Media Networks and Parks, instead, grossed US$4.9 billion and US$3.3 billion, respectively.

4.1.7 Brazilian participation

So far, general macro indicators about the Brazilian app stores have been presented and discussed. In this section, the analysis will focus on which countries contribute the most to the top 50 rankings on the Brazilian app stores, with a special interest on the Brazilian participation in the top rankings during Periods I and II.

As seen in the literature review, Brazil is now the fifth largest smartphone market in the world, and it is showing one of the fastest growths among all nations. However, Brazilian developers are not following the same trend of success. The Mobile app market is very particular in this sense. Governments do not place any economic barrier for foreign entrants, such as tariffs or quotas. Therefore, foreign competition is exceedingly intense, and foreign players currently dominate the market.

Brazilian developers, in order to thrive in the app economy, need to follow the same strategies of successful foreign apps, regarding quality, languages offered by the application, and international distribution in several different app stores.

In particular, some questions as *Where are the main developers from*? *What is the Brazilian participation in these rankings*? will be addressed in this section.

During the empirical analysis, it turned out that many apps did not have official information about their origin country. There were two different situations. The first one is understandable: some developers do not want to label themselves as being from country *X*. Instead, they want to be recognized as an international and open firm that is able to do business all over the world and to reach different markets.

The second situation is worrisome. Even though Mobile developers must provide a web page in order to publish their apps in the store, many developers that reached one of the top50 rankings during the periods of analysis are not officially present online. Internet presence may include an official website, a Twitter account, a Facebook page, or any other webpage capable of providing a minimum amount of information and interaction to clients and stakeholders. Developers that take a chance in a non-professional way compose the second group, and what is remarkably surprising, they reach the top positions more often than expected.

Making yourself easily discoverable on the Internet is relevant, because it attracts attention to the developer and its applications, thus improving their ranks. The website or the social network page has "*no inherent relation to the professional conduct of the firm. Rather, we interpret them as "signals" that reassure us that the firm is top-notch. They are to markets […] a good sign in a world of imperfect information.*" (Wheelan, 2010)

Some apps are developed outside the country of origin of the organization. For example, Electronic Arts' Dutch subsidiary published several successful apps in the Brazilian AppStore during both periods of analysis. Nevertheless, these apps were classified as coming from the US, because the US is the origin country of Electronic Arts, and it is where the headquarters of the company are. This definition does not alter the final results significantly.

4.1.7.1 Period I

In the first period of analysis, the United States were the leading country in both AppStore and Google Play. Other important countries in the Brazilian app markets are Brazil, France, and England.

American leadership was expected, since they have the largest number of developers and Mobile start-up companies. Besides, USA has strong cultural influence in Brazil, with respect to music, media, TV and Internet.

Notably, 12% of developers on AppStore and 14% on Google Play did not make their nationality available in Period I. These developers are either small Mobile companies or independent developers. Still, such a large number is not a good signal. The results for AppStore and Google Play are shown in the following charts.

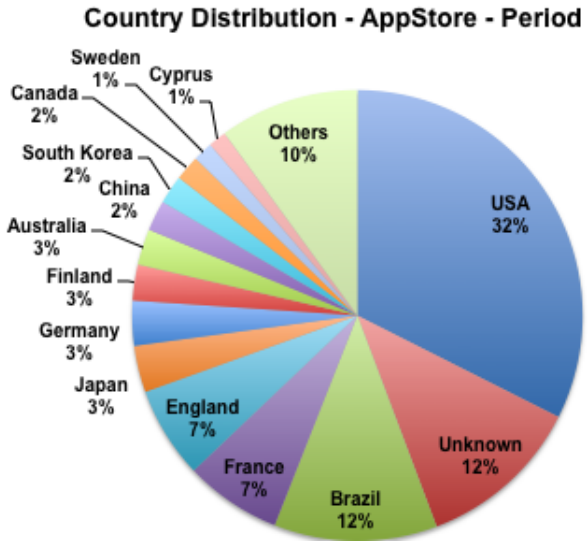

Figure 4-21: Country distribution - AppStore - Period I

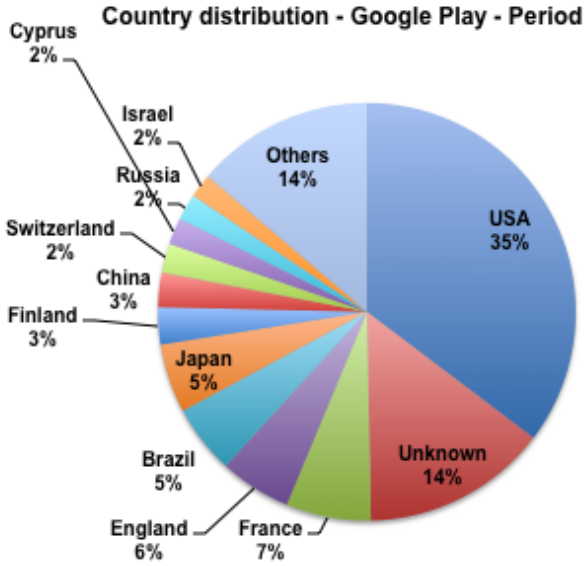

Figure 4-22: Country distribution – Google Play - Period I

On AppStore, Brazil had 12% participation, that is, 91 out of 777 entries were from Brazil.

Of these 91 apps, 40 (44%) are developed by big companies, especially brands (32 of them). Only 3 out of 40 apps were developed by big Mobile companies: *Livetouch* and *Movile*, headquartered in São Paulo, and *Aorta*, located in Curitiba. *Movile* is the leading Mobile entertainment company in Latin America, and it expanding globally. Today it has 9 offices in the USA and Latin America.

Brands play an important role in the Brazilian market. They include banks and other service providers, TV channels, magazines, websites, public bodies and manufacturers. 91% of these branded apps are free; only three of them appeared in the Top Grossing rankings: *Aurélio Dicionário*, *Escola Sabatina*, e *Oi Rádio*. The results confirm what the literature review showed: branded apps are generally used, besides to create or expand the Mobile channel for customers, to improve customer relationship and increase brand awareness.

36 out of 91 apps (40%) were published by small and medium companies, most of them Mobile firms (25 out of 36). Only six apps developed by these companies reached the top grossing rankings: Three of them developed by *Top Free Games*, one by *Movile*, and the other two by *MobileObjects* and *iDevMobile*. From these six apps, five of them are free apps and generated most of their income through in-app purchase.

Independent developers accounted for 15 out of 91 apps (16%), distributed in 7 paid apps, 7 free apps and 1 grossing app. Remarkably, the paid app *Portabilidade +9*, developed by *Noel Rocha*, stayed all 61 days in the Top Paid ranking during Period I.

Entertainment, Games, and Utilities were the three most favored categories, with 15, 14, and 13 apps respectively.

Brazilian apps stayed, on average, 9.6 days in the top rankings during Period I. The average rating of Brazilian apps on AppStore was 3.85. Last, 75% of them did not have in-app purchase options.

On Google Play, Brazil had only 5% participation, that is, 26 out of 487 entries were developed in Brazil. Therefore, Google Play is an environment with greater domination of foreign apps.

Of these 26 apps, 11 are developed big companies, 7 by small-medium companies, and 8 by independent developers. Independent developers achieved mainly the Top Grossing ranking, through paid apps without in-app purchase option. Games accounted for one third of the Brazilian apps on Google Play during Period I. Moreover, the majority of developers were Mobile companies (14 out of 26). There were only six Brazilian branded apps in this store.

Notably, only 2 of these 26 apps (both free apps) had in-app purchase options, while 14 were paid apps and 12 were free apps without in-app purchase option. None of

the paid apps was able to reach the Top Paid ranking. They all reached the Top Grossing ranking, because of the high prices charged by these apps, on average, US$8.50; they were able to generate higher income with fewer downloads.

Brazilian apps stayed, on average, 10.7 days in the top Google Play's rankings during Period I, and the average rating of Brazilian apps on AppStore was 4.27.

4.1.7.2 Period II

In Period II, one more time the USA were the leading country in both AppStore and Google Play. Other important countries in the Brazilian app markets during Period II were France, Germany, England, Brazil, China, and Russia.

Regarding *unknown* countries of origin, there are no significant differences – and therefore no positive evolution - between Period I and Period II. In Period II, 11% of developers on AppStore (against 12% in Period I) and 15% on Google Play (against 14% in Period I) did not make their nationality available.

Further results for AppStore and Google Play are shown in the following charts. There were no relevant differences in the first positions between Period I and Period II for both AppStore and Google Play, showing a steady domination from top countries.

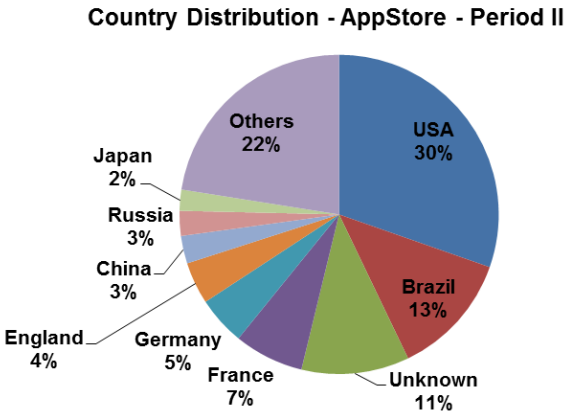

Figure 4-23: Country distribution - AppStore - Period II

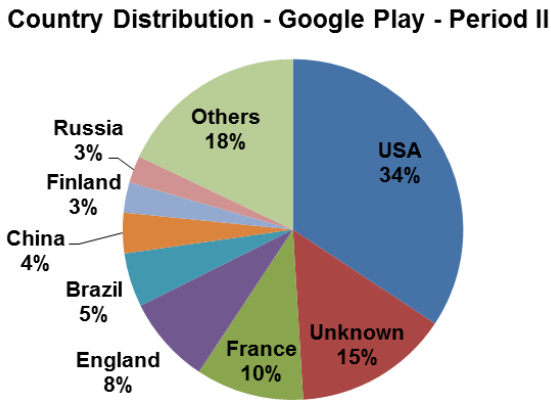

Figure 4-24: Country distribution – Google Play - Period II

On AppStore, Brazil had 13% participation (against 12% in Period I), representing 94 apps. Of these 94 apps, 49 (52% against 44% in Period I) are developed by big companies, which reinforced their participation from Period I to Period II.

Brands again played an important role in the Brazilian market. 87% of these branded apps were free (against 91% in Period I); only five of them appeared in the Top Grossing rankings (against 3 in Period I).

Small and medium companies published 22 out of 94 apps (23% against 40% in Period I), a sharp decrease in the time span. Only five apps developed by these small/medium companies reached the top grossing rankings (against six in Period I). From these five apps, only two of them are free apps and generated most of their income through in-app purchase.

Independent developers accounted for 23 out of 94 apps (24% against 16% in Period I), distributed in seven paid apps, fourteen free apps and two grossing apps (both without in-app purchases). Remarkably, the paid app *Portabilidade +9*, developed by *Noel Rocha*, stayed all 61 days in the Top Paid ranking during both Period I and Period II.

Games, Education, and Utilities were the three most favored categories in Period II. Brazilian apps stayed, on average, 13.3 days in the top rankings during Period II (against 9.6 in Period I, a 38.5% increase). The average rating of Brazilian apps on AppStore was 3.85 (same amount as in Period I). Last, 79% of them did not have in-

app purchase options (against 75% in Period I). Brazilian developers on AppStore heavily rely on the sale of the Mobile app.

On Google Play, Brazil had only 5% participation (same amount as in Period I), representing 16 apps. Of these 16 apps, ten are developed big companies, five by small-medium companies, and one by independent developers, a strong decrease from Period I. The number of branded apps increased from six in Period I (23% of total) to seven (44% of total) in Period II. Therefore, brands started giving more attention to Android consumers.

Notably, the number of apps with in-app purchases increased from 8% to 25% from Period I to Period II. In Period I, none of the paid apps was able to reach the Top Paid ranking. In Period II, there were two apps in the Top Paid rankings, chiefly because of the significant lower prices charged for these apps, US$ 1.95 on average, against US$8.50 in Period I.

