Marché et tarification des plateformes de vente d'applications mobiles comme marchés bifaces : analyse comparée France-Chine

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Marché et tarification des plateformes de vente d’applications mobiles comme marchés bifaces :analyse comparée France-Chine

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Pricing strategies of the app store platform in the mobile app market based on two-sided markets theory: a comparative study of France and China

ABSTRACT:

Mobile app is becoming an important mobile internet access channel. Three groups of end users affiliated with two Two-sided platforms in the mobile app market have attracted considerable attention. App store platform (App-store) is an app distribution platform connected with developers and users. App ad platform (Ad-store) supplies advertising services for advertisers through developers' apps. Developers, users and advertisers are end users. Mobile app market is a complicated two-sided market. There are widespread and interactive network externalities. The study focuses on the pricing strategies for the app store platform.

App-store shares paid app sales and in-app purchase revenues with developers. Ad-store shares in-app advertising revenues with developers. The App-store platform implements asymmetric pricing to developer side and user side. Developer side is the subsidy side as well as the revenue side for App-store platform. Mobile device purchasing cost constitutes a particular App-store platform pricing determinant. Membership fees are negligible in the mobile app market. Usage fee is workable.

It is a duopoly in the mobile app market. Apple and Google are the two giants with distinct business models. Both Apple's mobile device sales model and Google's in-app advertising model are extremely successful.

App-store, Ad-store and mobile devices are the three key profit makers in this market. Vertical integration inside this ecosystem will generate considerable revenues.

Chinese users have higher price elasticity of demand and they are particularly sensitive to the app prices when compared with the French.

Keywords :

App store platform, App ad platform, Asymmetric pricing, Mobile device purchasing cost,
In-app advertising, In-app purchase, Apple model, Google Model

Pricing strategies of the app store platform in the mobile app market based on two-sided markets theory: a comparative study of France and China

1 Chapter 1 Introduction

Contents

1.1 Research background

In the past few years, mobile applications (app for short) that run on mobile operating system through mobile devices have become an important mobile network channel. A complex, complete and efficient mobile app market ecosystem has been built with the objective of yielding considerable revenues. There are a series of participants with tight network externalities in mobile app market.

The most interesting issue is that there are actually two interconnected two-sided platforms working coordinately in mobile app market. These two magic platforms are app store platform and app ad platform called App-store and Ad-store in this study.

We need to talk first of the Apple App store while discussing the app store platforms. It was launched in July 2008 and created a new successful business model for app distribution. Apple App store ended the limited success of app sales by mobile network operator (carrier), resulting in a boom in the new app distribution era.

App store platform is a mobile app distribution platform which connects the developer and the user. App store platform supplies technical supports based on mobile operating system (MOS) to the developer for app development. App store platform distributes free or paid apps from developers to users.

In the case of apps being paid, app store platform will share sales revenues with developers according to a certain share split. In the case of free apps, ad platform will bring revenues for developers. App store platform generates no revenues from free app downloads.

The mobile app market ecosystem and its creative business model have attracted considerable attention. All the participants are well mobilized in this market.

Mobile app market is a complicated two-sided market. As in other traditional two-sided markets, studies of pricing strategies and profit-generating points in mobile app market are in great need. Due to the complex ecosystem, there are, today, few related studies on these subjects.

This study is focusing on pricing strategies of app store platform and the momentum behind the mobile app market ecosystem. My research also aims to analyze the geographical differences of app use and app price preferences through empirical studies.

This will complete the pricing study of two-sided markets platforms and introduce some useful research points.

1.2 Problem formulation

In mobile app market, users usually have to purchase mobile devices to access the app store platform. App store platform depend on app distribution and ad store platform are financed by supply in-app advertising services. The major, critical research questions start with the definition of the business model and the functioning of the whole ecosystem. Verification and analysis of the app user habits and price preferences are very important.

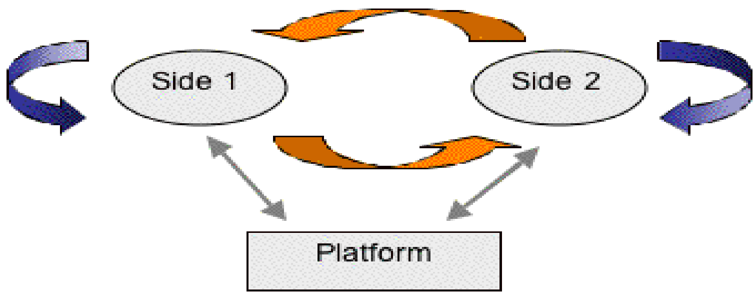

Figure 1- 1 Two-sided markets

The main research questions in my study are the following:

(1) What is mobile app market ecosystem? Who are the participants and what are their relations?

Why there are two platforms and how do they work? What is the landscape in mobile app market?

(2) What are two-sided markets? Is mobile app market a two-sided market? If yes, what are the attributes?

(3) What are the pricing strategies for platform in two-sided markets? What are the determinants for platform pricing? What are the pricing determinants for app store platform?

(4) What is the business model in mobile app market? What are app store platform's pricing strategies? What are membership and usage charges on both the developer and user sides?

(5) Are there geographical differences of mobile app use and app price preferences? What are the reasons?

(6) Can the pricing determinants be measured? Within the different app stores and in different countries, are there differences of pricing determinants?

(7) What can we learn from platform pricing in mobile app market?

Chapter 3 will discuss question (1), mobile app market description, ecosystem will be stated.

For question (2), the attributes, market structure, platform and end users behaviors of two-sided markets will be analyzed in chapter 2. Mobile app market's two-sided attributes are presented in chapter 3.

Question (3) platform pricing determinants and strategies in two-sided markets are coverd in the first part of chapter 4. Analysis and conclusions of app store platform pricing determinants are therefore obtained.

Chapter 4 is the core part of this thesis. After comparions of pricing determinants and strategies between app store platform and the general two-sided markets platform, I propose the pricing strategies along with business models for app store platform.

App store platform's membership fees and usage fees from two sides are discussed.

Question (5) is answered in chapter 5. A mobile app use and app price preferences survey was implemented mainly in France and China. Some interesting information has been collected on this subject.

Chapter 6 is based on empirical study to explain question (6). Price elasticity of demand for users has been abstracted and measured as one pricing determinant for app store platform from data collected in France (US) and China.

Question (7) is analyzed in chapter 7. Stemming from the app store platform pricing strategies and empirical study results, there are valuable points for pricing in the two-sided markets.

1.3 Research methodology

This thesis aims at analyzing the app store pricing determinants, strategies based on the two sided market theory, existing case studies. App usage, price preferences and price elasticity of demand for users have been factually studied and compiled.

Industrial organization theory, Economics of network industries and Information Economics related theory and models are mainly used in the mobile app market pricing analysis. Research methods like comparative study, empirical study and case study are used in this work.

I explain how each chapter is constructed, how the topic has been organized, as to the following methodologies.

(1) Orientation

I received a comprehensive briefing and precise guidance from my supervisor further to two detailed meetings and subsequent follow-up.

(2) Literature review

Review of literature has been a basis of my research and the source of answers to my questions. It helped me structure my work and oriented me to interesting ideas and conclusions. My research questions are concluded from pricing theory and strategies in two-sided markets literature.

(3) Questionnaire

Questionnaire was designed, distributed mainly by internet (ex. social networking, email) in France and China. Data from questionnaire was collected and arranged in a file. Data resulting are mainly presented in chapter 3 and chapter 5.

(4) Second Hand Data Collection

Due to the focus of this study on the worldwide mobile app market and empirical mobile app price and consuming study in different countries, secondary sources of data were beneficial for my data collection. I collected related data concerning the comprehensive mobile app market and app price through authoritative internet sources as website of app stores, professional mobile app analysis agency and mobile app consuming reports.

(5) Statistical analysis

SPSS (Statistical Product and Service Solutions) and AMOS (Analysis of Moment Structure) are used to analysis the data from questionnaire and establish the mobile app price determinants path diagram. Matlab is used to analyze the data collected from a professional mobile app analysis website to understand user's price elasticity of demand.

1.4 Thesis framework and innovative points

2.1.1 Thesis framework

In chapter 1, research background, research questions, research methods and literature summarization in two-sided markets are covered.

Chapter 2 elaborates attributes, development and industry chain in two-sided markets. The five basic industries in two-sided markets are Intermediary industry, Ad supported media industry, software industry, transaction systems and standard telecom network. Mobile app market is in the software industry. It is a demand-coordinator type two-sided market. The pricing structure in two-sided markets is non neutral. The platform works to expand the transaction range, to reduce the transaction costs and internalize the indirect network externalities between the two sides. General strategies for platform in two-sided markets are: asymmetrical pricing to two sides, subsidy, product differentiation, exclusivity, vertical integration or horizontal interconnection.

Chapter 3 is the description of mobile app market as a two-sided market. Mobile app store is a platform which offers software application and service through portable devices. It came from NTT DoCoMo's i-model mobile internet service in 1999 and was flourishing in Apple App store by 2008. Mobile app store is classified into four types: mobile operating system (MOS) app store, Mobile network operator (MNO) app store, Third-Party (TP) app store and Device manufacture (DM) app store. The dominant strength is definitely the MOS app store. Worldwide app price distribution is analyzed.

There is a complex ecosystem where three groups of end users affiliate with two Two-sided platforms. Developers, advertisers and users constitute the end users. App-store and Ad-store are the platforms. I have described the roles of participants, the distribution of app and in-app advertisement, the two platforms' functioning system and their interaction.

As App-store is a two-sided platform, there are two distinct sides-developers and users. Network externalities are obvious between the two sides. App store platform applies asymmetric pricing strategy to developers and users. The developer side is subsided and is the revenue source side for the platform. The pricing structure is non neutral for app store platform in mobile app market. Developer, user, App-store platform (MOS), Ad-store platform, mobile network and carrier, device supplier and advertiser are the main participants in mobile app market ecosystem. Platform's economic behaviors which include asymmetric pricing structure, subsidy, product differentiation and exclusivity are talked. My work delves into the economic behaviors of developers and users as well as comparisons between mobile app market and other types of two-sided markets.

In chapter 4, I refer to pricing determinants in two-sided markets and then for app store platform.Then I analyze business models, including in-app advertising, paid apps, freemium, and in-app purchases.Monetary relations in the market are defined, and benefits, costs and charges are analyzed. Limitations of modeling are stated. And Apple's device driving model and Google's in-app advertising modes are presented.Finally I put forward pricing suggestions. As the App-store and Ad-store platforms bring in the highest profits on this mobile app market, the revenue share split is a vital feature in pricing.

Chapter 5 is based on mobile app consuming survey in France and China through internet. The questionnaire is designed into five parts: demographic characteristics of app users, mobile device use habits, app usage and payment, app price preferences and app store uses. App price preference's influencing factors path diagram is achieved by Amos[1].Comparison of factors of influnce for app price preferences for Apple iOS users and other mobile OS users are stated.

Chapter 6 is an empirical study of app user's price elasticity of demand in France, China and US through second hand data collection. Data is from Apple App store. App price, category and rank in Apple App store are presented and compared in the three countries. App rank is taken as a parameter which reflects app download demands. User's price elasticity of demand (PED for short) is measured by app price and app rank. PED is derived through regression analysis. Comparisons of PED in the three countries and reasons of differences are talked. Mobile app life circle is also analyzed.

In the conclusion part, mobile app store platform's pricing suggestions are presented. New mobile app trend and regulation suggestions are discussed. The limitation of this study and future research interest are explained.

2.1.2 Innovative points

1. Organization and functioning mechanism of mobile app market ecosystem

Participants, role of members and interaction among the participants in mobile app market are stated to build a clear mobile app market ecosystem.

2. Identification of mobile app market as a two-sided market

Network externalities and multi products pricing are found in mobile app market. App-store which connects developer side and user side is an app distribution platform. Ad-store which directly connects developers and advertisers supplies advertising service through apps. Pricing structures for App-store platform and Ad-store platform are no neutral. The three groups of end users (developers, users and advertisers) and the two platforms make a particular market structure in mobile app

[1] Amos (Analysis of Moment Structures) is a structural equation modeling software by IBM.

market. The mobile app market is a two-sided market due to its attributes.