Brazilian apps stayed, on average, 25.7 days (against 10.7 days in Period I) in the top Google Play's rankings during Period II, and the average rating of Brazilian apps on AppStore was 4.27, the same as in Period I.

Brazilian apps could not increase their participation from Period I to Period II. However, it is clear that they played a much more important role in Period II, especially because they were able to stay longer in the top 50 rankings, which generates more visibility and income. Moreover, the number of branded apps increased considerably, demonstrating that companies are more aware of the importance of the Mobile market for their long-term strategies.

4.1.8 Estimating the number of downloads to reach the top 50

In this section, some different attempts are performed to estimate the number of downloads required to reach the top 50 in the Top Free and Top Paid rankings in Brazil, using only publicly available data such as price and rank of the apps.

First, the approach developed by Garg & Telang (Garg & Telang, 2012) will be experimented using Brazilian AppStore real data from Period I. Next, data provided by

German app analytics company XYO Logic (XYO Logic Mobile, 2013) will be used in the Garg & Telang's model to assess its validity.

4.1.8.1 Garg & Telang approach

The model assumes that a power law, or Pareto distribution can describe the demand-rank relationship of a Mobile app:

$$Demand = \beta * rank^{-\alpha} \quad (1)$$

The model estimates the number of downloads for a paid app. It supposes that a paid app generates the largest amount of its revenue through its sale, and that the app shows up in both Top Paid and Top Grossing rankings in the same day. Therefore, it is possible to write:

$$Downloads_{paid} = \beta_{paid} * {rank_{paid}}^{-\alpha_{paid}} \quad (2)$$

$$Revenues_{paid} \approx Downloads_{paid} * price = \beta_{grossing} * {rank_{grossing}}^{-\alpha_{grossing}} \quad (3)$$

From (2) and (3):

$$\beta_{grossing} * {rank_{grossing}}^{-\alpha_{grossing}} = price * \beta_{paid} * {rank_{paid}}^{-\alpha_{paid}} (4)$$

The unknown parameters are α and β, since price and ranks are known for both paid and grossing rankings.

Taking the natural log on both sides of (4):

$$\ln rank_{grossing} = \frac{1}{\alpha_{grossing}} \ln \frac{\beta_{grossing}}{\beta_{paid}} + \frac{\alpha_{paid}}{\alpha_{grossing}} \ln rank_{paid} - \frac{1}{-\alpha_{grossing}} \ln price$$

Or

$$\ln rank_{grossing} = K_0 + K_1 \ln rank_{paid} + K_2 \ln price \quad (5)$$

The last equation is linear in the parameters K_0, K_1, K_2, so it is possible to apply a linear regression and estimate the desired values:

$$\alpha_{grossing} = -\frac{1}{K_2}, \alpha_{paid} = -\frac{K_1}{K_2}, and \ \frac{\beta_{grossing}}{\beta_{paid}} = e^{-\frac{K_0}{K_2}}$$

The dependent variable in this model ($\ln rank_{grossing}$) is limited from the left and from the right, because the ranks cannot assume values lower than 1 and higher than 50 in the sample. Thus, applying an ordinary linear regression is not appropriate, because data is biased. To account the bias, it is necessary to apply a truncated ordinary least square regression with 0 as lower limit and 50 as upper limit for the ranks.

4.1.8.1.1 Results

The summary statistics of the data collected during Period I are given in the table below (the numbers in parenthesis are the standard deviations). Only apps that appeared simultaneously in the Top Paid and Top Grossing rankings were considered in the analysis.

Table 13: Summary statistics for overlapping apps in the top paid and top grossing rankings

OVERLAP SUMMARY	**iPhone**	**Android**
Number of overlapping apps	693	773
Average Rank Top Paid	13.51 (12.79)	17.31 (13.78)
Average Rank Top Grossing	25.12 (15.10)	22.46 (13.94)
Average Price	US$5.52 (US$9.81)	US$5.76 (US$4.22)
Average apps listed in both rankings	11.36 (2.43)	12.67 (4.56)
Average correlation among the ranks	-0.087 (0.231)	0.167 (0.213)

On average, 22.7% of the top 50 paid apps on iPhone and 25.3% of the top 50 paid apps on Android are also ranked among the top 50 grossing app lists. As described in the table, there is a very weak correlation among the ranks of apps on the top paid and top grossing list (average -0.087 on iPhone and 0.167 on Android). If the correlation were strong, it would suggest that better paid ranks tend to reflect better grossing ranks;

it is not the case for this data. The chart below shows the evolution of the correlation during Period I, and the number of apps listed in both rankings, for AppStore and Google Play.

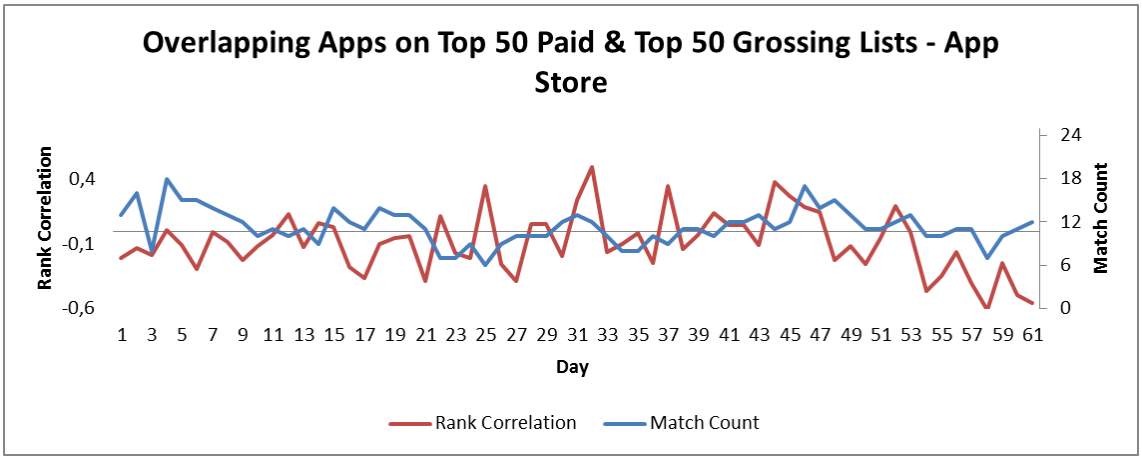

Figure 4-25: Rank correlation and match count for overlapping apps – AppStore

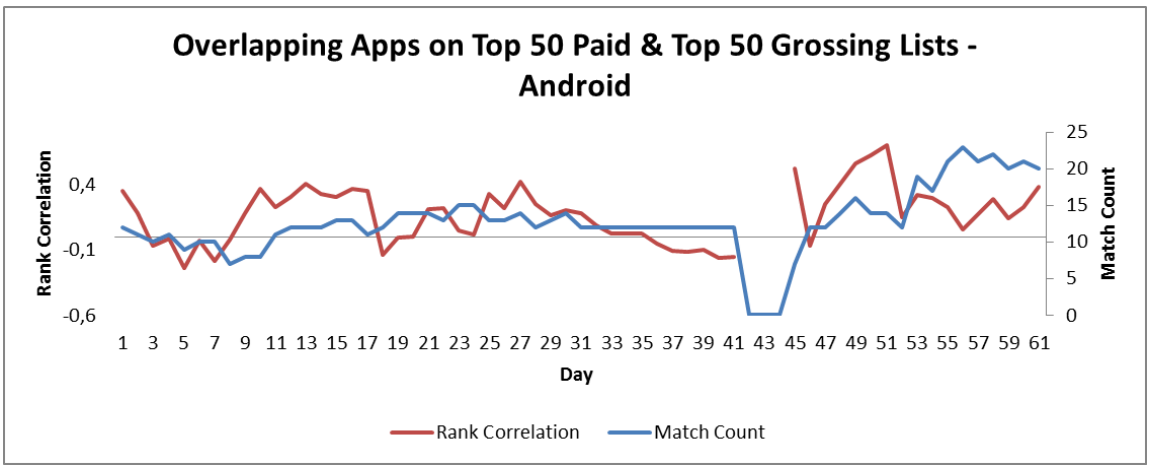

Figure 4-26: Rank correlation and match count for overlapping apps – Google Play

Applying a truncated regression, the values for K_0, K_1, K_2 were calculated. They are displayed in the following table:

Table 14: Values for the linear regression

	iPhone	Android
K_0	2.635 (0.160)	4.279 (0.443)

K_1	1.243 (0.140)	0.606 (0.120)
K_2	-1.235 (0.135)	-0.801 (0.176)
R^2	0.258	0.050
N	693	773
α_{paid}	1.006	0.757
$\alpha_{grossing}$	0.810	1.248
$\frac{\beta_{grossing}}{\beta_{paid}}$	8.445	208.945

4.1.8.1.2 Discussion of the model

Coefficients for both iPhone and Android are highly significant, but a very low value of R^2 suggests bad fit of data. The reason for a low R^2 is due to very little data for each day, on average roughly 12 points per day for both iPhone and Android. One way to improve R^2 is to estimate the model separately for each day or two days at a time.

The values for $\alpha_{paid}\ and\ \alpha_{grossing}$ obtained for iPhone are 1.006 and 0.810. Therefore, according to the model, the top ranked app in the paid ranking had, on average, roughly twice more daily downloads from November to December 2012 than the second ranked app, and approximately 50 times more daily downloads than the 50th app. The same ratios for Android are 1.7 and 19.

As it will be shown in the next section, the values and ratios obtained with this model are not so accurate. The assumption that a successful app in the Top Paid ranking will also succeed in the Top Grossing ranking does not always hold true. In-app purchase revolutionized the way developers monetize apps. For example, there are apps that reached the top3 in the Top Paid ranking, thus achieving great amount of sales, and did not reach the top50 in the grossing ranking, thus not profiting as much as other apps. Similarly, apps with a high sale price, like *TomTom*, have few downloads, and barely reach the top30 paid ranking. However, it is very often present in the top10 grossing apps. Hence, best-selling apps do not always profit more than other apps, and profitable paid apps do not always have high sales.

In-app purchase caused a distortion in the app economy, and it is not easy to estimate how much money apps are making from them, but it is important to take it into consideration during any Mobile app analysis.

4.1.8.2 XYO data[19]

According to XYO, Brazil accounts for 3% of global downloads on Google Play, and 1.6% on the AppStore. The ratio between top 50 free and paid downloads in Brazil is around 6 on AppStore and impressive 215 on Google Play, corroborating the finding that Brazilian users on Google Play are averse to paid apps.

Hereafter, the step is to analyze the data provided by analytics firm XYO, from January 2013. Quantitative data on individual monthly downloads in Brazil's app stores were retrieved and plotted on the Pareto distribution described in the previous section.

Based on aggregate figures provided by XYO, the parameters α and β of the Pareto distribution (1) were calculated for iPhone and Android free and paid rankings. Data is presented below. Smaller values of α suggest a flatter curve (longer tail) for equation (1), that is, the curve is more proportional, and so the differences among top ranked apps are not proportionally big.

Table 15: Coefficients alpha, beta, R^2, and daily downloads to reach the top

	N	α	β	R^2	Daily downloads to reach the 1st / 50th position
iPhone Free	50	0.761 (0.020)	31177.6 (1.1)	0.969	31,178 / 1,589
iPhone Paid	50	0.685 (0.011)	4218.3 (1.0)	0.987	4,218 / 289
Android Free	50	0.438 (0.013)	26763.2 (1.0)	0.957	26,673 / 4,821
Android Paid	50	0.462 (0.016)	131.5 (1.1)	0.943	132 / 22

[19] XYO is a Mobile analytics organization that provides, among other things, individual figures on app demand.

All coefficients are statistically significant and R^2 guarantees a good fit of data. The relationship between demand and rank does seem to follow a power law. Data provided by XYO is particularly important for this thesis, that is, rank and demand will be often linked in the next sections, using XYO statistics.

To reach the top on the AppStore, one needs almost 20 times more downloads than the 50th position in the free ranking, and 15 times more downloads in the paid ranking. On Google Play, instead, the ratios are 5.5 for a free app and 6 for a paid app. Hence, Google Play's download distribution is more egalitarian than AppStore's. Remarkably, an app needs only little more than 100 daily downloads to reach the top rank on Google Play's Top Paid ranking, while this number is more than 30 times higher on AppStore. Indeed, with 100 daily downloads on AppStore, an app is not able to reach the top 50. In general, developers of paid apps for Android devices have remarkably hard time to sell their apps in Brazil.

The charts below show the relationship between rank and demand, comparing AppStore and Google Play for paid and free apps, using the parameters α and β found out in the truncated linear regression. The difference between the two stores is striking for paid apps and less pronounced for free apps.

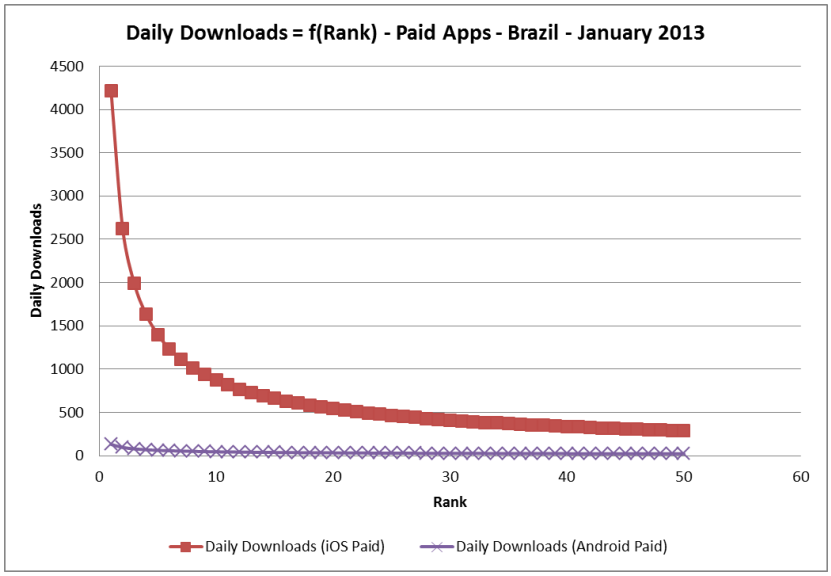

Figure 4-27: Daily downloads required to reach the top 50 positions in Paid Rankings

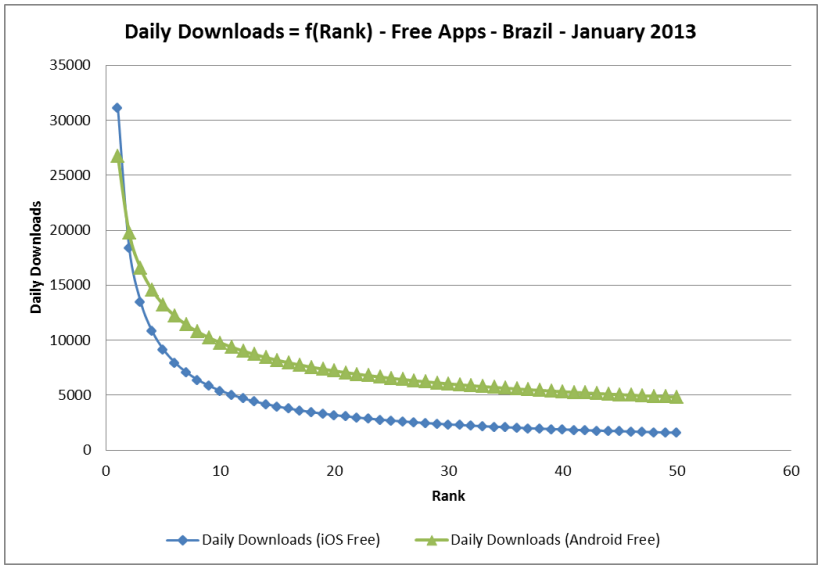

Figure 4-28: Daily downloads required to reach the top 50 positions in Free Rankings

Even though XYO provides data only on free and paid rankings, it is also possible to estimate the relationship between income generation and grossing rank by considering only apps that follow the premium model, that is, paid apps without in-app purchases, since all the revenue generated by these apps comes from the purchase of the app.

One difficulty arises from the low number of premium apps in the top 50 grossing rankings, which are dominated by freemium apps, because of in-app purchases. Still, on AppStore, two premium-only apps are constantly in the top grossing rankings in Brazil: *WhatsApp Messenger*, which costs US$0.99 and *Minecraft Pocket Edition*, which costs US$6.99. According to XYO's data, *WhatsApp Messenger* had nearly 105,000 downloads in Brazil in January 2013, while *Minecraft Pocket Edition* had nearly 12,700 downloads in the same period. Therefore, the first generated US$104,000 in revenues while the latter generated US$89,000 from sales.

From the AppStore rankings, it is known that *WhatsApp* occupied, on average, the 4th place in the grossing rankings in January 2013, while *Minecraft Pocket edition* occupied, on average, the 17th place in the same period, thus a US$15,000 difference in the income generated represented a decrease of 12 positions in the average rank, or US$1,250 for each position. So the competition for income generation is strong in the Brazilian AppStore, and small increments in income generation may result in big

differences in the rank. This hypothesis falls completely in line with the relative high turnover rate for the Top Grossing rankings in the Brazilian AppStore found out in the empirical analysis.

The same analysis can be performed for Google Play: two premium apps are constantly in the top grossing rankings in Brazil: *SwiftKey Keyboard*, which costs US$3.99 and had 2,800 downloads in January 2013 in the Brazilian Google Play (US$11,200 in revenue), and again *Minecraft Pocket Edition*, which costs US$6.00 and had 900 downloads in the same period (US$5,400 in revenue). *SwiftKey Keyboard* occupied, on average, the 12th position in the Top Grossing ranking, while *Minecraft Pocket Edition* ranked 22nd, on average. In this case, a difference of US$6,000 in income generation represented 10 positions in the Top Grossing rankings.

It is also possible to estimate the parameters α and β[20] for the relationship between income and grossing rank, supposing it indeed follows a power law relationship. The chart below illustrates the curve for the top 50 positions on AppStore and Google Play.

The estimates in this section are drawn from primary sources (app stores rankings) and from secondary sources (XYO analytics firm). Therefore, it should not be taken as utter truth. However, XYO data can be considered accurate enough to provide a good overall idea of how rankings, number of downloads and income generation are related and what roles these variables play in determining the dynamics of the app stores' rankings.

Developers can use these estimates to evaluate strategic decisions and marketing campaigns, such as return on investment from a campaign, entry strategies, positioning, and so on.

[20] AppStore: $\alpha_{grossing} = 0.104 \; and \; \beta_{grossing} = 119{,}622$. Notice that revenues are proportionally more equally distributed in the curve due to the low value of α.

Google Play: $\alpha_{grossing} = 1.14 \; and \; \beta_{grossing} = 189{,}844$. Notice that most revenues are generated in the "head" of the curve due to the high value of α. The distribution is top-heavy.

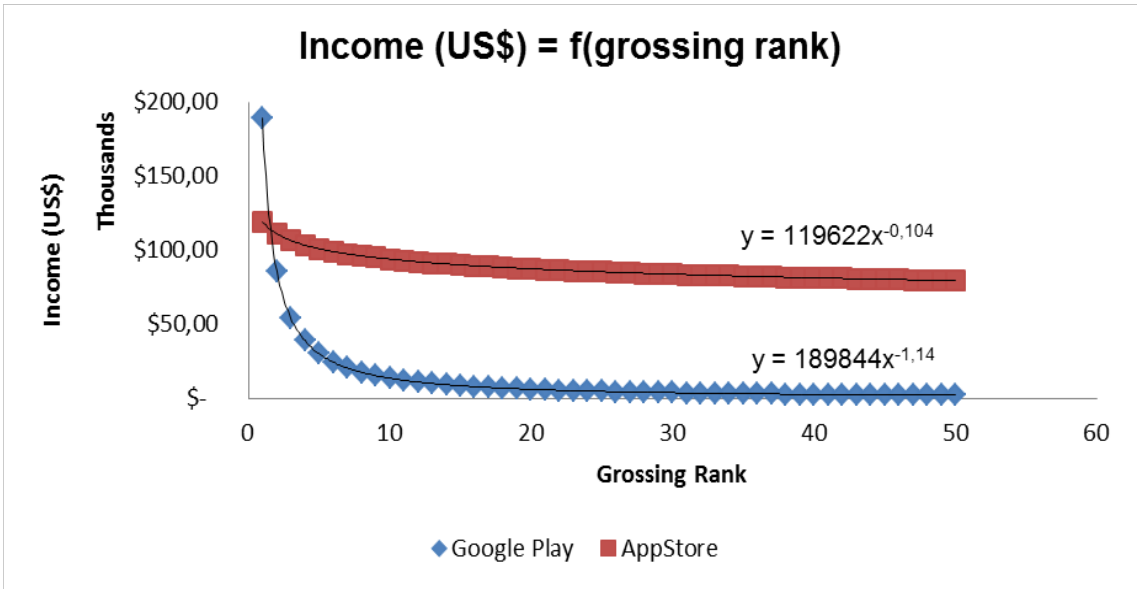

Figure 4-29: Income as a function of the average monthly grossing rank in the Brazilian AppStore

4.1.9 Days in the top 50

Another interesting way to understand the behavior of app stores in Brazil is to assess how long, on average, an app remains in the top 50 rankings. The longer an app is listed in the top, the higher its popularity. It is important for developers to develop strategies not only to reach the top, but also to stay there in the long run.

Reaching the top in the long run is not an easy task, though. New apps are published every day and incumbents keep investing to push their apps up in the rankings. There are very few apps that have reached the top and maintained their successful position over time, such as *WhatsApp Messenger*, *Angry Birds*, and *Facebook*. As one can see, these apps are usually developed by big companies, members of the very exclusive group of winners of the app stores. Moreover, the ranking algorithm of the store strongly impacts the ability of an app to sustain a high rank in the long run.

4.1.9.1 Results

The results for Period I and II are displayed in the charts below for AppStore and Google Play. Both periods comprise 61 days, from November 1st 2012 to December 31st 2012, and then from April 1st to May 31st.

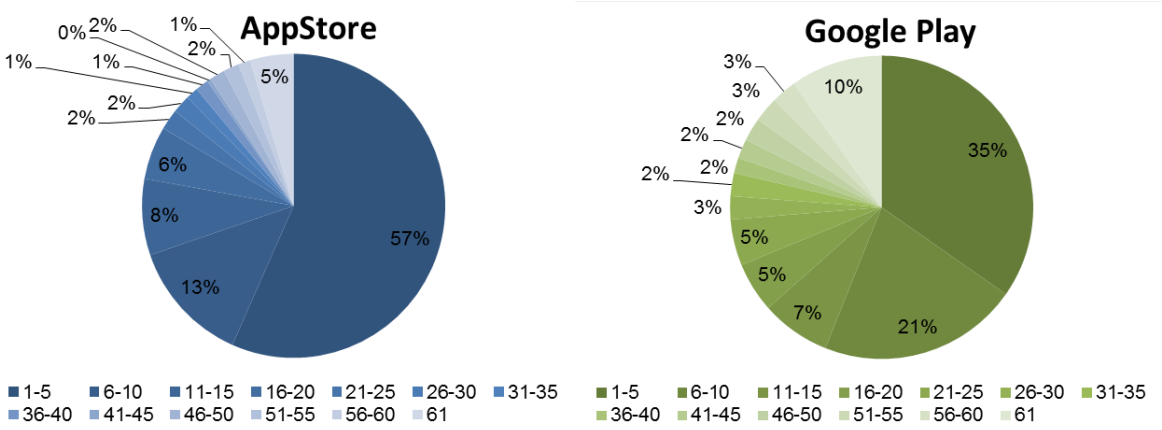

Figure 4-30: Distribution of apps according to the days in the top 50 – Period I

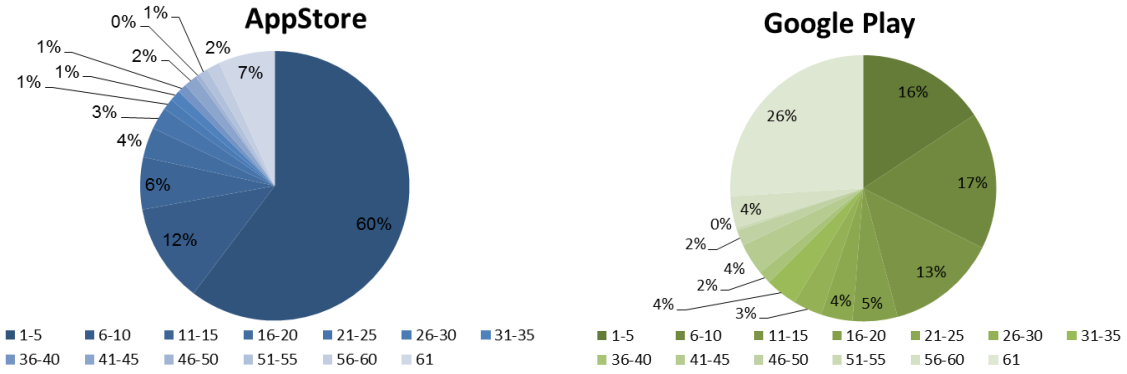

Figure 4-31: Distribution of apps according to the days in the top 50 – Period II

As one can see in the charts, most apps remain in the top 50 rankings for fewer than 5 days on AppStore: 57% on AppStore in Period I, and 60% in Period II. Considering the apps that were listed in the top 50 for fewer than 10 days, the numbers increase to 70% on AppStore and 56% on Google Play in Period I, and to 72% on AppStore and 33% on Google Play in Period II, corroborating the indicator that there is a higher turnover rate on AppStore than on Google Play.