Platform pricing determinants and strategies in two-sided markets can be utilized in App-store platform (or Ad-store platform) pricing.

3. Classification of app store

MOS is the important infrastructure which supports mobile device operation and mobile app developing. Application stores are classified into MOS App-store, MNO (mobile network operator/carrier) App-store, TP (third party) App-store and DM (device manufacture) App-store by the types of their platform operators. This app store classification well reflects the mobile app market forces and reveals the profit-generating points in mobile app market.

Mobile device is an important profit-generating point.

4. Business model in mobile app market and app store platform pricing determinants

Business model is built based on the revenue sources flow in mobile app market.

Platform pricing determinants like price elasticity of demand for end users, network externalities, single or multihoming, customer demand for product diversity and difficulty of monitoring transactions also influence app store platform pricing. Mobile device purchasing cost is a particular pricing determinant for app store platform.

5. App price preferences empirical study

App price preference for users can reflect price acceptance and sensitivity. This will help developer's app pricing and offer useful suggestions for platform pricing to user side.

Interesting results have evolved from an empirical study developed mainly in France and China.

6. Case study about measurement of app price elasticity of demand for user

Measurement of platform pricing determinants is meaningful. App price elasticity of demand for user determinant was measured based on data from Apple App store in France (US) and China.

Geographical differences of app price elasticity of demand for user and reasons are concluded.

1.5 Literature sum-up

The literature about two-sided markets are classified into the following four categories: (1)The development of two-sided markets; (2) the pricing strategies: Singlehoming and multihoming, price elasticity of demand, exclusiveness, tying, network externalities and alliance among the platforms are taken as the main influencing factors to the pricing and social welfare. (3) The payment card system study: the influence of interchange fee to the price strategy and welfare in payment card system is a popular subject. (4) Regulation and social welfare related.

Most of the case study literature is mainly about credit card industry, telecommunication industry, advertising platform, real estate agency, B2B e-commerce platform and others.

Mobile app market is new typical two-sided market burgeoning with the development of mobile internet. There are few systematic pricing studies for mobile app market. App store platform pricing strategies and the particular business model in mobile app market can offer useful references in the future digital economic research.

2 Chapter 2 Two-sided markets

Contents

2.1 Definition, attributes, history and development

2.1.1 Definition of two-sided markets

In 1985, Alivin Roth proposed a new concept "two–sided matching market", aroused by the case in labor market (Roth, 1985).

Within the studies about markets with network externalities, two-sided markets (in a sense) were just considered to be markets characterized by a special type of network externalities. These externality do not depend on consumption of end users in the same group (for example, consumers of the same product), but on consumption of different, but "compatible", end-user on an opposite market side.

Jullien (2004) argued that, by reducing the gains from interaction, the total price level affects participation. Increasing prices would mean reducing participation of both sides of the market. From this point of view, externality is then difficult to distinguish between one-sided or two-sided usage.

Wright (2004) described two-sided markets as two distinct types of users, each of whom obtains value from interacting with users of the opposite side over a common platform.

Armstrong (2004) defined markets involving two groups of agents who interact via "platforms," where one group's benefit from joining a platform depends on the size of the other group that joins the platform as two-sided markets.

Rochet and Tirole (Rochet & Tirole, 2004) gave a rigorous definition for two-sided markets under the condition that costs may not be passed trough from seller to buyer.

Definition of two-sided markets from Rochet and Tirole (2004) was: *there is a platform which charges usage fee* a^B *and* a^S *per-transaction from buyer side and seller side. When the transaction volume* V *varies with* a^B *when* a *is constant, this market is a two-sided market. where* $a = a^B + a^S$ *and* a *is the aggregate price level from the two sides.*

Rochet and Tirole (2004) definition is linked to the platform pricing structure.This definition reveals that platform can affect the volume of transaction by changing its pricing structure. This definition is the canonical and widely accepted one, despite the fact that it does not include platform charging membership fees (or fixed fees) or two-part tariffs from two sides and it is not a complete definition. Generally the buyer side is taken as the side 1 and seller side as the side 2 in two-sided markets.

For my thesis, I will apply the definition of Rochet and Tirole (Rochet & Tirole, 2004). A market is two-sided if the platform can affect the volume of transaction through its asymmetric price structure to the two sides by an equal amount of the total price level. Platform has to get both the two sides on it. [2] App store platform is designed to get both developers and users on board in mobile app market.

2.1.2 Attributes of two-sided markets

Based on the study of Rochet and Tirole (2004), Wright (2004) and Jullien (2008), the following are peculiar features to describe two-sided markets.[3]

(1) Two distinct and well identified groups of agents or end users;

(2) Network externalities (positive or negative) exist between two sides;

(3) Platform provides products or service to two sides and prices to two sides at the same time;

(4) A platform can internalize the network externalities between two sides (Wright 2004) [4]and reduces the transaction costs;

(5) Pricing structure is non-neutral in two-sided markets;

(6) Platform can affect the volume of transaction through its asymmetric price structure to the two sides by an equal amount of the total price level.

Network externalities in two-sided markets mainly mean the cross-side effects or indirect network externalities between two sides. Sellers benefit from the number and product or service usage of buyer side. Buyers benefit from the number and product or service supply of seller side. Both sellers and buyers benefit from the interaction between the two sides. Parker and Van Alstyne (2000[5], 2002[6]) classified cross-market externalities and inter-network externalities into indirect network externalities in two-sided markets.

Indirect network externalities are classified into membership externality and usage externality (Rochet and Tirole 2004). Membership externality means the effects of one end-user being associated in membership within one side to end-users from the opposite side. Membership decisions generate membership externality. Usage externality means effects of one end-user being interacted with another opposite side end-user to end-users from opposite side. Usage externality arises from usage decisions. If I benefit from downloading an app from Apple App store, then the app developer exerts a (positive) usage externality by supplying more apps to Apple App store. Platform usually charges fixed user-specific and paid ex-ante fees as membership fee. Usage fee is

[2] Rochet and Tirole, Defining Two-Sided markets,2004
[3] JI Hanlin,Research of pricing strategy of two-sided markets,2006
[4] In these markets, platforms cater to both types of users in a way that allows them to influence the extent to which cross-user externalities are internalized.
[5] Parker and Van Alstyne, Information Complements, Substitutes and Strategic Product Design,2000, Available at SSRN: http://ssrn.com/abstract=249585
[6] Parker Geoffrey and Marshall Van Alstyne, Two-Sided Network Effects: A Theory of Information Product Design, 2005, Management Science, 51(10): 1494–1501.

usually a variable interaction-specific and paid ex-post fees.

There also exists the inter-side effects or direct network externality in two-sided markets. Direct network externality indicates the increased benefit to one user with the increase of the number of other users who use the same products or compatible products like standard telecomm network or razors and blades markets (Jean Tirole, 1988)[7].

Platform's pricing structure is non-neutral and the mark-up for sellers cannot be passed to buyers. The price allocation between the two sides has impacts on participation of two sides on platform and transaction volumes.

Platforms in two-sided markets compete both to facilitate the transactions and to get more participation of end users. End users in two-sided markets are both users and "input".[8] Each end user's participation can create value for others.

Indirect network externality, multi-product pricing, non-neutral pricing structure and transaction volume affected by pricing structure are the distinct properties of two-sided markets.

2.1.3 History and development of two-sided markets

The study of two-sided markets began in the 1990s with the study of labor market (Roth, 1985). And then antitrust cases in international credit card in 2000 attracted the great attention of two-sided markets. Mobile app market and e-commerce platform with their great success, bring the two-sided market into our sight. (Figure 2-1)

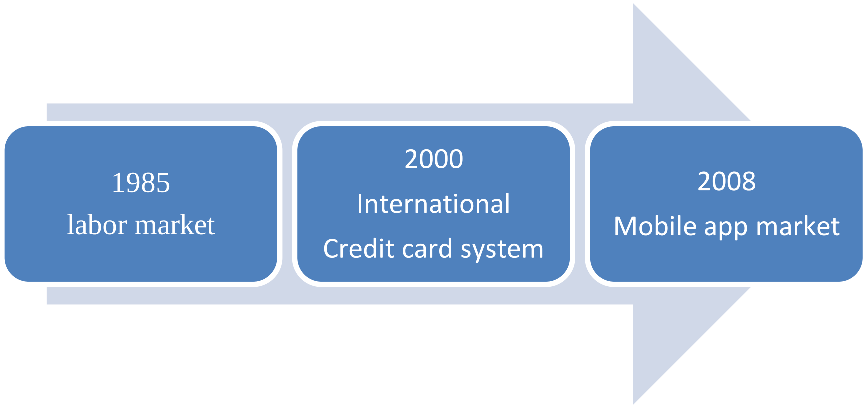

Figure 2-1 Milestones in two-sided markets

There are plenty of two-sided markets in the real world today, Such as Application stores for iPhone and iPad; Cloud Computing platform; Mobile payment system, credit card platform; Video game platform; computer system software; portals; dating club; TV network and so on. We can find two-sided markets easily in Internet industry; computer industry and payment card system.

[7] Tirole Jean, The theory of industrial organization,1988
[8] Bruno Jullien, Skewness and competition in multi-sided markets,2008

Before any formal study of two-sided markets, there had been some papers which had addressed specific issues of some two-sided markets. Markets with network externalities first attracted the attention of economists. Markets with network externalities have been widely analyzed, especially since the contributions by David (David, 1985), Katz and Shapiro (Katz & Shapiro 1985), Farrell and Saloner (Farrell & Saloner 1985), and others.

And then around the year 2000, the debates which were triggered by a series of antitrust cases against some international credit card networks (Visa, MasterCard) had pushed the practice of setting an interchange fee by cooperative credit card networks. Katz (Katz,2001), Rochet and Tirole (Rochet & Tirole ,2002), Schmalensee (Schmalensee ,2002), Wright (Wright,2004),(2003a), (2003b), Gans and King (Gans and King,2003),all these authors agree that credit card services have special characteristics, and that the conventional practices of antitrust policy were not totally applicable to this industry. And then the same characteristics were noticed in other markets, such as in media industries (Ferrando et al., 2004; Kaiser and knight, 2004; Reisinger, 2004) or electronic intermediaries (Caillaud and Julien, 2003; Julien 2004).Progressively, a general theory of two-sided markets emerged.[9]

There was a surge of interest in two-sided markets with the appearances of papers by Armstrong (2004), Caillaud and Jullien (2003), and Rochet and Tirole (2003a). We can call Rochet and Tirole the founders of two-sided market theory. They had not just given a reasonable definition and structure of two-sided market but also introduced membership fee and usage fee to solve the pricing problem in this market. There were also researchers who considered series of factors which dominate the pricing in two-sided market such as elasticity of demand with respect to the total price; network externality; single and multi homing; product variety needs of consumers, etc. some other papers provided general introduction and lessons to be drawn (Evans, 2003) or general theoretical and framework (Rochet and Tirole, 2004).

Two-sided market pricing study has caught people's attention again when the totally new business model of Apple App store introduced in 2008. Mobile app market has been paid more and more attention as time goes on and resulting in a dynamic increase of application stores. This has greatly changed the industrial pattern in telecommunication industry, traditional E-commerce industry, portable intelligent device manufacturing industry and other areas.

[9] Roberto Roson,Two-sided markets: A tentative survey,2005

2.2 Classification, market structure and industrial distribution

2.2.1 Classification of two-sided markets

Evans (2003[10]) classified two-sided markets into three types. Evans's classification covers most of the forms involved in two-sided markets and is reasonably limited. It will be applied in my study.

- Market-Makers: This market enables members of distinct sides to transact with each other. Ebay, supermarket, real estate, recruitment sites, and night clubs are the typical examples.

Each member of one side profits more per-transaction when there are more members of the other side. This will greatly increase the probability of a successful match between two sides and also improve the matching efficiency through reducing searching time for a suitable match.

- Audience-Makers: This type of market can match advertisers to audiences. Yellow pages, magazines, newspapers and free television are all audience-makers two-sided markets.

Advertisers profit more when there are more audiences who will be the potential customers for purchaising advertisers' goods. Audiences profit more if there are more useful content from advertisers. Advertising platform attempts to supply as much as possible competitive contents to attract more audiences. Advertisers like to publish their advertisements through the advertising platform which covers more audiences.Negative network externality exists for audience when there are too many spams.

- Demand-Coordinators: End-users from two sides interact through the platform mediation. Goods and services generate indirect network effects across two or more groups. Mobile app market, credit card system and computer software platform like Windows are all typical demand-coordinators markets. Software platforms coordinate users and developers. More computer users rely on the platform are more valuable to developers and more applications run on the platform are more valuable to computer users.

There are also other ways to classify two-sided markets. Hagiu (2006[11]) classified two-sided markets into two-sided open platforms and two-sided proprietary (closed or profit-maximizing) platforms. Two-sided open platforms, which allow "free entry" on both sides of the market. Linux is an open source platform.

Two-sided markets can be also classified into two-sided market with and without payment between end-users based on study of Rochet and Tirole (2004). In Software platform and B2B E-commerce

[10] Evans, D. (2003) "The Antitrust Economics of Multi-Sided Platform Markets," Yale Journal on Regulation, 20(2): 325–82.
[11] Hagiu,A.(2006) "Proprietary vs. Open Two-Sided Platforms and Social Efficiency",working paper

markets, payments exist between end-users. It is complicated in mobile app market. For free apps in app store platform, there is no payment between developers and users. But for paid apps, there exist payments between the two sides.

2.2.2 Market structure in two-sided markets

Before talking about the structure, we have to introduce usage externalities and membership externalities (Rochet and Tirole, 2004). Usage externalities is relevant to the transaction volume, cost of the network will be lower when the transaction volume and usage frequency increase because of the economies of scale effect. Usage externalities are ex post externalities through decreasing the operating cost of the network. Membership externalities mean that even if the end user just registers as a member of the platform without buying nor spending for the products, consuming behaviors and decisions of other consumers will be affected. Membership externalities are ex ante externalities affecting the expectation of providers and consumers.

There are five kinds of structure in two-sided markets.

2.2.2.1 Basic structure of two-sided markets

Suppose that there are potential gains from trade in an "interaction" or transaction between two end users, whom for short we call the buyer (B) and the seller (S). Platform provides the products for the interaction for two sides through offering a channel of interaction or facilitating the interaction.

Figure 2-2 is the basic structure in two-sided markets. Platform can charge membership fees which are usually fixed from two sides and/or charge usage fees which are relevant with transaction volume. There can be with or without payment between the two sides.

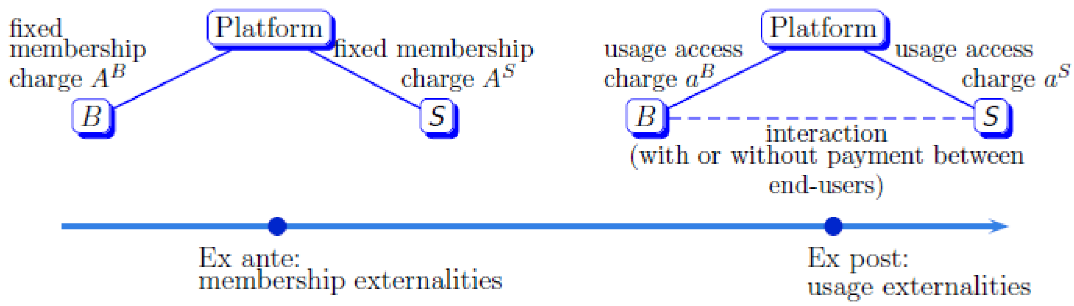

Figure 2-2 Basic structure of two-sided markets [12]

[12] Rochet and Tirole, Two-Sided markets: An Overview,2004

2.2.2.2 Connection through service provider

Figure 2-3 Connection through service provider structure of two-sided markets

In this structure, end users connect with the platform through service providers or intermediaries. We call service provider "SP" for short. The typical cases of this kind of structure can be found ordinarily in payment card system, telecommunication industry and internet industry.

In payment card system, payment cardholders and merchants connect to the payment platforms through service provider called "issuers" and "acquirers". Issuers are the cardholders' bank and acquirers are merchants' bank. Acquirer SSP pays an interchange fee a^S to issuer each transaction. The issuers BSP receives a^B. a^{S1} and a^{B1} are the transaction cost born by end users B and S. The transaction cost depends on the commercial conditions offered by the service provider.

In telecommunication industry, there are different intermediaries. Telecommunication operators and service providers are all intermediaries. We can take the telecommunication operators as an example of intermediaries in this paper. There are no natural buyer and seller. End users on two sides can change their status as buyer to seller or seller to buyer. There is a flow of communication between a caller and a receiver. We label the caller who is technically at the origin of the connection S and the receiver B. S and B are on two different but interconnected networks S and B. Network B has an agreement for terminating the connection with Network S. The agreement specifies a (per minute or per megabyte) termination fee a^S =- a^B >0 to network B paid from network S. Then the network S and B pass through this termination charge or revenue to their end users B and S in the form of per minute calling and receiving charges or outgoing and incoming traffic fees. The platform in this situation is virtual and taken as the mechanism recording off net traffic and operating settlements[13].

The same structure exists also in the internet industry, such as online recruitment platform, E-Commerce platform.

As there has been much research on this subject, I have not included it in my thesis.

2.2.2.3 Two sides connect through the same service provider

This is a special structure in two-sided markets. The service provider P2 connects two sides of end

[13] Rochet and Tirole, Two-Sided markets: An Overview,2004

users B2 and S without needing to interact with other service providers like P1. Rochet and Tirole(2004) called such interactions “on us” or “ on net”.

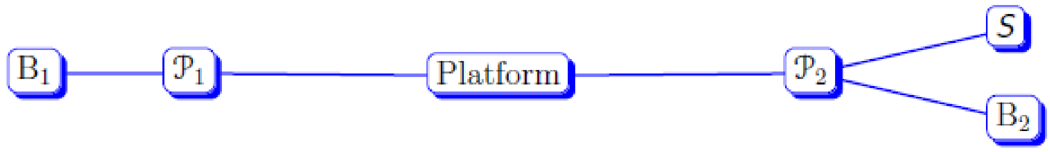

Figure 2-4 two sides connect through the same service provider structure [14]

We can find this type of structure when the acquirer and issuer are from the same bank in payment card system and a telecommunication operator serves both the caller and receiver in telecommunication industry.

2.2.2.4 End users’ multi-homing

This is also a common structure in two-sided markets. Buyers prefer to affiliate with more platforms (multi-homing) to meet more potential sellers and so do the sellers. Like the sellers and buyers in real estate industry, both the two sides prefer to enter non-exclusive arrangements with multiple real estate agencies.

Video game developers always try to port their game to more than one platform.

Figure 2-5 End users’ multi-homing structure

2.2.2.5 Interconnections among the platforms

There are two types of Interconnections among the platforms: direct interconnection and indirect interconnection.

Direct interconnection connects two or more platforms directly. Indirect interconnection connects the platforms through the interconnection hub.

In the Mobile data services and Instant Messaging markets, platforms communicate with others through direct interconnections.

[14] Rochet and Tirole, Two-Sided markets: An Overview,2004

In China, all the banks connect with the China Union pay to interconnect with others and then supply financial services to the end users.

In mobile app market, there are three groups of end users and two platforms which consist of a complicated and interacted market structure.

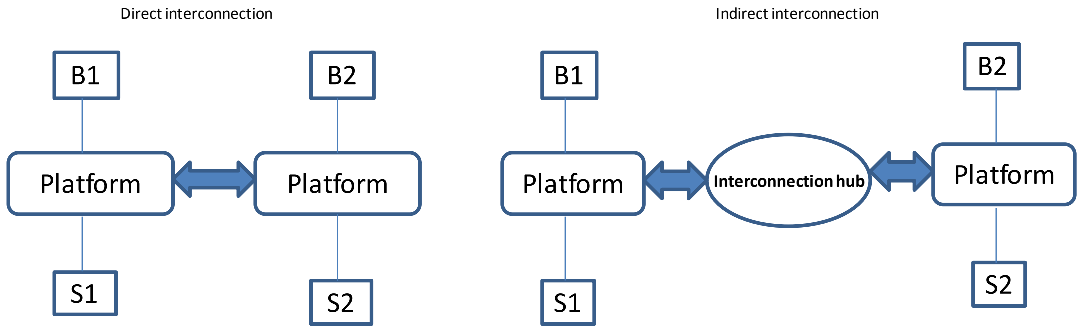

Figure 2-6 Interconnection among the platforms

2.2.3 Industry distribution of two-sided markets

Two-sided markets exist broadly in internet, telecommunication, media and payment card industries. We can also find the examples of two-sided markets in intermediary industries like E-commerce platform, dating club, supermarket, travel or real estate agency.

Table 2- 1 Industry distribution of two-sided market

Industry	**Platform**	**Side 1**	**Side 2**	**Examples**
Intermediary *(Market-Makers)*	Real estate agency	buyer	seller	21 century
	Online recruiting company	Job seeker	Recruitment firms	Adecco
	Travel/tickets agency	buyer	seller	Popular Express travel
	Super market	consumer	supplier	Carrefour
	Dating club	men	women	eDarling.fr
	B2B	buyer	seller	Amazon
AD supported media *(Audience-Makers)*	Yellow page	reader	advertiser	Page Jaune
	Newspaper	reader	advertiser	Metro
	Television	audience	advertiser	CNTV
	Instant Messaging	Internet user	advertiser	MSN
	Web portal	Internet user	advertiser	Google
Software *(Demand-Coordinators)*	Application store	user	application developer	Apple App store
	Video game console	gamer	game developer	Nintendo
	PDA	buyer	software developer	Palm

	Computer operating system	buyer	software developer	Windows OS
	Telecom operator's integrated service platform	user	SP or CP (service provider or content provider)	China Mobile's Monternet service[15]
Transaction Systems *(Demand-Coordinators)*	Payment card system	cardholder	merchant	Visa
Standard Telecom network *(Demand-Coordinators)*	Telecommunication operator	receiver	caller	Orange

(Reference: Evans David (2008))

Application store is a new type of platform in two-sided markets. Like video game console and computer operating system, app store also tries to get application developers and users on board for app distribution. Mobile app market involves series of participants including mobile network operators (carriers), mobile network and mobile device suppliers. It has brought changes to these related industries through supplying apps as a mobile internet access.

2.3 Platform's economic behaviors and strategies

2.3.1 Why does the platform exist?

The failure of applying the Coase theorem is a necessary condition for a two-sided market. In the Coase world, the gain from transaction between the two sides depends only on the total charge levied by the platform and the price structure is neutral. The reallocation between two sides had no impact on economic outcomes when the price structure is neutral. In two-sided markets, the price structure does matter to the gains of platform and social welfare.

In the Coase theorem, a clear delineation of private property rights is an essential prelude to market transactions; If private property rights are well defined under zero transaction cost, exchange will eliminate divergence and lead to efficient use of resources or highest valued use of resources; The allocation of resources is invariant to the assignment of private property rights under zero transaction cost and zero income effect.[16] But in real economic world, the transaction cost and asymmetric information do exist; the appearance of platform can reduce the transaction cost and asymmetric information. Rochet and Tirole (2004) indicates that the existence of two-sided market depends on the failure of Coase theorem.

[15] Monternet which combined "Mobile" and "Internet" launched in 2000 by China Mobile. It is the brand of mobile data services from China Mobile.Users can download ringtone,MMS,games and other information service from this platform. Subscribed users reached to 90 million in 2009 and was replaced by China Mobile's app store platform-Mobile Market (MM) in 2009.
[16] http://en.wikipedia.org/wiki/Coase_theorem

Platform creates values for end users of two sides in two-sided markets. End users profit more per-interaction through platform's service:

(1) Expanding the range of transaction objects.

Users can go to the application store to download all the applications they wish, thereby reducing the need to visit a vast number of websites, and increasing the probability of finding suitable goods.

(2) Reducing the transaction cost.

All platforms help reduce costs by providing a virtual or physical meeting place for customers. Two-sided platforms reduce the transaction costs by matchmaking, building audiences, and minimizing costs. Software platforms are mainly about minimizing duplication costs. Advertising-supported media is mainly about building audiences. And intermediaries concern mainly matchmaking[17].

Today, we can buy nearly all the goods we need just by clicking the mouse in the computer and then wait for the goods delivered by the professional delivery services. That reduces a lot of transaction cost.