On one hand, AppStore's apps distribution did not vary much from Period I to Period II. On the other hand, Google Play's apps showed a big shift from the range 1-10

days to the range 11-15 days and especially to the 61 days range, meaning that more apps in Period II were able to grab higher downloads and longer user retention.

It is interesting to note that few apps are listed in the top 50 for periods between 25 and 60 days (9% on AppStore and 17% on Google Play in Period I). Therefore, there is a non-uniform distribution, that is, the majority of apps are listed for fewer than 25 days, and then few apps are listed from 25 to 60 days, and finally a relevant amount of apps stays in the top 50 during the whole 61-days period. Hence, one can assume that if an app stays in the top for more than 25 days, there is a good probability that this app is a winner and it will stay during the whole period of 61 days. On the other hand, the likelihood to stay fewer than 25 days is much higher.

Considering apps listed during the whole period (61 days) as the actual winners, they have twice the presence on Google Play than on AppStore, 10% vs. 5% in Period I, and more than thrice in Period II (26% vs. 7%, respectively). The numbers suggest stronger competitiveness in the Apple environment and/or a ranking algorithm on Google Play that favors more user retention rather than daily downloads.

On AppStore, only two Brazilian apps were part of the winning group: *Portabilidade +9*, from *Noel Rocha*, in the Top Paid ranking and *Turma da Galinha Pintadinha*, from *ZeroUm Digital*, in the Top Grossing ranking. *Portabilidade +9* is an app that automatically adjusts all phone contacts to the new 9 digit rule, approved in São Paulo in 2012. Initially, it was considered a seasonal app, since after a while it will not be useful anymore. However, *Portabilidade +9* was able to stay in the top 50 rankings for the 61-days period also in Period II. *ZeroUm Digital*, instead, is a firm that produces and sells DVDs, CDs, and other products targeted to infants. The app is an educational game for the new digital kids generation. In Android, there was only one app in the winning group: *Ant Smasher*, a free game developed by *Best Cool Fun Games*, the number one Mobile gaming company in Brazil in sales. Therefore, the Brazilian participation among winning developers is limited and restricted to two games whose target audience are children and one arguably seasonable app related to a new government regulation.

On AppStore, 42% of the winning group is composed of Top Grossing apps, while the other 58% are equally distributed between free and paid apps. On Google Play, the winning group is equally distributed between free and paid apps. There was not any app

in the grossing ranking. Once more, AppStore and Google Play have shown notable differences in dynamics and behavior.

4.1.10 Promotion channels

In this section, the goal is to assess the most effective methods to promote a Mobile app, to make it move up in the rankings and to improve its visibility and revenue generation.

Users have few methods to search for an app within an app store: (1) through the editor's choices, a selection of few apps made by the app store owner; (2) through the top charts containing the most downloaded/profitable apps; (3) using a system of recommendations provided by the store; (4) using the search engine within the store. The lack of an efficient app search system makes thousands of apps undiscoverable (*Zombie Apps*, as described in the literature review). The best way for a Mobile app to be found within a store is to be positioned among the first positions in the top charts. However, considering that new users sometimes generate less income than the costs to acquire them, it might be inconvenient for developers to invest in customer acquisition, which on the other hand, reduces the odds of the app to move up in the top charts.

Therefore, it is fundamental for startups, new entrants, and incumbents to know which the best promotion channels for a Mobile app in Brazil are; so they are able to make the best of their (very often limited) marketing budget and still achieve good results. The local market can be tricky especially for foreign developers, because appropriate promotion channels are often different according to the target country. In Italy, for example, there is a cluster of four or five important blogs specialized in Mobile apps for iOS or Android. Thus, one of the best ways for a developer to promote his/her apps in Italy is to ask a review from these blogs (Almini, 2011). In Brazil the situation is quite different, since blogs do not have the same representativeness, since they are not one of the first choices of users looking for Mobile apps.

In this section, the analysis consists of monitoring the new entrants in the top 50 rankings in a daily basis. Next, search engines (Google or Bing) are used to track

whether these new entrants had any promotion campaign in the two-day period prior to their arising among the top ranked apps.

During Period I, the analysis was limited to the apps advertised in the Mobile app for iPhone *AppGratis*. *AppGratis* was one of the most successful apps in the past year for iOS promotion. Every day it displays one or two sponsored apps that, for a limited period, become entirely free or have special discounts. *AppGratis* also promotes originally free apps and iPad apps.

During Period II, the app stores were analyzed in depth, in order to evaluate other important promotion channels, such as specialized websites, social networks, and blogs.

4.1.10.1 Results and Discussion

During Period I, comprising 61 days from November 2012 to December 2012, advertised apps in *AppGratis* were analyzed. Information about the price before the promotion, the ranking before the promotion and the ranking after the promotion were collected. The results are displayed below.

In 46 of the 61 days of Period I, advertised apps were not present in the top 1000 positions one day before the promotion, while the other 15 apps were, on average, ranked as 269th top app in their respective ranking (free or paid). After the promotion, the apps move up, on average, roughly 800 positions in the top free ranking. Most of the apps were paid before the promotion and, as shown in the previous sections, to climb up one position in the top free ranking an app needs approximately six times more downloads than in the top paid ranking. The results are particularly impressive.

After promotion, the average rank was 5, that is, apps reached, on average, the top5 position in the Top Free ranking after advertising on *AppGratis* in Period I. Hence, on average, they had roughly 9,000 downloads in the day of the promotion, according to XYO data. Moreover, in 21 days the promoted app reached the 1st position in the Top Free ranking, thus having more than 25,000 downloads (according to XYO data), and in other 17 days the app reached the top3. *EpicLyrics*, app developed by *Diego Chohfi*,

had 50,000 downloads in the Brazilian AppStore after publishing it on *AppGratis*[21]. Similarly, *iBoletim*, app developed by 12 years-old *Natan Gorin*, had 20,000 downloads in the Brazilian AppStore after publishing it on AppGratis[22]. Of course, *EpicLyrics* reached the first position in the Top Free ranking, while *iBoletim* reached the third position, according to their developers.

Only in two days the advertised app did not reach the top50 ranking: two games developed by *Mobage*, albeit they were very close to the top50. Apps range from several different categories including Games, Productivity, Utilities, and Finance. *AppGratis*, therefore, represented a great promotion channel to move up the rankings during Period I.

One missing point in this first analysis is the performance of the app few days after the promotion (this gap was tackled in depth in the analysis of Period II. The only available information is that *EpicLyrics*' daily downloads decreased more than 98% just few weeks after the end of the offer in *AppGratis*.

Other important promotion channels for Mobile apps are social networks. There are more than 80 million Internet users in Brazil (43% penetration), and most of them use social networks. Indeed, Brazil is the second largest market for Facebook, with more than 55 million active users. Moreover, Facebook is the most accessed website in Brazil, followed by Google Brazil, Google USA, and YouTube. Twitter and LinkedIn occupy the 14th and 15th positions, respectively[23]. YouTube and Orkut have more than 20 million users in Brazil, while Twitter has more than 30 million Brazilian users, but only a quarter of them are active. Last, LinkedIn has more than 10 million registered users from Brazil.

In Period II, the analysis of the promotion channels was extended and deepened. Blogs, search engines, social networks, and apps like *AppGratis* and its main competitor - *App of the Day* - were censored.

[21] Diego Chohfi provided this information in an email exchange in January 2013.

[22] Natan Gorin provided this information in an email exchange in April 2013.

[23] Data extracted from www.alexa.com

Unfortunately, only two promotion channels consistently presented effective results: *AppGratis* and *App of the Day*[24]. Although there are dozens of blogs, forums, social networks, and other websites (specialized on Mobile apps) to promote apps, none of them offered good results during the time span of the census. On the other hand, *AppGratis* and *App of the Day* represented a much safer choice for developers to invest their marketing budgets. The results from these two channels are presented below.

On *AppGratis*, 63.3% of the sponsored apps reached the first position in the Top Free rankings, achieving 25,000+ daily downloads, according to XYO data. Moreover, 81% of the sponsored apps reached the top 3 positions in the Top Free rankings, achieving 13,000+ daily downloads, according to XYO data.

On *App of the Day*, the measures are 19% of the apps reached the first position and 65.8% for the top 3 positions. Therefore, *AppGratis* was a more effective channel than *App of the Day* during Period II[25].

The chart below shows the average rankings of the sponsored apps in five different time periods: (1) one day before the promotion, (2) the day of the promotion, (3) three days after the promotion, (4) five days after the promotion, and (5) seven days after the promotion. This chart does not differ paid and free apps, thus it is not very precise. However, it gives a first clue about the rank evolution of the sponsored apps on these two channels. *AppGratis* had better performance than *App of the Day*, in all of the five measures. The chart also shows sharp dampening on the performance overtime. Still, the average rank is better after seven days than it was before the promotion (35% better on *AppGratis* and 15% on *App of the Day*).

[24] The analysis for AppGratis and App of the Day considered only AppStore, since these apps were launched on Google Play only in the middle of May 2013 and so far they have not reached satisfactory results, due to differences between AppStore's and Google Play's ranking algorithms (Google Play seems to favor user retention more than simply number of downloads).

[25] It is likely that AppGratis has a larger customer base than App of the Day. Thus, it is also likely that AppGratis charges sponsors a higher price. Osservatorio Mobile from Politecnico di Milano estimated that the price charged by AppGratis in May 2013 to sponsor a Mobile app only in Italy was around 20,000 euros.

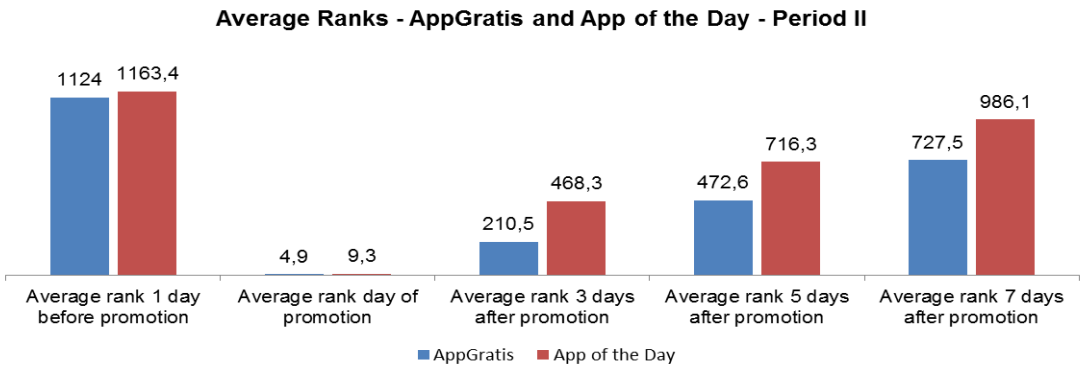

Figure 4-32: Average ranks for sponsored apps - AppGratis and App of the Day - Period II

Table 16: Average improvement on ranks after promotion on AppGratis and App of the Day

	AppGratis	App of the Day
Day of promotion	99.5%	99.2%
Three days after promotion	81.3%	59.7%
Five days after promotion	58.0%	38.4%
Seven days after promotion	35.3%	15.2%

As mentioned before, not all developers keep their apps free after the promotion on the two channels. In fact, most of them raise the price of their apps within one week after the promotion; this behavior must be taken into account in order to evaluate the performance of the channels without distortion, since free and paid rankings have different demand-rank relationships.