In a word, if the platform is the bottle neck[18] among the two sides, there is no other bypass for the transaction except the platform. Platform offers a route for transactions for the two sides. When there are other bypasses among the two sides, platform's existence can enlarge the range of transaction objects, reduce the transaction cost and improve the quality control of transactions.

2.3.2 Platform's asymmetric pricing strategy

In two-sided markets, platform has to coordinate both the two sides of end users. To attract end users from one side on board, platform has to make a lower (or negative) price to this side first and then attracts end users from the other side through the effects of externalities. To compensate and reap profits, platform usually makes a high price to the other side (the latter one). Platform's asymmetric pricing does not reflect the marginal cost of product or service supplied to two sides. This was called asymmetric pricing strategy in two-sided markets.

If platform charges both two sides' higher prices at first, there will be only few (or no) end users who are willing to transact through this platform. Platform will not benefit in this way.

There are plenty of examples of asymmetric pricing in real life. Online recruiting platform charges nothing from job seekers and charges fees mainly from the recruiters who want to release the recruiting advertisements in the platform. Publishers of the free journals in the metro charge from

[17] Evans David ,Markets with two-side platforms,2008

[18] Bottleneck platform exists in telecommunication industry. SP (service provider) has to connect to the telecommunication platform if they want to send their service to users. Developers of Windows and Linux have to connect with the Operating system platform to sell their services to users.

the advertisers and the journals are free to the readers. Lower prices or free to one side will bring end users of this side on platform. When one side is on board, the other side will be also attracted on the platform because of network externalities between the two sides. So platform's asymmetric pricing can effectively get both the two sides on board.

Table 2- 2 Asymmetric pricing in two-sided markets

Platform	Side 1	Side 2	Fewer charged side	Profit of platform
Real estate broker	Buyer	seller	1	Sales commission
Journals	Reader	Advertisers	1	Advertising costs
Portal website	Internet users	Advertisers	1	Advertising costs
Operating system	Consumers	Software developers	2	Sales commission
Video game console	Gamers	Game developers	Neither	Game royalties and game sales commission[19]
Credit card	Consumers	Merchants	1	Sales commission
Application store (app store)	Users	Application developers	1	Sales commission

(Reference: Evans (2003b))

We can get some conclusions from Table 2- 2. Most of platforms change less from the user side and makes higher price from the seller side.There are two exceptions: for operating system, platform charges mainly from the consumer side. Haigu (2005) explains this question from the view of consumers' product variety need. Consumers for operating system, their needs of product variety are lower. Haigu indicates that platform will charge more from consumer side when consumers' need of product variety is lower. For video game console, platform charges both game royalties from developer side and game sales commission from gamer side. Game consoles are sold near or below marginal costs. Mobile app users have higher product variety demands and users are the less charged side in mobile app market.

Bolt and Tieman (2008[20]) showed that maximal skewed pricing is profit maximizing under constant elasticity of demand. The most elastic side of the market is used to generate maximum demand by providing it with platform services at the lowest possible price. Full participation of the high-elasticity, low-price side of the market attracts the other side. As this side is less price elastic, the platform is able to extract high prices.

[19] Both game royalties from developers and game sales commission from games are the revenue sources for video game console.
[20] Bolt Wilko and Tieman Alexander, Heavily skewed pricing in two-sided markets,2008

2.3.3 Platform’s subsidy and support

There are also the cases in which platform charges fewer or no fees even gives subsidies to one side, like operating system. At the beginning of operating system, platform charges no fees from developers. Application store platform charges fewer fees from app developers. Both operating system platform and application store platform supply subsidies to developer side for accumulating the content supply in their platform stock. The reason is that when there are few consumers on the platform, product or service providers will not be willing to join the platform without gaining enough profits. So it is common that platform offers subsidy or support to the service provider side first and then attracts the consumer side later.

In two-sided markets, the side generating higher network externality is a natural candidate for the platform’s subsidy and support (Bruno Jullien 2008).[21]

This also happens in super market and payment card system. Product or service providers arrive earlier on the platform and the platform offers support or subsidies to them.

At the first development of Palm which was the leader in the personal digital assistants market, Palm had founded the ‘software development Forum’ and established 54 million dollars fund to support the software developers. At the same time, Palm offered developers the Palm developing kit for free. Palm had made a great success through the support to software developers.

For Apple app store, it offers free the software development kit based on iOS (Apple’s operating system) environment and supplies other technical support to developers. Except the 99 dollars membership fees, developers for Apple app store can enjoy the 70% of their sales easily.

Online recruiting platform also offers subsidies to the job seekers. There are operating costs for publishing and searching the proper job for the platform. But for now, most of the online recruiting platform charges free from job seekers. In fact, Platform offers subsidies to job seekers if the operating cost was counted.

2.3.4 Platform’s product differentiation

Because of the consumers’ needs of product variety and the different positioning of platform, platform usually offers different products to satisfy the different customers’ needs.

There are two kinds of product differentiation: vertical differentiation and horizontal differentiation. Platform differentiate themselves from each other through choosing particular levels of quality and consumers choose the higher or lower quality based on their income and relative demand for quality. This is the vertical differentiation. Horizontal differentiation appears when platforms differentiate themselves by choosing particular features and prices to appeal to the particular groups of customers.

[21] Bruno Jullien, Skewness and competition in multi-sided markets,2008

22

Platforms have different positioning in the competitive market. Apple app store aims to supply the content to the Apple mobile devices which take the high-end positions in the market: iPhone, iPad, iPod touch. Google play is avalaible to series of mobile devices and aims to raising its market share in mobile app market. Free apps supported in-app advertising is the particular feature of Google Play. There are more free apps in Google Play than in Apple App store.China Mobile Market (MM) supplies apps run on iOS, Android, Windows Mobile and other mobile operating systems (MOS for short). iOS and Android apps are the two dominant strengths in MM. MM supplies app developing services to developers like cross-MOS developing service. MM platform helps developers to compile one app to support different MOS.

2.3.5 Platform's exclusivity

Multihoming is normal in two-sided markets. Super market will not just collaborate with one single provider [23]and forbid this provider to work with other super markets. Payment card platform allows cardholders to use the payment card of other banks and it will not forbid the merchants to accept other banks' payment cards. When end users on one side multihome, platform may offer exclusive contract to this side to prevent its multihoming and then make profits with the increased demand from the other side end users[24].

In mobile market, platform is operated by different operating systems. Developers can supply the same application to different application stores as long as they run the same procedure on different operating systems. Apple app store allows developer supply the same application to Google play or Nokia store.

There are exclusivities in telecommunication industry in China. Before China Mobile Market, there was a "Monternet" [25](brand of a mobile internet service for China mobile) in China Mobile's Wap website. SP sell the contents and services (most of them are rings and themes for mobiles) to China Mobile's Monternet. China Mobile's users can go to Monternet to buy the contents. China Mobile is dominant in China Telecommunication industry and took 60% of all mobile users in China. (There were about 0.65 billion China Mobile users in December, 2011 and about 1billion total mobile users in China.) The rules for the SP who want to supply their contents to Monternet were that they can't supply service for other telecommunication operators except China Mobile.

Platform has to meet the following two conditions if it tries to apply for the exclusive contracts: first, platform has a dominant market share and can guarantee the sellers enough gains; second, the multihoming behaviors of consumers can be observed. If the multihoming is hard or highly costly to

[22] Evans David and Noel Michael, Analyzing market definition and power in multi-sided platform markets,2005
[23] Except it is in a perfect monopoly market and there is only one provider.
[24] Armstrong Mark, Two-sided markets, competitive bottlenecks, exclusive contracts,2004
[25] Monternet is a wap portal in China Mobile which started in December, 2000.

be observed, the exclusivity of platform will not work well during the transactions[26].

Exclusivity forces the sellers to choose only one platform, and that may cause the sellers to go to the rival platform. It is not obvious that exclusivity is effective for the platform in two-sided markets.

2.3.6 Platform's vertical integration and horizontal interconnection

2.3.6.1 Vertical integration

Platform's vertical integration usually exists when platform can not effectively attract the sellers to supply the products or services to platform. So platform will try to integrate the upstream suppliers or downstream buyers.

Apple is a typical example of vertical integration, especially with many players from the ecosystem for the iPhone and iPad, where they control the processor, the hardware and the software. Hardware is not typically manufactured by Apple, but third-party manufacturers such as Hon Hai Foxconn or Asus Pegatron manufacture Apple's products to their specifications. Apple retail stores sell their own hardware, software and services directly to users.[27]

For Apple App store and Google play, they all have their own developing team for some applications in their application stores. This is a type of vertical integration in mobile app market. And they also accept applications from independent application developers. The difference is that Apple app store refuses to accept the applications which are in competition with their own ones. Google play is an open store and has no limitations for external applications.

Vertical integration can be also found in mobile app market ecosystem. Apple and Google also operate their own advertising platforms for apps--iAd and Admob. Furthermore, Apple controls its mobile device supply and Google acquired Motorola mobile to supply its native mobile device. Vertical integration has brought huge profits into the mobile app market.

2.3.6.2 Horizontal interconnection

When new entrants or the weaker platform wants to share the resources of the dominant platform and the dominate platform can also benefit to accept the interconnection, there will be interconnections among the platforms. Interconnections among different platforms are called horizontal interconnection.Platforms should be compatible for horizontal interconnections.

In two-sided markets, consumers of platform 1 can benefit from both the direct network

[26] JI Hanlin, Research of pricing strategy of two-sided market,2006
[27] http://en.wikipedia.org/wiki/Vertical_integration, retrieved 28/03/2012

externalities from consumers of platform 2 and the indirect network externalities from sellers of platform 2.

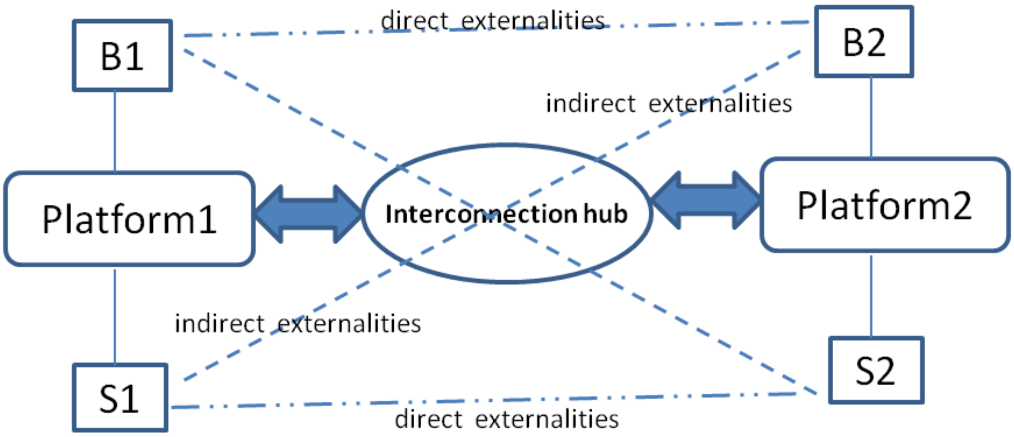

Figure 2-7The effects of interconnection of two platforms[28]

In mobile app market, due to the incompatible mobile operating systems, there is no horizontal connection among Apple app store, Google play, Window Phone store and other app stores for now.

2.4 Two sides end-users' economic behaviors

Behaviors of end users through the platform can be classified into the following types:

- Registration;
- Searching;
- Bargaining;
- Information transmission;
- Trading;
- Platform conversion;
- Singlehoming and multihoming;
- Payment;
- Product evaluation

[28] JI Hanlin, Research of pricing strategy of two-sided market,2006

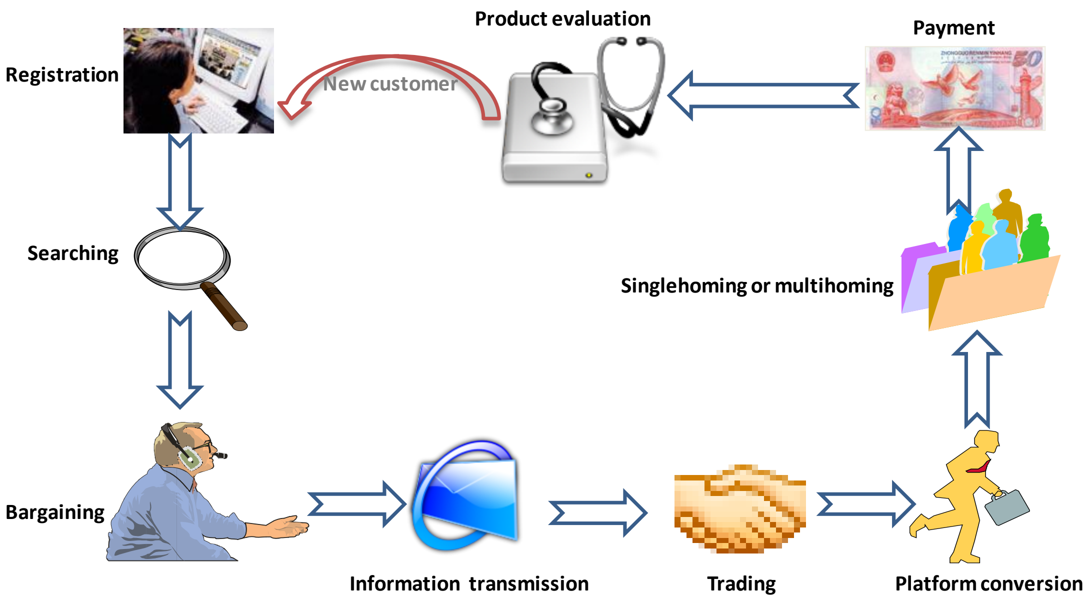

Figure 2-8 End users' behaviors in two-sided markets

2.4.1 Registration

Registration means that end users visit the platform, register and then get a trading qualification. Application developers access to app store, pay for the membership fee (some app stores are free for registration for developers) and then get the app development kit. Application users go to register through the platform and get an account and its passwords. Usually the platform asks for the payment card information or other online payment ways [29]of end users for the future gaining or paying for the applications. Transaction observed by platform becomes possible through registration of end users. Mobile app users are required to leave their registration information to when they download free or paid apps from app store.

2.4.2 Searching

Consumers look for product or service information. Enterprise searches for the suitable job seekers through the online recruiting platform. Application users go to app store to search for the practical or interesting applications.

Platform classifies the different needs of end users through special standards. End users can search for the target information easily.

[29] Like PayPal or telecommunication operator's billing payment system.

2.4.3 Bargaining

In the traditional commerce or electronic commerce, buyers negotiate prices, delivery conditions and other product relevant services with the sellers. Through the bargaining, both the buyers and the sellers can find a suitable trading object at an acceptable price with the relevant after selling services. Bargaining could be both online and offline. If the bargaining is offline, platform generally charges a membership fee for end users.

In e-commerce platform, there are mainly two ways of bargaining: auction and fixed price.

In two-sided markets, the advertisers bargain over the price and places of their publications with the journal publisher or television channels. Buyers and sellers of the real estate bargain over the price of the immobile property. Sellers of a house have also to negotiate sales commission with the real estate agency. Application developers negotiate the profits sharing ratio with the platform. In mobile app market, the actual standard of sharing ratio between application developer and platform is 7:3.

2.4.4 Information transmission

Sellers want to transfer their product information to buyers and buyers want to search for information on the target product. Platform is the intermediary and communicates with end users of two sides.

Advertisers go to the media platform like TV and newspapers to publish their product information to audiences (buyers). Application stores publish developers' apps information for users. Information is well delivered through intermediaries and platforms.

2.4.5 Trading

Exchange of products or services is the traditional trading in two-sided markets, like E-commerce industry and real estate industry.

Publishing or receiving information through media is also trading, like TV and newspapers industry.

Looking for the right partners in dating clubs is also trading.

In a word, the transactional objects in two-sided markets could be products, services, information or end users themselves.

2.4.6 Platform conversion

Platform conversion often appears when end users change their addresses or they are not satisfied with the products or services of the former platform. Switching costs always exist for end users when they change of platform. End users have to spend time to adapt the new transaction mode and establish his new transaction resources.

In mobile app market, users have to change the mobile device for platform conversion. Mobile device purchasing cost is the important part of the platform conversion costs in mobile app market.

2.4.7 Singlehoming and multihoming

Multihoming is a technique used to increase the reliability of the Internet connection for an IP network. In the context of competing business networks, platform multihoming refers to the condition of users affiliating with more than a single platform.[30]

Users affiliating with only one platform are singlehoming.

Platform's horizontal differentiation can result in end users' multihoming behaviors. End users choose their favorite features or prices of different competing platforms and then rely on some of them.

In two-sided markets, platforms focus on the single homing side and make profits from the multi homing side (Armstrong 2006). Video game developers are charged royalties through each piece of game sale because they are the multihoming side.

There are also exceptions. Payment card systems are multihoming on both two sides. Most merchants accept credit and debit cards from different payment card systems including the one which has less cardholders. Cardholders prefer to have multiple credit or debit cards and mainly use a favorite one.

In application stores, application developers are usually multihoming. Users in mobile app market are usually singlehoming because of the incompatibility of mobile operating systems and subtle app differentiation in different app stores. App store platform mainly charges from the developer side.

Be singlehoming or multihoming does affect the pricing structure in two-sided markets.

[30] http://en.wikipedia.org/wiki/Multihoming , retrieved 29/03/2012

2.4.8 Payment

Payment is an important step in all the transactions.

There are two types of payment methods. The first type is paid through coin, money and banknote in terms of the price. The second is to transfer money from one account to another. Credit card, debit card and money transfers are electronic payments methods. Magnetic stripe card, smartcard, contactless card and mobile handset are the technologies for electronic payments. Payments through mobile handsets are also called mobile payments[31].

Taobao [32]which is the biggest C2C E-commerce platform in China has a complete payment system. There is a professional payment centre which is called Zhifubao in Taobao. End users can deposit money directly into their Zhifubao account for transactions. Zhifubao is also an intermediary of payment. Buyers pay first to Zhifubao and Zhifubao can transfer the payment to the buyer after the buyer receiving the goods and confirming the product quality. End users can also use their credit and debit cards for payment and the payment will stay in the Zhifubao until the transaction is finished.

In application stores, Apple app store mainly use consumers's credit card payment system. Google and others also accept PayPal for payment. Nokia store support the telecommunication operators' billing system for the payment of its applications.

2.4.9 Product evaluation

Customers giving a positive or negative evaluation for their bought products or services have a great impact on other customers' buying decisions.

Product evaluation works extremely well today with the development of Internet for transactions.Users around the world can see and profit from the product evaluation by customers, especially in online transactions.

In application stores, one can find the ranks of most downloaded applications in one day, one month or even one year. Each user can give a comment about the application which he has experienced. Good product evaluation could be an effective promotion for the applications. Angry bird which is the most popular game in 2011 is a good example with a great product evaluation.

2.5 Literature review in two-sided markets

Generally, the papers about two-sided markets focus on the following 4 main categories:

[31] http://en.wikipedia.org/wiki/Payment, retrieved 29/03/2012
[32] Taobao is a Chinese language web site for online shopping, similar to eBay, Rakuten and Amazon, operated in China by Alibaba Group on May 10th, 2003. http://en.wikipedia.org/wiki/Taobao, retrieved 29/03/2012

(1) The development of two-sided markets;

(2) The pricing strategies and social welfare which are caused by series of factors: single homing and multi homing, price elasticity of demand, exclusiveness, tying, network externalities, alliance among the platforms and so on;

(3) The industrial empirical study especially in payment card system industry: the influence of interchange fee to the price strategy and welfare in payment card system.

(4) Some other papers work on the regulation and social welfare in two-sided markets.

For my thesis, I focus on the factors of pricing strategies for App-store platform in mobile app market and try to assess them in an empirical study.

Table of Figures

Table of Contents

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3 Chapter 3 Mobile app market is a two-sided market

Contents

3.1 Introduction of mobile app market

3.1.1 History of Digital application distribution platform

A mobile app (or mobile application) is a software application designed to run on smartphones, tablet computers and other mobile devices. Mobile apps are multiple--to mention a few: games, GPS and location-based services, banking, order-tracking, utility ,sports ,health ,ticket purchases, not forgetting the earlier ones like email,calendar,contacts and weather information[33].

Mobile app market's rapid development benefits from the amazingly replacement of Smartphone. A Smartphone is a mobile phone built on a mobile operating system, with more advanced computing capability and connectivity than a feature phone[34]. Touch screen, portable media player, digital camera, GPS, web browser and high-speed data access by connecting with Wifi and mobile broadband implanted into the device. Smartphones function efficiently and rapidly as a distribution platform for applications worldwide.

Since the late 1990s, mobile application stores aim to offer software and service across a wide range of handsets, portals, storefront and mobile website (Figure 3- 1).

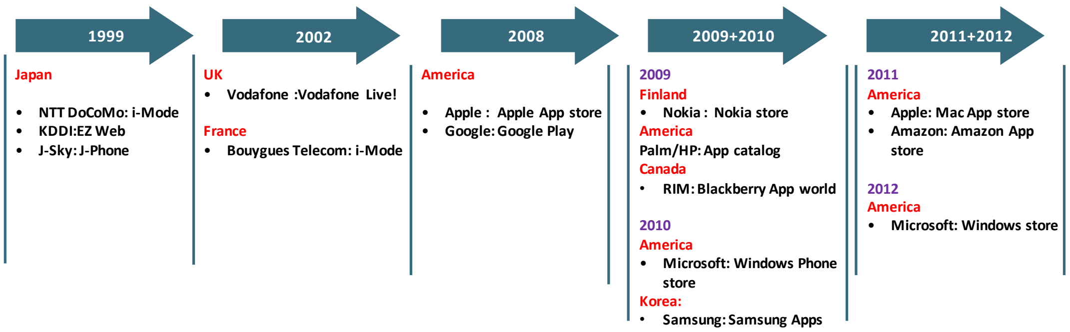


Figure 3- 1Milestones in the history of digital application platform

Launched on February 22, 1999, NTT DoCoMo's i-mode is a mobile internet (as opposed to wireless internet) service which launched in Japan. I-mode supplies various services such as e-mail, sport results, weather forecast, games, finiancial services and ticket booking mainly by mobile operator.[35]

There are more than 12,000 official i-mode sites linked to Docomo's i-mode portal and billing system and are supervised by Docomo. There are also about 100,000 unofficial i-mode sites. Users can access i-mode sites through the special i-mode button and access the i-mode official sites by URL or QR code (a barcode) through their mobile phones.

[33] Mobile app, http://en.wikipedia.org/wiki/Mobile_application,Retrieved 02/03/2013
[34] http://en.wikipedia.org/wiki/Smart_phone,Retrieved 08/01/2013
[35] http://en.wikipedia.org/wiki/Imode Retrieved 16/11/2011

I-mode users have to pay for both sent and received data. The basic monthly charge is mainly of JPY ¥200 - ¥300 for i-mode not including the data transfer charges, with additional charges on a monthly subscription basis for premium services. There are also fixed monthly payments of family discount and flat packet plans for unlimited transfer of data like JPY ¥4,000 per month.

Following the same pattern for all of these in the information industry, KDDI, competitor of Domoco, launched EZweb, J-Sky launched J-phone in Japan just after Docomo's imode mobile internet service. Vodafone in UK which launched Vodafone live! was based on the acquirement of J-sky[36]. Imode service was brought in France through Bouygues Telecom in November 2002.

The current i-mode center is called CIRCUS which runs on the operating support system –CARNIVAL in Docomo's Kawasaki office in Japan.

From 1999 to 2006, i-Mode service had developed enormously. As of June 30,2006,I-mode had 46.8 million users in Japan and over 5 million users mainly in Europe, Oceania and Asia[like UK,France,Italy, Australia,Russia,Singapore and Hongkong. However most of the i-mode alliance (Docomo's parters) dropped the i-mode service in 2007 and 2008 because of low subscriber numbers and lack of support from certain vendors.

Third-party digital application distribution platforms appeared stimulated by the boom of i-mode service and they are still vigorous today. Getjar was founded by Getjar and Accel Partners in 2004. There are 257,000 available apps in Getjar app store. It can support Android, Blackberry OS, IOS, Symbian, Windows Mobile and other operating systems.