On *AppGratis*, 63% of the apps were free after three days and their average rank was 89 (representing roughly 1,000 daily downloads on third day, according to XYO data); while the average rank of apps that were paid after three days was 420 (roughly 264 daily downloads, according to XYO data). Still, 52% of the apps were free after five days, and their average rank was 350 (representing roughly 360 daily downloads on fifth day, according to XYO data), while the average rank of apps that were paid after five days was 605 (roughly 52 daily downloads, according to XYO data). Finally, 48% of the apps were free after seven days and their average rank was 626 (representing roughly 230 daily downloads on seventh day, according to XYO data); while the average rank of

apps that were paid after seven days was 820 (roughly 43 daily downloads, according to XYO data).

On *App of the Day*, 50.6% of the apps were free after three days and their average rank was 158 (representing roughly 660 daily downloads on third day, according to XYO data), while the average rank of apps that were paid after three days was 804 (roughly 43 daily downloads, according to XYO data). Still, 48% of the apps were free after five days, and their average rank was 448 (representing roughly 300 daily downloads on fifth day, according to XYO data), while the average rank of apps that were paid after five days was 965 (roughly 38 daily downloads, according to XYO data). Finally, 40% of the apps were free after seven days and their average rank was 879 (representing roughly 180 daily downloads on seventh day, according to XYO data); while the average rank of apps that were paid after seven days was 1058 (roughly 35 daily downloads, according to XYO data).

Hence, *AppGratis* had better performance than *App of the Day* in all measures. However, the difference diminishes over time, especially considering daily downloads, because of the long tail of the rank-demand curve. Still, *AppGratis* is a better promotion channel, because it offers better performance in the most relevant measures (day of promotion and three days after promotion). The table below summarizes the results.

Table 17: Results for the census on AppGratis and App of the Day in Period II

	AppGratis		App of the Day	
	Average Rank	Daily downloads[26]	Average Rank	Daily downloads[27]
Free apps – day of promotion	**4.9**	**9,300**	**9.3**	**5,700**
Free apps – 3 days after promotion	89	1000	158	660
Free apps – 5 days after promotion	350	360	448	300
Free apps – 7 days	626	230	879	180

[26] Estimated using XYO data.

[27] Estimated using XYO data.

after promotion				
Paid apps – 3 days after promotion	420	264	804	43
Paid apps – 5 days after promotion	605	52	965	38
Paid apps – 7 days after promotion	820	43	1058	35

From the results it is possible to draw several interesting conclusions. First, in terms of visibility (rank) and daily downloads, it is better to let the app free for the seven days after the promotion (this is particularly interesting for apps offering in-app purchases.)

Second, the difference between the two channels becomes virtually negligible after five days, in terms of daily downloads. Therefore, apps that do not offer in-app purchases and rely solely (or mostly) on sales should stop the offer right after the promotion if sponsoring on *App of the Day*, or after three days if sponsoring on *AppGratis*.

Third, another strategy (especially good for free apps with in-app purchases) is to increase the price of the app few days before the promotion. Promotions have a psychological effect on users, that is, the bigger the discount offered by the developer the higher the attention paid by customers. In fact, three (out of sixty-one) of the sponsored apps during Period II opted for this strategy, all of them sponsoring on *App of the Day*. Their average rank was two in the day of promotion, beating the overall average of *App of the Day* in seven positions (or approximately 12,000 daily downloads, according to XYO data).

Four, all in all, these two channels are particularly good to attract new users but are very poor to retain them. A good promotion channel should be able to provide a sustainable return on the investment in the medium-long run. It also shows that customers expecting miraculous deals primarily download most of the sponsored apps impulsively.

Finally, an important remark: *AppGratis* was removed from AppStore on April 9th 2013, because of guideline violations of AppStore's terms of service. However, the app

remained on business by offering new promotions to its existing customer base and by expanding its offer to Google Play. The former is the reason why its performance was not strongly affected and it still outperformed *App of the Day* without the need to add a single customer to its pool. Still, it is not possible to assure that *AppGratis* will keep its leadership in the near future. Instead, it will struggle to continue its business in the next months or years.

4.2 Italian Mobile apps in the Brazilian market

A market assessment analysis was conducted in parallel to the empirical analysis. The analysis aim to accompany the launch of two real Italian Mobile apps in the Brazilian market: QuizPatente for iPhone and Android devices and AllMyTv for Android devices[28].

The apps are developed and maintained by two Italian startup companies: Luca Micheli develops QuizPatente and CTMobi develops AllMyTv. They are supported by Osservatori ICT & Management, Politecnico di Milano's research group focused on Mobile technologies. Both apps were first launched in Italy and, as a second step they are looking for overseas expansion. Brazil is one of the target markets for these apps, and developers benefited from the empirical analysis performed in this thesis.

Hereafter, the sections present some of the strategic aspects for launching these two applications, including an analysis of the most important competitors and the marketing mix of each app.

4.2.1 AllMyTv

AllMyTv is the evolution of the former app TvItaliane, first launched in the end of 2011. AllMyTv, launched late 2012, is a real Mobile TV that streams Italian and

[28] Due to time constraints, the two apps were still not present in the Brazilian app stores by the time this thesis was delivered. Therefore, it was not possible to include the results of the market assessment.

international TV channels available on the Internet directly to the smartphone. It works based on a search engine that looks for TV streaming channels on the web. All the content is provided and hosted by third parties. Up to March 2013 the application had been downloaded more than 300,000 times, and the vast majority of users were in Italy. The launch in the Brazilian app store was supposed to occur in June 2013, but it was delayed due to technical issues.

AllMyTv is available for Android devices (smartphones and tablets) and Amazon's Kindle Fire. It is not available for iOS devices, because Apple devices do not support *Flash* technology, which is crucial for video streaming. The main issue AllMyTv might face in Brazil is the high costs for cellular data plans, as seen in the literature review, because video streaming is an extremely data consuming activity.

Up to March 2013, AllMyTv had more than 3.4 million sessions. The average session length is 30 seconds, and only 16% of the sessions last more than 1 minute. There are 105,000 active users on average: 73% are male and 25% are female[29].

The charts below show the most used devices, Mobile carriers and firmware versions of AllMyTv users (data is from March 2013). Most of the users use Samsung devices with recent Android versions[30] (4.0 or superior). Moreover, they rely more on Wi-Fi connections to watch TV (excluding those with undefined or unknown connections). Wi-Fi is usually faster and more reliable than cellular Internet connection.

[29] Data extracted from AllMyTv analytics.

[30] AllMyTv requires Android v2.2 or superior.

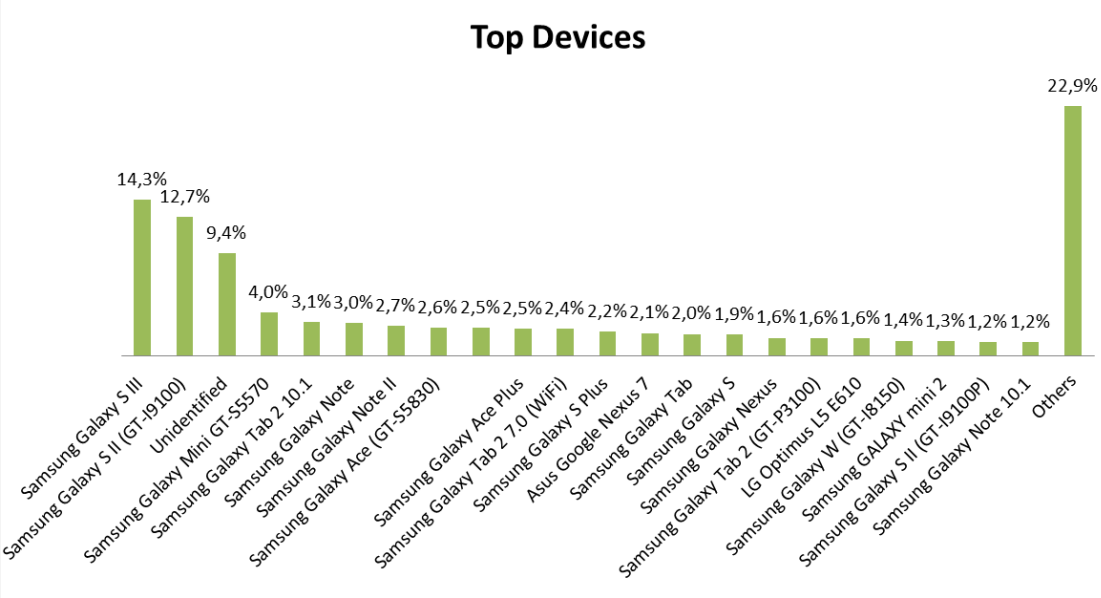

Figure 4-33: Top devices for AllMyTv users (March 2013)

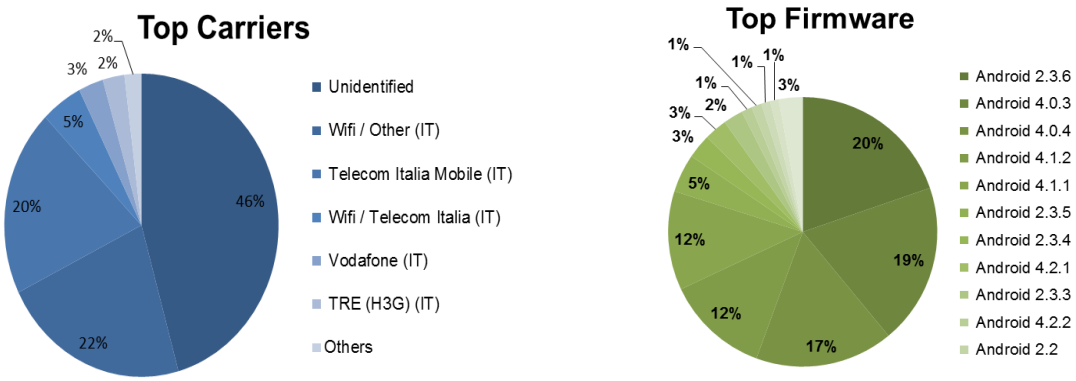

Figure 4-34: Top carriers and top firmware for AllMyTv users (March 2013)

4.2.1.1 Functionalities

AllMyTv streams TV channels publicly available on the web, from several different countries. It provides a search box in which users can search and filter searches by language and country. Moreover, it is possible to look for channels by topic or keywords, whenever channels provide tags for their content. Users can select favorite channels to make them easier to find.

An interesting feature is the real-time alerts. Users can select a channel or the title of a TV show and be notified when it becomes available. Besides, it is possible to look for the title of a show and AllMyTv will tell which channel is currently providing that show. Whenever possible, AllMyTv also provides the schedule of the channels. Last, on AllMyTv users can interact with his/her friends through the Facebook interface.

4.2.1.2 Economic Analysis

AllMyTv's revenues come solely from ads and in-app purchases, since it can be downloaded for free on Google Play. Ads are displayed in the screen while users watch TV. As seen in the literature review and in the empirical analysis, this may not the most efficient way to generate income, because of possible low click-through-rates (CTR).

Android users in Brazil usually prefer free apps with ads rather than paying to download apps, as showed by the empirical analysis. Moreover, ad revenues are not limited by the number of sold apps, as in the case of premium apps. On the other hand, there is the problem of low CTR and also that ads are usually intrusive, which can be annoying for some customers and it might ruin the user experience.

4.2.1.3 Potential Market Estimation

The majority of AllMyTv users in Italy are young people, from 13 to 29 years old, who want to have TV access on the go, according to AllMyTv's analytics data. A similar age distribution is assumed for potential users in Brazil.

According to the literature, there are roughly 17 million smartphones running Android in Brazil, and almost 65% of them belong to people from 13 to 29 years old. TV penetration in Brazil is high, so it is fair to assume that everybody who has a smartphone has access to TV channels at home or at work. Besides youngsters, other people could be interested in AllMyTv, such as workers during lunch-breaks, people getting around public or private transportation, or people interested in watching national and foreign channels, not available in Brazil.