Apple App store is a successful mobile digital application distribution platform launched at perfect timing in July 2008 when the i-mode mobile internet service became extinct. Development of i-Mode service left us relevations for operating the mobile application platform.A successful mobile application platform needs to answer the basic demands which include rich services/applications, convenient accesses to the platform and effective support of platform owners.

This new type of application store can easily meet the needs of customers through various services and multiple accesses. The Apple App store has marked an entirely new phase in the distribution and monetization in the all things digital time.30% of app sales revenues goes to Apple App store platform and 70% goes to the developers. Apple's 30-70 share had become the actual standard in mobile app market.

After Apple App store, Mobile app market rocketed up. App stores run by mobile operating system owners like Google Play, Nokia store, Blackberry World, Palm/HP App catalog, Windows phone store and Windows store had shoot up. At the same time, mobile network operators set up their own app stores, such as AT&T App centre, le Cloud d'Orange (known as Orange App shop before) and China Mobile Market. Third-Party app stores are also main members in the mobile app market.

[36] In October 2001, British mobile phone group Vodafone increased its share of Japan Telecom and J-Phone. On October 1, 2003, the name of the company and the service brand was officially changed to Vodafone. On March 17, 2006, Vodafone Group sold its holding of Vodafone Japan (Vodafone K.K.) to SoftBank and it was renamed Softbank Mobile later.

Getjar, Appia, Maopao app store and Appitalism are independent app stores. Traditional online retailers like Amazon and Ebay opened their app stores to follow the app trend. Today we are in a brillian world of applications and are able to find all we need to satisfy every whim and desire.

3.1.2 Classification of mobile apps

Mobile apps can be classified in different ways.

- Free or paid apps

Free or paid is often used to describe and distinguish mobile apps. 70% of apps in Google Play are free. Usually there are no ads in paid apps. Free apps integrated with ads are called ad-funded apps.

There are three main raisons for the existence of free apps. First, the app developer promotes his app freely with immediate benefits. A new app can be sold free first and then be charged when it is well accepted. Popular paid apps can be charged free in a period of time and then switch to paid mode in order to increase sales. Second, developer's main revenue comes from ad-funded free apps which can be downloaded freely with display of ads. Developers can get ad proceeds shared with app ad platform. Third, the first basic version is free, then the advance ones are charged. This can also be called freemium upsell for mobile apps. Paid apps are the revenue resource and developer can subsidize the free app downloads with this revenue. Free apps are used as propaganda for paid apps. The developers, by implementing cross-subsidy strategies between free basic versions and paid advance versions, maximize their benefits.

- Category of app

Apps in app store are usually classified by categories/types. The popular app categories are Games, Books, Social networking, Entertainment, Lifestyle, Education, Health, Productivity and Food & Drink. Subcategories also exist. In Google Play, Games apps are classified into Arcade & Action, Brain & Puzzle, Cards & Casino, Casual, Racing, Sports Games and other subcategories. Productivity apps are often downloaded to accomplish specific tasks such as landscaping photos, documents, making digital movies, and doing analysis for specialized fields and other projects.These apps cover and facilitate all aspects in our daily life.

- Standalone or Out-of-app product supported apps

In the mobile app market, we found that some developers supply standalone apps (like Games), standalone service (like photo editing tool) or Information related apps (like weather information).

Downloads of apps (like Games, News and Productivity) can bring revenues directly to developer. User's utility comes directly from app downloads and consuming.

Other developers offer apps supporting their external products or activities like metro schedule.

Users download the metro schedule apps (Beijing Subway for example), check the time and ticket price for the train, buy the tickets in metro station and take the train for their journeys. This kind of apps is both a product/service information carrier and a channel to reach their actual products. The app downloads can increase their external goods sales. They are used frequently.

3.1.3 Landscape of mobile app market

3.1.3.1 Map of global mobile app market

There are regional differences for app development in the global mobile app market. USA, Canada, UK, Australia and Sweden are the leaders in high mobile device penetrations. South Korea, Hong Kong and Taiwan are the powerful market challengers. China and Japan can be classified as market challengers based on their important emerging app consumption power with their unique app usage characteristics due to their special cultural backgrands. Brazil, Russia, India, Switzerland and Israel are the market followers having lagged behind the leaders and challengers. South East Asia countries are in the market nichers group. Mobile apps are not heavily used in the rest of the world.

In February 2013, mobile app analytic company ‘Flurry’ investigated the top 30 heaviest app using countries and classified them into 6 groups according to the level of mobile technology adoption and app usage characteristics [37] (Figure 3- 2). From Flurry’s map, we have an excellent understanding of the worldwide app market.

USA, Canada, UK, Australia, Sweden and others in blue are early adopters of mobile technologies and were put into mobile pioneer group.

South Korea, Hong Kong and Taiwan in purple with the analogous app usage pattern were put into the connected Asia group. China (in red) and Japan (in orange) have their unique app usage characteristics because of their special cultural backgrounds. The Chinese app market is becoming important because of its sharp increase of smartphone penetration rate and huge app user base. As of February 2013, China’s installed base of smartphone and tablets surpassed that of the United States[38]. Japanese app developing is becoming more and more competitive.These countries are the active challengers in the mobile app market.

Large countries like Brazil, Russia and India and smaller but influential countries such as Switzerland and Israel in yellow were put into Lumbering Giants group. France and Germany are also in the same group. The Lumbering Giants group members have similarities in app usage but were left behind in adopting mobile technologies by the pioneers and challengers.

South East Asia countries in green (except of Mexico) form a group as the market nichers.

[37]http://blog.flurry.com/bid/94447/The-New-Global-App-Market, Retrieved 02/03/2013
[38]http://blog.flurry.com/bid/94352/China-Knocks-Off-U-S-to-Become-World-s-Top-Smart-Device-Market,Retrieved 02/03/2013

Countries in grey color are not in top 30 heavily app usage list in Flurry's report which was published in February 2013.

By analyzing from a geographically view point, Europe countries are divided into two groups. UK, Sweden, Netherlands and Denmark are in mobile pioneer group. France, Germany, Italy, Spain, Switzerland, Russia and Turkey are in the lumbering giants group. North America countries like USA and Canada join in the app pioneer group. Asia, South Korea, Hong Kong and Taiwan act actively in the mobile app market and they have become the second tier just behind the pioneer group. Australia is an active app usage country.From South American countries, Brazil is in the pioneer group.

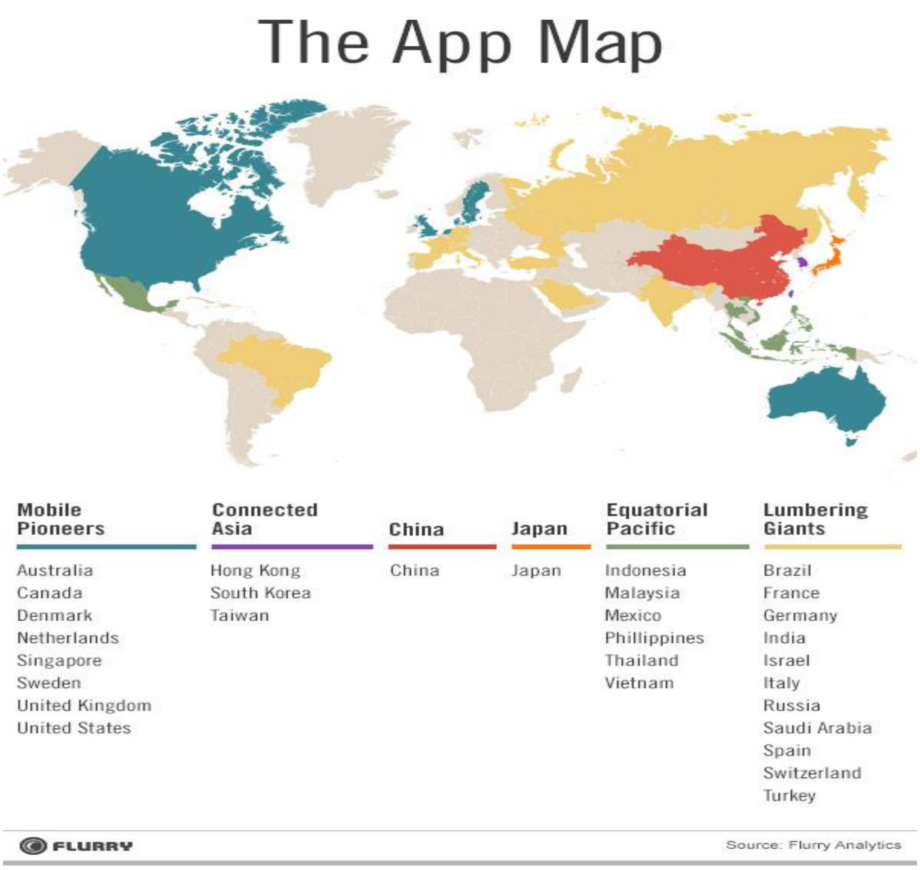


Figure 3- 2 The world App Map

(Resource: Flurry Analytics)

3.1.3.2 App revnues in different countries

The app revenue pattern for the dominant app usage countries was presented according to mobile app analytic company 'Distimo''s full year report 2012. USA was the largest market by revenue, followed by Japan, the United Kingdom and Australia in 2012. For Google Play, Japan rivals the United States. And while Japan is the second largest market for iPhone revenues, there are almost no iPad app sales. South Korea, which has low revenues from iPhone and iPad apps, was the third largest country in terms of revenues in Google Play.[39] China surpassed USA as the largest market in the Apple App store for iPad in February, 2012. Two thirds of all app sessions occur outside USA according to Flurry's report in February, 2013[40].

In 2011, USA was the largest country by app download volume and revenues. China had become the second largest market in terms of total download volume in June 2011. The download volume in Asia increased greatly which was equal to USA download volume in June 2011. The revenues of app stores in Asia were about two thirds of USA. France and Germany's download volumes had declined from December 2010 to June 2011[41].

3.1.3.3 Main app store revenues

Apple is the initiator and leader in the mobile app market. Google caught up and is the main competitor for Apple App store. Blackberry keeps a steady income from its Blackberry World. Windows focuses on its Windows phone store based on its rich experiences of PC operating system. Nokia tries to regain dominance in the mobile app market through its collaboration with Windows. It will adopt Windows phone 7 and later as its smartphone operating system (Table 3- 1).

Table 3- 1 Main app store revenue from 2009 to 2013 ($, Million)

Store (including developers revenues)	**2008**	**2009**	**2010**	**2011** (Estimated*)	**2012** (Estimated*)	**2013** (Estimated*)
Apple App store	N/A	769	1,782	2,910	4,900	10,000
Google Play	--------	11	102	425	1,225[42]	5,200
Blackberry World	--------	36	165	279	N/A	N/A
Windows Phone Store	--------	N/A	N/A	N/A	N/A	N/A
Nokia Store	--------	13	105	201	N/A	N/A
Total	**206**	**828**	**2,155**	**3,815**	**7,000**[43]	**26,000**

(Source: HIS Screen Digest Research, May 2011; App Annie Index, November 2012; Distimo 2012 Year in Review; Gartner, September 2013)

There was no direct revenue data of Google Play. According to App Annie Index November 2012, iOS monthly revenue was 4 times of Google Play; Distimo 2012 year in Review- An average day in November 2012 for the App Store was $15 million in revenues and $3.5 million per day for Googly Play in 20 of the largest countries in both stores and Distimo report claimed that ios app store revenues 430% bigger than Google Play[44]. I presume that the number of Google play revenue in 2012 is one fourth of Apple App store with the number of 1,225 million dollars. Gartner Research estimated the app sales overpassed $10 billion in 2013.