The potential market for Android apps in Brazil is high, with more than 15 million users. The challenge for developers is to reach and retain these customers in a sustainable way.

4.2.1.4 Competition Analysis

In this section, the most important competitors of AllMyTv and similar apps for Android devices are listed and described. It is assumed that the main competitors are the ones that reached the top 50 rankings throughout the empirical analysis.

4.2.1.4.1 *TV ao vivo para Android* by *Online Television* (free app)

The first director competitor for AllMyTv in the Brazilian Google Play is *TV ao vivo para Android* (*Live TV for Android*), developed by *Online Television*. In February 2013, Brazil was the second largest market for this app; only slightly behind the USA, with more than 215,000 downloads. Other important markets for this app are Spain, UK, and Portugal. Its value proposition is very similar to the one of AllMyTv: it offers more than 100 TV channels including music, movies, sports, cartoons, news and more, and it is available in 25 countries.

During Period I, *Live TV for Android* showed up 33 times in the Android's Top Free Ranking. Its best rank was 11th, achieved 5 days in a row from December 3rd to December 7th 2012. Its worst rank was 42nd, achieved on December 24th 2012. Based on the empirical analysis (XYO data), to reach the 11th position in the Android's Top Free Ranking, *Live TV for Android* had roughly 9,300 daily downloads, and to reach the 42nd position, it had approximately 5,200 downloads in that day. Its average position, during Period I, was 20th; implying an average of 7,200 daily downloads.

One difference from *Live TV for Android* is the way ads are displayed. This app adds notifications in the home screen menu bar for games and other offers, displeasing some users. According to the developer, that is the only way to make money with the

app and provide it for free. The average rating, reckoned on 42,000 reviews, is 4.1 out of 5 stars.

4.2.1.4.2 *TV Online* by *Global Soft* (free app)

TV Online reached the 7th position three days in a row during Period I, and achieved 4,200 downloads in Brazil in February 2013. It has similar features similar to those of AllMyTv and *Live TV for Android*, offering more than 100 TV channels. However, it was removed from Google Play for unknown reasons, making it remarkably difficult to find out more information about the app and about its developer.

4.2.1.4.3 *Assistir Televisão* by *Watch TV* (free app)

Assistir Televisão is the Brazilian version of *Watch TV*. In February 2013, it had 44,500 downloads in the Brazilian Google Play, representing 11% of its global downloads. Brazil is the second biggest market for *Watch TV*, after USA, and followed by France, Germany and Russia, all of them with a similar number of downloads of Brazil.

Regarding functionalities, the main difference is that the TV channel is opened from the web browser of the smartphone, instead of streaming it directly within the app. It offers more than 100 TV channels, split into several different categories. The developer say a HTML 5 version of the app is being developed, to overcome the need of a flash player, but the technology is still not on par with it. From November 2012, the app has received an update almost every week. However, up to March 2013 it still could not reach the top 50 rankings, having a 250th place as its best rank so far. Its average rating is 3.2 out of 5 stars.

4.2.1.4.4 *SPB TV* by *SPB TV AG* (Free app)

SPB TV offers on-demand video services on Android devices. It is one of the top quality apps in this segment regarding functionalities, because it offers features such as channel preview, TV guide, onscreen controls, adaptive network bandwidth, and more.

In February 2013, it had 16,500 downloads in Brazilian Google Play store, so it was far away from reaching the top 50 rankings[31], which require, at least, 145,000 monthly downloads. The app has an average rating of 4.0 out of 5 stars.

Despite its poor performance, it is the closest app to AllMyTv regarding variety of available features. It lacks social network interface though.

4.2.1.4.5 Discussion

There are several other similar apps competing in the Brazilian Google Play, such as *Watch Live TV*, *Mobile Live TV*, *TV Live Plus*, and so on. These apps had 1,000-13,000 monthly downloads in the national app store in February 2013.

From the competition analysis, it is reasonable to state that there are several different players competing in this market niche, and most of them have similar offers, that is, they all have virtually the same offer and value proposition. The most important difference affecting performance is the quality of the streaming. Thus this is the most important critical success factor for AllMyTv and for any app offering live TV on a smartphone or tablet.

The actual market for Mobile TV on Android devices is around 300,000 downloads a month, and *Live TV* from *Online Television* is the market leader. All apps are available for free, so a premium offer is a wrong strategic decision. Moreover, none of the apps are freemium, that is, they do not offer premium content to be purchased within the app. The only way to monetize such apps is through internal ads or home screen notifications, or possibly an in-app purchase to remove ads permanently.

[31] Its best rank was 250th, in February 12th 2013.

4.2.1.5 Porter's five forces model

The Porter's five forces model is an intuitive but powerful model to assess attractiveness of a market is. It evaluates five important market dimensions that allows for a good overall view of how appealing the current situation is: Internal Rivalry, Bargaining Power of Buyers, Bargaining Power of Suppliers, Threat of Substitute Products, Threat of New Entrants.

The most important factor positively affecting the attractiveness of the Mobile app market in Brazil is the fast growth of the Mobile business area and the rise of the middle class that is eager to consume these products and services. However, the competition is harsh, because of the dynamics of the app stores; and there are many players with different origins and sizes trying to thrive in the Mobile app market.

4.2.1.5.1 Internal rivalry

By analyzing the apps, one can see that there are many small players and there is not a big variety on their offers. An app emerges as the main rival for AllMyTv: *Live TV for Android*. Anyway, there is still a gap for a high quality app, especially with high quality video streaming; and most of the existing apps keep placing intrusive ads on the home screen or in front of the video streaming.

The market is not so concentrated, because there are not few, big players. Instead, there are many small players, with high homogeneity among them. On one hand, low concentration increases the intensity of internal rivalry. On the other hand, high homogeneity among players decreases it. When all products are basically the same, there is the commoditization effect, in which price is the only difference among products. In this case, there is the extreme situation in which all apps are free. Moreover, switching costs are null, since users are able to switch to different suppliers without spending any amount of money. Finally, industry growth is high, since the Mobile app market is expanding in fast paces.

Therefore, the intensity of the internal rivalry can be considered high, mainly because of low product differentiation, low or null switching costs, low market concentration. The internal rivalry is the most important force in the AllMyTv's case.

4.2.1.5.2 Bargaining power of buyers

The empirical analysis showed that, in general, Brazilian Android users prefer to have ads within the app or notifications in the home screen rather than paying for the download. Besides, there are too many buyers (or customers) and suppliers (app developers). In fact, it is hard to assess the bargaining power in such a market. While some customers will pick the cheapest app that offers what they are looking for, suppliers will always have other customers to attract and monetize.

4.2.1.5.3 Threat of new entrants

Apps are developed on a daily basis and there are few entering costs. Therefore it is likely that new apps will show up in the future to compete in the Mobile TV area, also because technology is always improving and so the quality of online video streaming. Competition is global, since any developer in the world can enter the Brazilian app stores. Moreover, in the Mobile industry, factors such as economies of scale, capital requirements, and brand identity are less intense than in general industries. Therefore, the threat of new entrants is particularly high.

4.2.1.5.4 Threat of substitute products

A Mobile TV is the substitute product for the regular TV. The Mobile application market is likely to strengthen its position in the future, so substitute products are not a big threat right now, unless a new technological breakthrough comes up. Nevertheless,

new apps may offer new and better features, so it is important to monitor the market regularly. All in all, the intensity of this force is not high.

4.2.1.5.5 Bargaining power of suppliers

It is not easy to analyze who are the actual suppliers for the Mobile app industry. Google Play and AppStore can be considered as the suppliers of the distribution channel of the apps, and they have high bargaining power for paid and freemium apps, since they get a 30% share on every single purchase made by a user. The table below summarizes the discussion of the five forces model.

Table 18: Summary of five forces model for AllMyTv

Force	Intensity
Internal Rivalry	High
Bargaining Power of Buyers	Low/Medium
Threat of New Entrants	High
Threat of Substitute Products	Low
Bargaining Power of Suppliers	High

4.2.1.6 Marketing Plan

The marketing mix of Mobile apps is discussed in the marketing plan. The marketing mix assess important marketing aspects of a product, including how it should be designed and what it should offer, the optimal price, the place, and the promotion channels (already discussed in a previous section).

4.2.1.6.1 Product

There are over 700,000 apps on AppStore and Google Play. Dealing with such large numbers, it becomes extremely hard to step into and be noticed in the stores, in order to adequately compete for income. Moreover, a relevant part of the developers are moving toward the freemium revenue model, in order to achieve a larger user base, and then generate income within the app.

Because of this scenario, quality becomes essential for any app that seeks fast growth and success. One of the top-of-mind examples of such trend is *WhatsApp Messenger*, which has been getting over 7.5 million monthly downloads in a regular basis in the past two or three years. It offers a certainly simple but high quality product that meets the need of millions of users.

Another recent example is from *CSR Racing*, a game developed by *Natural Motion*. It is a high-end 3D game with console-quality that is free to play and has generated over US$12 million in its first month, through in-app purchases. *Natural Motion* has spent much less in promotion than its competitors. According to its CEO Torsten Reil, "*our vision from the outset has been to focus on making games that people want to play – and to go viral through quality. Our combination of deep free-to-play monetization insights with polished gameplay and high-end 3D graphics generates margins impossible for the old type of 2D games, especially those who have to aggressively spend to buy players."*

Therefore, the main strategy for the product, in this case the Mobile app AllMyTv, is to focus on quality, especially regarding (1) big variety of TV Channels, (2) high quality of the streaming, (3) connection with social networks, and (4) friendly user interface and high usability.

The major problems of currently available Mobile TV apps are (1) app crashing, (2) bad streaming quality, and (3) intrusive ads. Focusing on these problems and also addressing the quality of cellular connection from users are key issues to determine the success of AllMyTv in Brazil.

4.2.1.6.2 Price

As already discussed, AllMyTv ought to be free. Revenues will come from ads, donation, and from in-app purchase that eliminates the ads. Since some TV channels provide tags and keywords, AllMyTv could use these keywords to exhibit more suitable ads according to the type of channel and show being presented.

4.2.1.6.3 Place

Place is related to the distribution channel of the product. In the specific case of Mobile apps, the only available channel is the app store[32]. In the future, if technology allows, AllMyTv first step should be to move toward the Apple's AppStore and possibly to other ecosystems, to expand its customer base and improve revenue generation.

4.2.2 QuizPatente

QuizPatente is a free Italian Mobile app for iOS and Android devices developed by an Italian start-up company AppSolutely. QuizPatente is a game in which people can prepare themselves to take driver's license test in an interactive and funny way. It was first launched in Italy in August 2012. In March 2012, more than 99.5% of its users still come from Italy. It has been downloaded more than 300,000 times and it has, on average, 81,000 active users, with an average usage of 5 minutes.

On average, QuizPatente's users have two times more sessions a month than the average benchmark for games, with 5 sessions. Up to March 2013, QuizPatente had almost 9 million sessions. The user retention is 44% after 30 days, 30% after 60 days and 20% after 90 days[33]. One reason for the decreasing retention is that users are not likely to user the app again after taking the exam, and the preparation usually lasts fewer than three months.

[32] There are some non-official alternative app stores, but they are not taking into account in this thesis, because they are not as widespread as the official stores.

[33] Data extracted from QuizPatente analytics.

The charts below show the most used devices, Mobile carriers and firmware versions of QuizPatente users (data is from March 2013). Most of the users use iPhone devices with recent iOS versions[34] (6.0 or superior). Moreover, Mobile carrier Telecom Italia (TIM) is the most preferred Internet connection for QuizPatente. Finally, users rely more on Wi-Fi connections (excluding the undefined and unknown connections), since it is usually faster and more reliable than cellular Internet connection.