Growth rate in the mobile app market decreased from 2008 to 2012 (Figure 3- 3).The growth rates

[39] Distimo-publication-Full year-2012,Retrievd 02/03/2013
[40] The new global app market, Flurry,21/02/2013
[41] Distimo-publication-June-2011,Retrieved 07/07/2011
[42] App Annie Index November 2012 & Distimo 2012 Year in Review
[43] http://mobile.163.com/13/0220/08/8O52P9SP001166DT.html，Retrieved 02/03/2013
[44] http://venturebeat.com/2012/12/20/distimo-app-market-report-ios-app-store-revenues-430-bigger-than-google-play-but-growing-slower/#vb-gallery:1:593698,Retrieved02/03/2013

from 2008 to 2009 and 2009 to 2010 were 300% and 160%. 2008 to 2010 was the initial stage of the mobile app market development. 2011 to 2012 was the prosperity period. Growth rate kept at 77% in 2011 in comparison with 2010 and 83% in 2012 in comparison with 2011. There will be more growing competition in this market and the financially solid and experienced ones will survive.

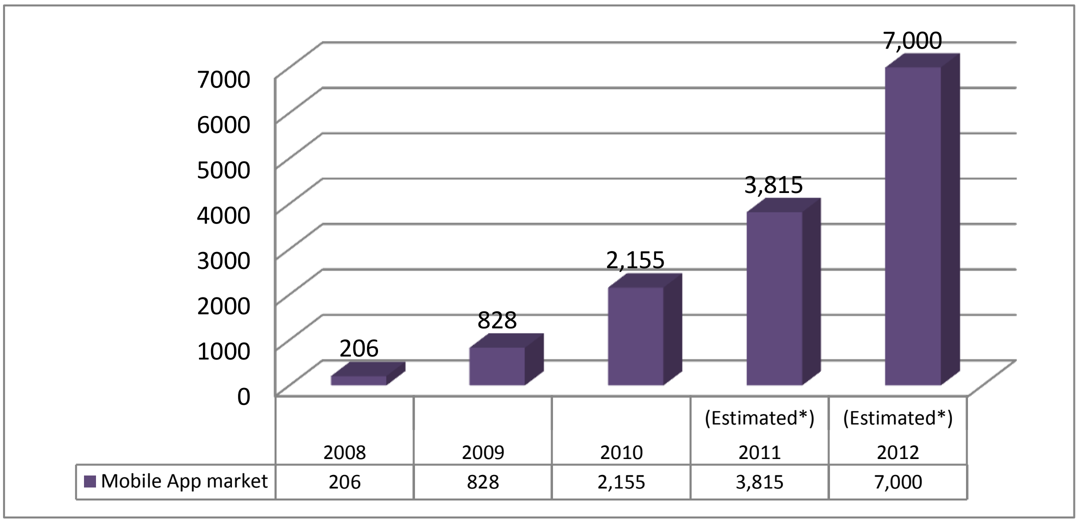


Figure 3- 3 Mobile app market revenue from 2008 to 2012 ($, million)

Apple App store and Google Play are the two giants in the mobile app market. We can see their over all process from Figure 3- 4.

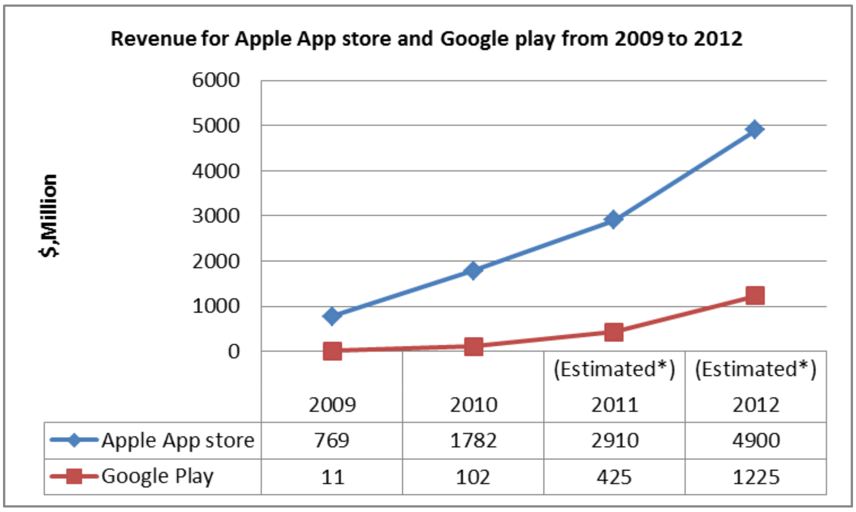


Figure 3- 4 Revenue for Apple App store and Google Play from 2009 to 2012

Google grows rapidly due to its open resource Android OS and multi-adaption with series of mobile devices. However, because of its monetization problems for developers, Google Play's per app revenue is much lower than Apple. Revenue per app is $6,480.00 and $1,200.00 for the Apple App Store and Google Play, respectively. Blackberry has the largest revenue per app with $9,166.67.[45]

[45] Eric Zeman,"BlackBerry App World Generates Highest Revenue Per App". Baconthego.com. Retrieved May 5, 2011.

Google still has a long way to go. Because of the closed system for devices, operating system and the intense competition, Apple needs to be alert and to find new advantaged apps or strategies to maintain its first place.

Table 3- 2 Apple App store vs. Google Play

	Apps	**Devices**	**Downloads**	**Developers**	**Average price per download (*estimated in 2012)**
Apple App store	800,000+	410+ million	40+ billion	214,500+	$0.28
Google Play	800,000+	500+ million	40+ billion	200,000+	$0.11

(Source: Wikipedia, Asymco and Flurry)

The Average price per download (APPD) for iTunes in 2012 was about $ 0.28; it can be taken as the APPD in Apple App store. APPD in Google Play in 2012 was about $0.11(Table 3- 2).

Mobile app market, a vigorous marketplace, has an endless need of improved business models and monetization systems to remain key figures. It encourages the individual or enterprise developers to join this market and all the users can freely choose their preferred apps.

Opportunities for success but with inevitable ups and downs, demanding constant presence by the members of the app ecosystem.By its potential and its ferocity, it is both sublime and brutal.

3.1.4 App price in mobile app market

Prices of most apps in app store are between $1 and $2. The petty-amount consumption mode in app store is greatly appreciated by app users. There are also some expensive apps which price more than $10 or $50 for the special usages like GPS, Medical product and so on.

3.1.4.1 App price distribution

Prices for mobile apps distribute generally from 0, 0.99, 1.99 to 999.99 in US dollar or local currency.Figure 3- 5, Figure 3- 6and Figure 3- 7 are the app price distributions for Apple App store in US in 2008, 2011 and 2013.

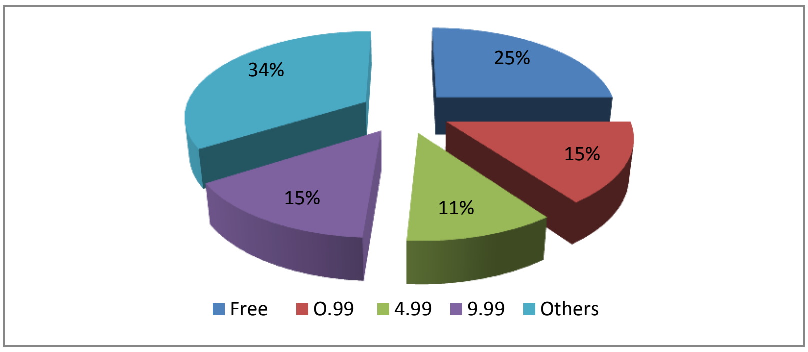


Figure 3- 5 App price distribution in Apple App store in US in July 2008

(Source: 148apps.biz)

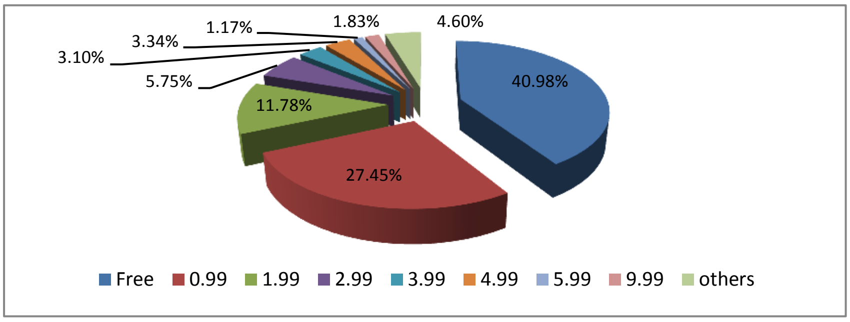


Figure 3- 6 App price distribution in Apple App store in US in October 2011

(Source: 148apps.biz)

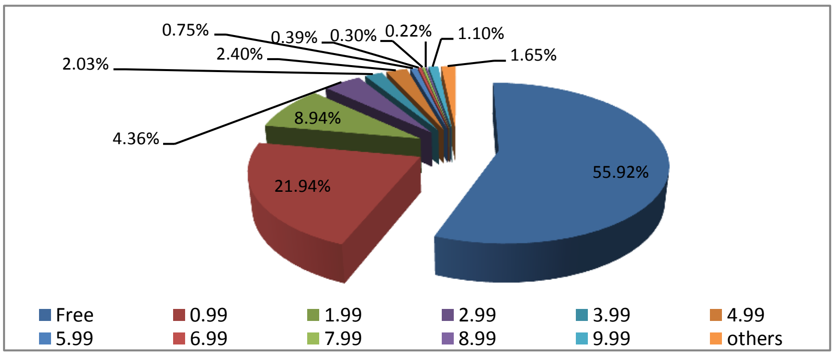


Figure 3- 7 App price distribution in Apple App store in US in March 2013

(Source: 148apps.biz)

We can see that free apps take the dominant place with an enormous increase from 2008 to 2013 in Apple App store in US. Free apps reached 55.92% in March 2013 compared to 25% in July 2008. $0.99 apps are the main parts for paid apps. It reached 21.94% in March 2013 than 15% at the first start of Apple App store in 2008. $0.99 apps reached a peak at 27.45% in October 2011.Paid apps below $5 decreased from 51.4% in October 2011 to 40% in March 2013.

In Google Play, nearly 70% apps were free apps in January 2012[46]. $0.99 apps are also the core parts of paid apps.

As to app downloads, ratios of free to paid app downloads for iPhone in USA and UK in July 2012 were 14.9:1 and 14.8:1. That means free app downloads were nearly 15 times more than paid app downloads. In China, this ratio was 119:1. This ratio was extremely high at 82:1 in Google Play in July 2012[47].

In other words, free apps are the majority in the mobile app market. Petty-amount apps are the most downloaded paid apps. There is a '$1 barrier' rule. Users prefer paid apps less than 1 dollar. Petty-amount consuming models are easily or widely accepted in the mobile app market.

3.1.4.2 Average app price

Both average app price (AAP) and average game price (AGP) in Apple App store in US declined from 2011 to 2013. AAP had declined to $1.58 in March 2013 compared to $2.24 in 2011. AGP is generally lower than AAP, having decreased from $1.05 in 2011 to $0.89 in2013 (Figure 3- 8).

Games, the revenue source for app stores, in 2012 was approximately 50% of all free downloads, and 60% of all paid downloads. In terms of revenue, more than 75% of revenue derives from Games based on 200 most grossing/popular applications in United States in July 2012.[48]

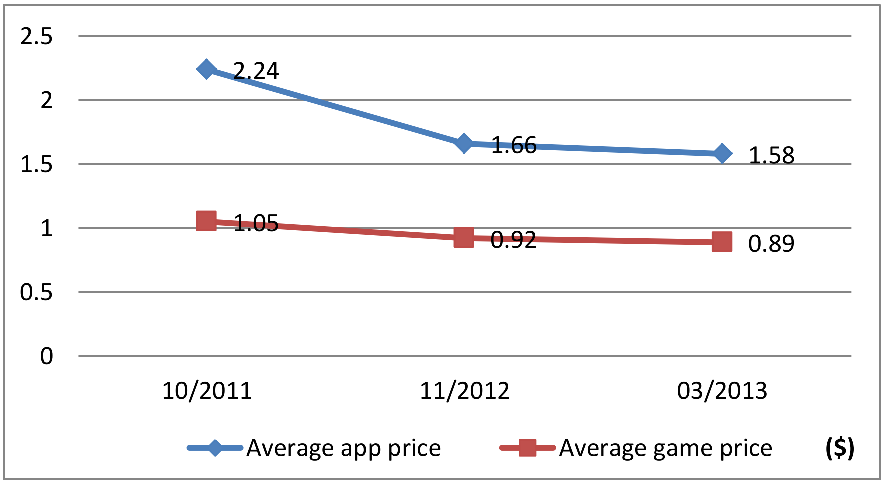


Figure 3- 8 Average app price (AAP) and Average Game price (AGP) in Apple App store in US 2011-2013

(Source: 148apps.biz)

[46] Distimo publication February 2012, The Amazon App store: Show Me the Money, Retrieved 02/03/2013
[47] Do Free Apps Really Account For 89% Of All Downloads? http://www.distimo.com/blog/2012_09_do-free-apps-really-account-for-89-of-all-downloads/,Retrieved 02/03/2013
[48] The app store opportunity, http://www.slideshare.net/phonegap/the-appstore-opportunity-by-gert-jan-spriensma-phonegap-day-eu-sept-14-2011,Retrieved 02/03/2013

3.1.4.3 App price distribution by category

Apps in different categories are often set at different prices by developers. App store offers various categories of apps to satisfy users' needs. Utility and Productivity are two categories often with higher prices for apps.