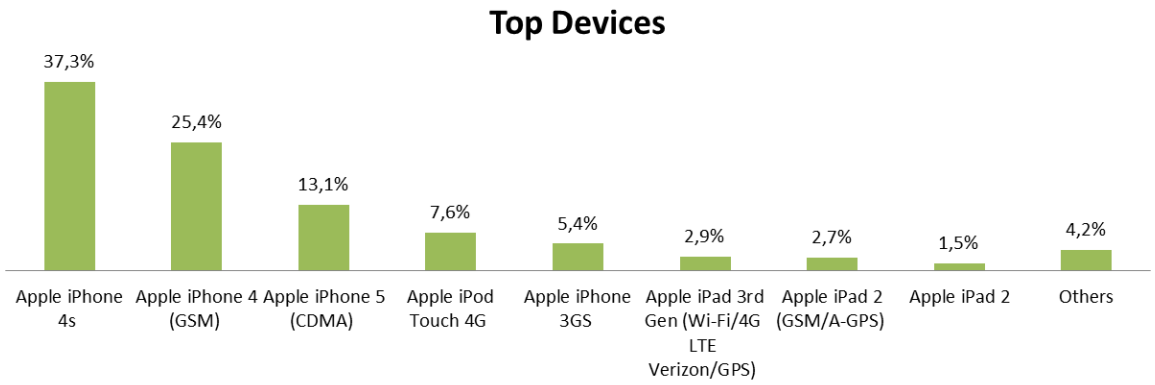

Figure 4-35: Top devices for QuizPatente users (March 2013)[35]

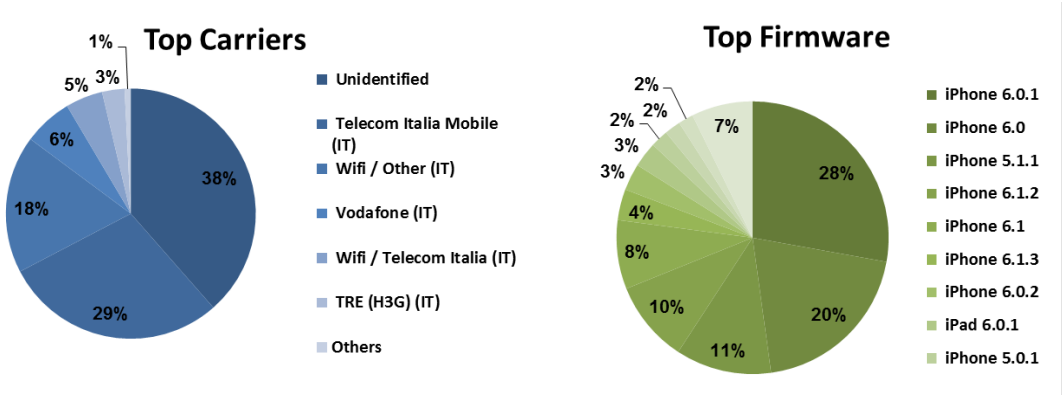

Figure 4-36: Top carriers and top firmware for QuizPatente users (March 2013)

4.2.2.1 Functionalities

[34] QuizPatente for Android requires Android v2.2 or superior

[35] It is important to notice that QuizPatente was launched for Android devices few months after its iPhone's launch

Theory is divided into two categories in QuizPatente: Driving Codes and Rules and Traffic Signs. The first one contains textual pages that describe de rules and codes for driving in the specific country. It includes general driving principles, classification and definition of the roads and traffic, prohibitions, and so on. The app uses a search engine for keywords and separates the rules by articles. The second part explains graphically all the existing traffic signs. The signs are divided into subcategories, and some examples of real situations are given. Within each category, it is possible to get further details about every sign, in the form of textual explanation.

Within QuizPatente there is also a statistics tab, in which users have access to aggregate information regarding his/her overall performance in the quizzes, including the most common mistakes and the average number of errors. Error charts are column charts that show the number of mistakes made in each quiz and the time evolution of the quizzes.

QuizPatente also offers interaction with social networks (Facebook and Twitter) and with Game Center, in which users can compare their scores with other users, and they compete to be the best player. This way is particularly interesting for games to increase interaction with users and to attract and maintain these users inside the app.

Regarding Quizzes, there are two different kinds: Formal and Fun Quizzes. In the first, users can take quizzes based on real theoretical exams. Formal Quizzes have the same number of multiple-choice questions and the same length as a real quiz. Besides, it is also possible to take specific quizzes about one or more specific topics of the theory, for example: a specific quiz about norms and speed limits. At the end of each quiz, user receives feedback (approved or fail), the total number of mistakes, and the social network functions become available. Shared results on social networks double the total score for the game center. One point to improve its usability is that users cannot return to the main menu after starting a formal quiz. Fun Quizzes are similar to Formal ones, but there are three options to play: time trial quizzes, traffic signs quizzes, and real situation quizzes.

4.2.2.2 Economic Analysis

QuizPatente revenue streams are two-fold: donation and in-app ads. Users are able to donate US$0.99 to support QuizPatente and AppSolutely, and as a reward, all internal ads are removed from the app. It is suitable for users that are not willing to click on ads and actually think that intrusive ads may ruin their experience. In-app ads are shown during the quizzes. Ads might generate higher revenues in the long run, if it is supposed users appreciate them. However, relying solely on this method can be dangerous, because the click-through-rate (CTR) might be low. The ad network should contain innovative content to attract more *clicks*.

4.2.2.3 Potential Market Estimation

Brazilian Department of Motor Vehicles (DENATRAN) is the federal agency that regulates and manages driving licenses nationwide. Each of the states (and the federal district) has a statewide agency, which is responsible for applying the exams and issuing the licenses. In Brazil, an individual must be 18 years old or older to apply for a driving license. There are plenty of free questionnaires with real questions for the theoretical exam available in the Internet.

Data about the total number of licenses issued by each state is not easily available online, and most of the statewide agencies did not reply to emails. However, it was possible to get official data for two of the states, and using them it was possible to estimate the quantities for all other states. Obviously, each state has its own particularities, and the numbers may vary a little, but the values shown here serve as a base for a rough estimation. Based on the gathered data, it is estimated that 2.3% of the population got their first driving license in 2012, or approximately 4 million people. The chart below shows the estimated figures for all 27 states.

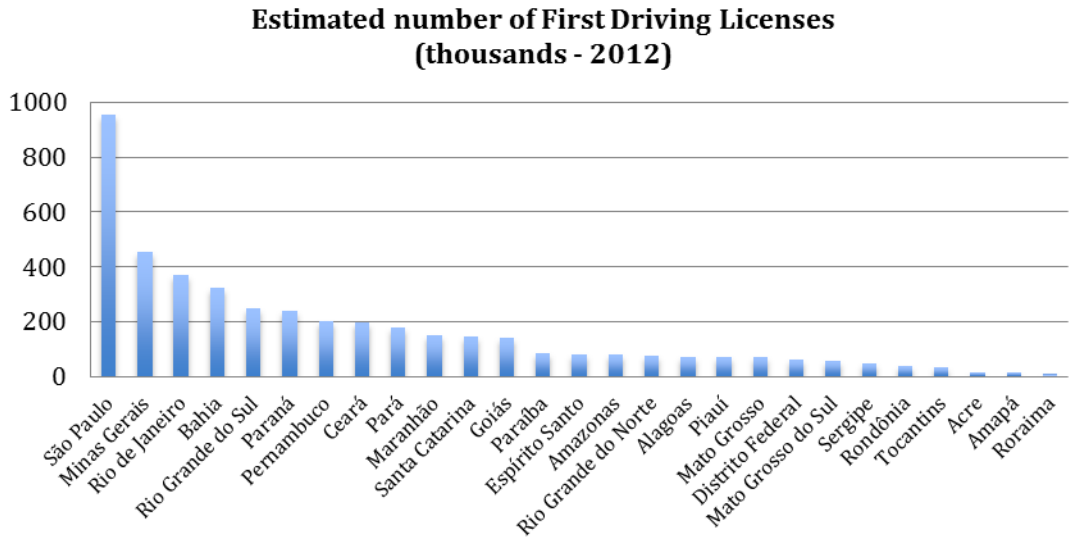

Figure 4-37: Estimated figures for first licenses in Brazil in 2012

In Brazil, the driving course is divided into two parts: theoretical exam and practical exam. The theoretical exam is the only relevant for this Mobile app. In this part, students have to take a 45-hours course on legislation (18 hours), defensive direction (16 hours), first aid and emergencies (4 hours), environment and citizenship (4 hours), and mechanics (3 hours). After taking the theoretical course, students have to apply for the theoretical exam, which consists of a quiz containing 30 multiple-choice questions. It lasts for 40 minutes. Students with score equal or higher than 21 (70%) are approved and can start taking practical driving lessons[36].

For the practical exam, students need to take 20 practical lessons of 50 minutes each, in order to be able to take the practical exam. After approval in the practical exam, they get the permission to drive that lasts for one year. If during this first year the driver gets a fine, he/she loses the permission to drive.

Using data from the literature and supposing a linear distribution of smartphones from people between 18 and 29 years old, there are roughly 6 million of smartphone users in Brazil between 18 and 24 years old, which is the target market for QuizPatente. Besides students, other people could be interested in using the app, such as driving teachers, gamers, parents, driving schools, and so on.

[36] Further information is available on http://www.denatran.gov.br/

4.2.2.4 Competition Analysis

In this section, the most important competitors of QuizPatente and similar apps for iOS and Android devices are listed and described.

4.2.2.4.1 Habilite-se by *BossHouse*

This app has the same concept of QuizPatente. It simulates an actual quiz of theoretical exam, and reports the final results. It also has a light version that provides just few questions and it is free, while the full version offers more questions and costs US$1.99. Its average rating is 3 out of 5 stars. Some users reported it as “a good app to be used 3-4 times only.” There are several recent reviews, meaning that currently there is a public eager for this kind of app.

During the first three months of 2013, *Habilita-se* was constantly ranked in the top 100 Education apps for iPhone, while its best overall rank was 431, which represents roughly 66 downloads in that day, generating US$130 in revenue.

4.2.2.4.2 *iTeoria* by *Swift Management AG*

iTeoria might be the major competitor for QuizPatente in both Android and iOS devices. It is a free app, with in-app purchase of US$0.99 to remove ads (similar to QuizPatente). It is the only foreign competitor. *iTeoria* also offers connection with Game Center. In addition to usual quizzes, this app offers a section devoted to theoretical learning of each category (Defensive Direction, Legislation, Mechanics, Environment and Citizenship, and First Aid), where users can practice before proceeding to real quizzes. However, there is not a theory part as there is in QuizPatente. This app exists in other countries, such as Switzerland, France, and Argentina, and it has been awarded

the app of the year in 2011 by *Swisscom*. Some reviews state “very good app” and “[It is a] great app, because I learn and play at the same time.”

In the first three months of 2013, *iTeoria* could not reach the top 500 overall free rankings, but it is constantly in the top 200 free apps in the Education category for iOS.

For Android, this app costs US$3.20. It was launched in March 2013, and since then it oscillates from the top 25 to the top 150 in the top paid Education category for Android. Its Android rankings are displayed in the figure below.

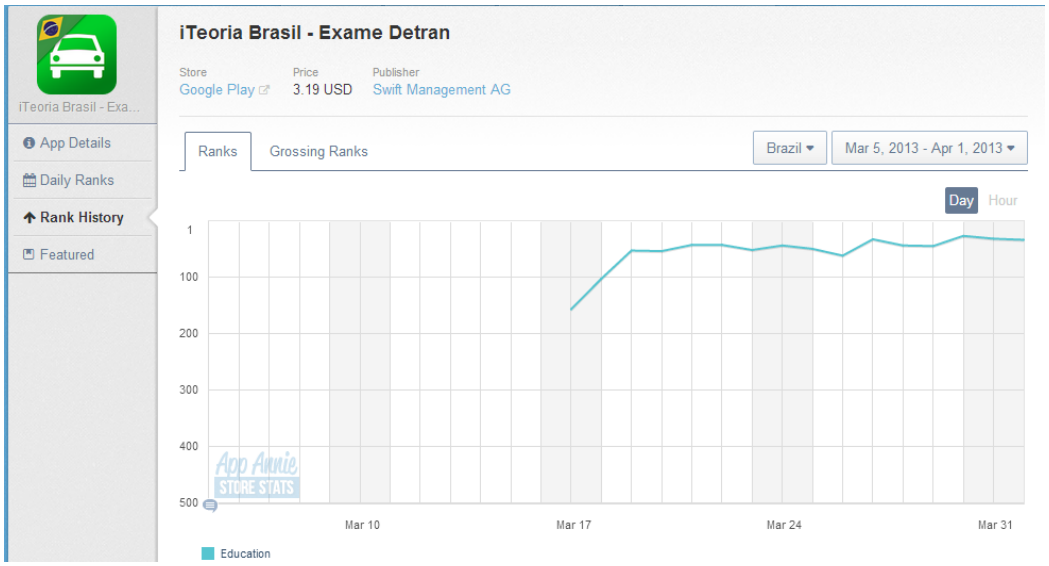

Figure 4-38: Android rankings for iTeoria (Education paid category)

4.2.2.4.3 *Simulado Detran* by *JCode Sistemas*

This app works only on Android systems, and it has a free and a US$0.99 paid version. Its average rating is 4.2 out of 5, including some reviews as “so far the best app.” The difference between the free and paid versions is the number of available questions (200 in the premium version), and also the free version does not have real quizzes. Instead, it offers only 20 questions, when a real exam has actually 30.

In this app, users can create their customized quiz, choosing the type and the quantity of questions they want to answer. The app allows users to see which answers were wrong and it also shows the history of the previous quizzes. The figures below display its rankings for both free and paid versions in the first three months of 2013.

Figure 4-39: Simulado Detran Free (category Education: between 46th and 64th

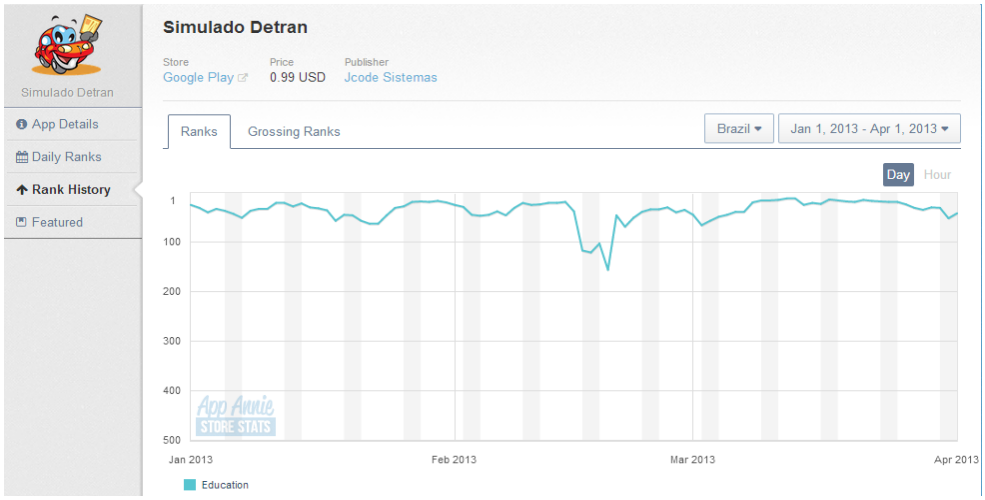

Figure 4-40: Simulado Detran Premium (category Education): between 12th and 156th

4.2.2.4.4 Habilita by *Kabeca Software*

Habilita also has two different versions: free and paid for US$1.99. The difference is in the total number of questions (100 in the free version and 400 in the premium one). In the English description of the app, the developer suggests its use for foreign people interested in driving in Brazil during 2014 FIFA World Cup and 2016 Olympic Games.

The app is quite similar to QuizPatente and *Simulado Detran*. The graphical interface is quite simple, with black background and white texts, always showing some traffic signs as part of the design (see figure below).

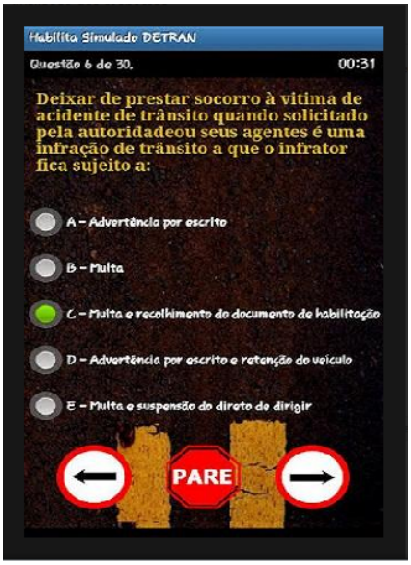

Figure 4-41: Layout of Habilita

It is available only for Android smartphones and tablets, and its rating on Google Play store is 4.7 out of 5 for the free version and 5.0 for the premium version. Some comments include “excellent app” and “I was approved in the theoretical exam only using this app.” In the first three months of 2013, *Habilita* free oscillated from ranks 211 to 89, while the premium version ranged from 14 to 198, both in the Education category of Google Play.

4.2.2.4.5 Placas de Trânsito Quiz by *Nilemar Barcelos*

This is a free app that focuses only on road signs. Users can choose a single sign and the app will ask a question showing four alternatives for the correct answer for that sign (see figure below). The total number of errors and successes are displayed in the top right corner of the screen. It is the only app in this analysis created by an independent developer. It is available only on the Google Play store for Android devices, and its rating is 4.5 out of 5 stars.

Figure 4-42: Placas de Trânsito screen examples.

4.2.2.4.6 Discussion

There are several other similar apps competing in the Brazilian market (both on Google Play and AppStore), such as *Simulado Detran* by *Progit Tecnologia*, *Detran Simulados*, and so on. These apps had particularly few monthly downloads in the national app store in February 2013.

From this competition analysis, one is able to see that there are several different players competing in this market niche, and all of them have similar offers. What seems clear is that they all have virtually the same offer and value proposition. Thus it is hard to determine the most important critical success factors for QuizPatente. Of course, it must have a large questions database and a friendly user interface, and be very accurate. Social network and Game Center interfaces are good extras.

The actual market for apps as QuizPatente is very limited both for iOS and Android devices. Since none of these apps reached the top in the overall categories, it is hard to estimate its actual size. Some apps use the premium revenue model, so it may be a good strategy for generating revenue in the Brazilian market, since the current market is not large. From XYO data, it is estimated that the top1 free app in the Education category had, on average, 1,400 daily downloads in March 2013, while the 10th place

had roughly 1000 daily downloads (on Google Play). Once again, paid downloads in Brazilian Google Play are virtually null.

4.2.2.5 Porter's five forces model

Similarly to the analysis made for AllMyTv, in this section a Porter's five forces analysis is performed for QuizPatente.

4.2.2.5.1 Internal rivalry

A group of 4 or 5 apps have similar offers to that of QuizPatente (*iTeoria*, *Habilite-se*, *Simulado Detran*, and so on), but QuizPatente seems to be the only one with the full offer: large set of questions, traffic signs, theory, quizzes, Game Center connection and Social Network interaction. Moreover, it is free. However, competitors have the advantage to be local and to know better the local market and local driving regulations.

Based on the number of downloads and the reviews, there is a growing public interested in this kind of Mobile apps. The intensity of internal rivalry can be considered medium to high, especially because of the difficulties to differentiate the existing apps.

4.2.2.5.2 Bargaining power of buyers

As mentioned before, Brazilian users prefer to have ads rather than pay for the apps, especially Android users, suggesting high bargaining power for consumers of free apps. Besides, there are too many buyers (or customers) and suppliers (app developers). In fact, it is hard to assess the bargaining power in such a market. While some customers will pick the cheapest app that offers what they are looking for, suppliers will always have other customers to attract and monetize.

4.2.2.5.3 Threat of new entrants

Similarly to AllMyTv, the threat of new entrants is particularly high for any Mobile app.

4.2.2.5.4 Threat of substitute products

The threat of substitute products can be considered low, because a Mobile application is already the substitute product for many other products such as books, e-books and games. The Mobile application market is likely to mature and stabilize in the near future, so substitute products are not a big threat. Nevertheless, new apps may offer new features, so it is important to monitor the market regularly.

4.2.2.5.5 Bargaining power of suppliers

As mentioned in the AllMyTv case, it is not easy to analyze who are the actual suppliers for the Mobile app industry. Google Play and AppStore can be considered as the suppliers of the distribution channel of the apps, and they have high bargaining power for paid and freemium apps, since they get a 30% share on every single purchase made by a user. The table below summarizes the discussion of the five forces model.

Table 19: Summary of five forces model for QuizPatente

Force	Intensity
Internal Rivalry	Medium/High
Bargaining Power of Buyers	Low/Medium
Threat of New Entrants	High
Threat of Substitute Products	Low
Bargaining Power of Suppliers	High

4.2.2.6 SWOT Analysis

Based on the analysis presented so far, a SWOT matrix that fits both QuizPatente and AllMyTv in the Brazilian market is displayed below, due to the similarities of the challenges presented for both apps.

Figure 4-43: SWOT matrix for QuizPatente and AllMyTv

5 CONCLUSIONS

This thesis has presented the results from the empirical analysis on the two most important Mobile application stores in Brazil, namely Apple's AppStore and Google Play. It has shown that there is a plethora of incumbents and new entrants in the Mobile app stores market arena, but only few of them have achieved sustainable download and income generation, and thus can be considered winners. One of the responsible for the leaders' success is the ranking algorithm, which privileges well-established apps, and causes low turnover rates, even though AppStore's turnover rate are much higher than Google Play's. Another responsible is the app store itself, which hides the vast majority of apps, and requires large investments from developers to sponsor or feature their apps. Last, the nature of smartphone usage enhances major categories at the expense of minor ones (that is, in general, users use apps chiefly from Games, Utilities, Entertainment, and Photo and Video categories).

Paid apps on Google Play charge, on average, 70-100% more than paid apps on AppStore. Two possible reasons, which emerge from the empirical analysis, are: (1) iOS users are more leaning to spend on Mobile apps than Android users, thus iOS developers can balance lower app revenue with lower demand, and/or (2) Android developers are forced to charge higher prices to compensate fewer downloads, and/or (3) iOS developers face stronger competition than Android developers. From Period I to Period II, it was possible to see a downward trend of average prices on both stores.

Regarding revenue models, in-app purchases were present in approximately 75% of the Top Grossing apps in Period II (and also in Period I on AppStore). Both the literature and the empirical analysis confirm that this is the prevailing revenue model for free apps, and its success has made many paid apps adopt it too.

With respect to firm's profile, most successful developers are big firms with Mobile as their core activities. Nevertheless, there are lots of opportunities for small and independent developers (approximately 50% of the top apps fell in these categories), and software houses or brands (around 40% of the top apps fell in these categories). On the other hand, Brazilian developers are still struggling, achieving only 12% participation

on AppStore and 5% on Google Play, possibly due to lack of expertise, investments, and incentives for technological entrepreneurs.

Concerning daily downloads, AppStore and Google Play resemble in the Top Free rankings, but they differ completely in the Top Paid rankings. The top free app requires approximately 30,000 daily downloads on AppStore and 26,700 on Google Play. The top paid app, instead, requires 4,200 daily downloads on AppStore and only 132 downloads on Google play. Differences in willingness to download is important for developers faced with tough decisions as to launch free or paid apps, on AppStore or on Google Play.

The study cases of two Italian Mobile apps provide a general framework to assess the attractiveness of an app store for new entrants. The analysis of competitors, together with the empirical analysis results, showed that the potential market is large, and that there are several small competitors with similar offers, but most of them have quality issues and/or poor performance.

Despite of all benefits of the empirical analysis, there are some limitations that are worth to point out for future works. Currently the literature lacks a generally accepted performance measurement system specific for Mobile application stores, including the definition of an appropriate set of KPI. Moreover, the empirical analysis provides only macro figures, disregarding important aspects of individual apps. Next, further research on ranking algorithms is required to disclose detailed information on how Mobile apps positions swing over time. Finally, more dependable and accurate measures of individual daily downloads are extremely relevant for any operational or strategic assessment, especially regarding costs per additional download and per additional rank. Unfortunately, both this thesis and the literature currently lack an efficient method to reckon them, since Garg & Telang's approach has shown poor results with Brazilian data, and XYO is a secondary source of information.

Given the particular nature of the Mobile application stores, which are continuously changing, there are opportunities for further investigating the Mobile app stores in the future, including the stores not analyzed in this thesis. Developers can draw from this thesis' results to understand better the Brazilian Mobile app market, and improve their decision-making process. In addition, further research can draw from this thesis's

empirical analysis, targeting different app stores, countries, and/or time spans, so as to expand the academic coverage of the Mobile offer around the world.

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