1 App category distribution

Games, Education and Entertainment were the 3 most popular app categories in Apple App store in March 2013(Figure 3- 9, Figure 3- 10). Compared to the 3 most popular app categories in 2011, Games apps are the most supplied apps in response to the large demands and evident user preferences. Books apps dropped from the second to the fifth. Entertainment apps keep the third position in Apple App store in USA. Education apps jump to the second most app category in 2013 compared to 2011. Education is currently the most lucrative app, with an average eCPM (effective cost per mille/thousand impressions) of $0.92 according to Velti Mobile Ad Report[49].

Google Play's special application category is navigation like Google earth.

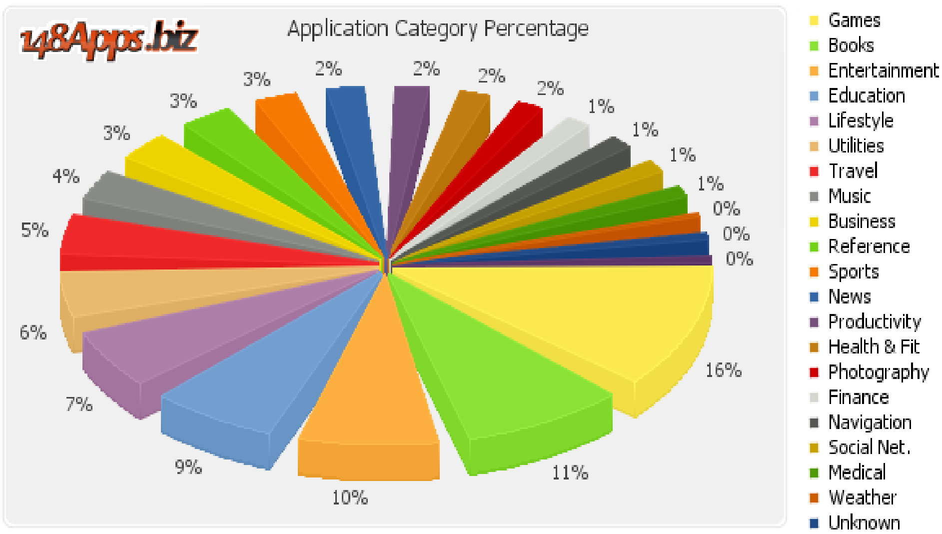


Figure 3- 9 App category distribution in Apple App store in November 2011 in US

(Source: 148apps.biz)

[49]http://www.inside.com.tw/2013/01/10/a-more-complete-picture-of-the-itunes-economy/average-price-per-app-monthly-developer-payment-and-download-rate,Retrieved 02/03/2013

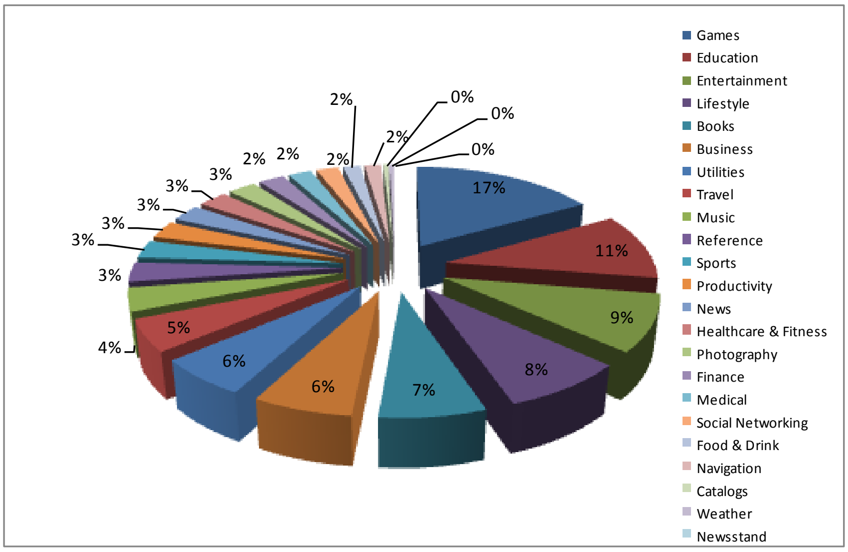


Figure 3- 10 App category distribution in Apple App store in March 2013 in US

(Source: 148Apps.biz[50])

2App price distribution by category

App price depends largely on the category/ type of applications. Apps are typically priced lower if they are relatively easy to make and are copied quite fast. Applications that require many supported services besides developing the application, like navigation apps, tend to be priced significantly higher (Figure 3- 11).

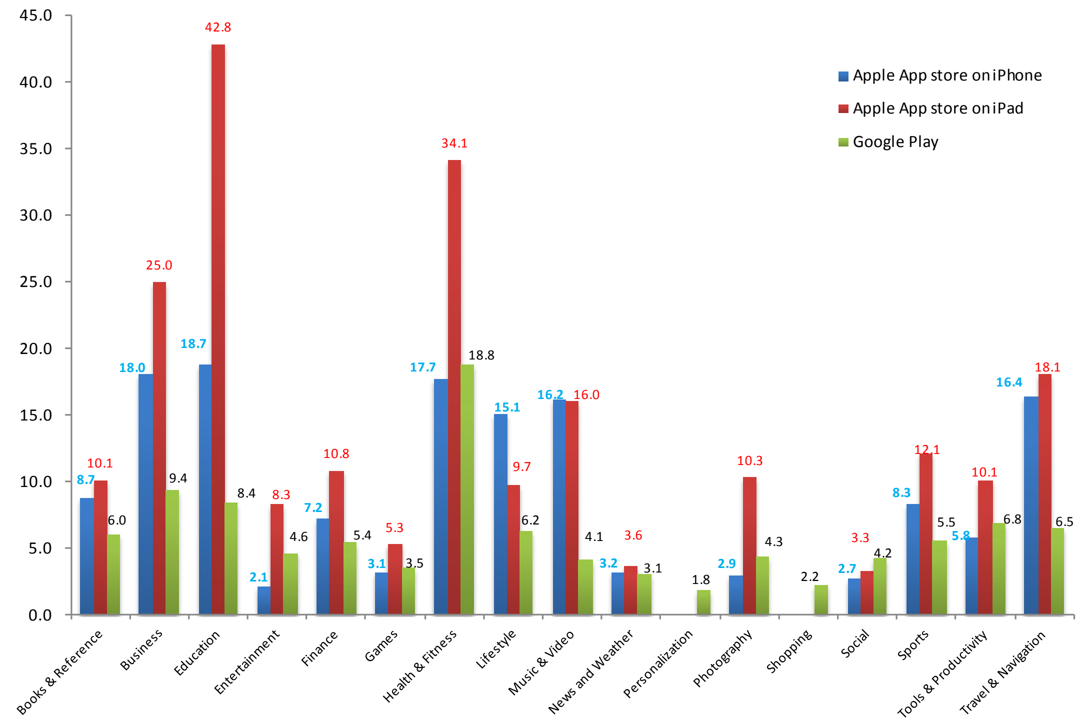


Figure 3- 11 Average price among the top grossing applications per category in Google Play, Apple App store on iPhone and iPad in US from October to December 2011

(Source: Distimo[51])

[50] http://148apps.biz/app-store-metrics/?mpage=catcount,Retrieved07/03/2013
[51] Distimo-Publication-January-2012,Retrieved 02/06/2012

In App store on iPhone, the five most expensive apps were Education,Business,Health & fitness,Travel & navigation and Music& video priced over $16 among the top grossing apps (Figure 3- 11).

In Google Play, Health & fitness was the most expensive app category with priced at $18.8. Then Business, Education, Tools&productivity and Travel & navigation were the less expensive apps with prices ranging between $5 and $10.

In both App store for iPhone and Google Play, Education, Business, Health & fitness, Travel & navigation were the same popular app categories by revenue. But Business apps in Google Play were less expensive than in App store for iPhone. Google Play was also known for its Tools&productivity apps because of Android's open source developing environment advantage.

Games app in App store for iPhone, App store for iPad and Google Play were almost the least expensive app. But it is the revenue source for app stores.

Compared Figure 3- 11 with Figure 3- 12, Navigation, Education, Business, Books and Productivity were popular categories both in 2010 and 2011. Health & Fitness apps got a sharp increase from 2010 to 2011 as per the trend these days of customers paying more and more attention to their health and their bien- être.

Figure 3- 12 Average app price per category in Apple App store in US in December 2010

(Source: App of the day[52])

3 App revenue distributions by category

Games are the apps that are downloaded the most which also generate the most revenues in the

[52] http://appoftheday.com/infographic,07/12/2010, Retrieved o3/03/2011

mobile app market. More than 75% of revenue derives from Games in July 2012[53] (Figure 3- 13). Widgets apps are the second most downloads followed by Entertainment. Productivity, Music, Books, News, Social networking were also the revenue generating app categories.

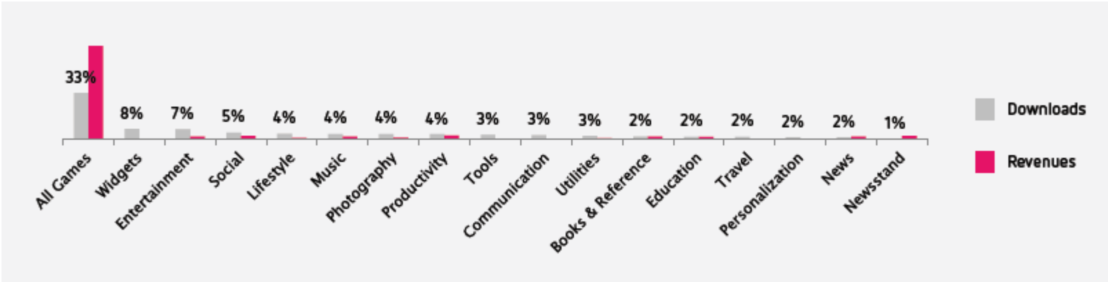


Figure 3- 13 Apple App Store and Google Play aggregated downloads and revenues per category in 2012

(Note: Categories with less than 2% were excluded)

(Source: Distimo[54])

3.2 Ecosystem of mobile app market

3.2.1 Participants in ecosystem

There are three groups of end users, two platforms and the infrastructure including device supplier and carrier (network) in total seven participants in the mobile app market (Figure 3- 14). Apps and ads are the products in the mobile app market. Mobile Operating System (MOS) is members of infrastructure. MOS is considered integrating into app store platform in this study.

The developer, the user and the advertiser are end users. The developer and the user are taken as the two sides through mobile app store platform for app production and consumption.The developer (also called publisher) and the advertiser are taken as the two sides for app advertising through ad platform.

The device supplier and the carrier (network) supply mobile device and mobile network access for users to connect with app store platform. Mobile device associated with one MOS is the basic equipment for receive apps. The device supplier installs MOS for his devices at a price or free.

App store platform runs also on MOS. Dominant MOS app stores like Apple App store and Google Play have their own native MOS--iOS and Android. Mobile device can receive apps from app store platform which operates on the same MOS.App store platform is usually preloaded into mobile devices. The device supplier is the key participant in these sales.

App store platform is named App-store and app ad platform as Ad-store in this study (Figure 3- 14).

[53] The app store opportunity, http://www.slideshare.net/phonegap/the-appstore-opportunity-by-gert-jan-spriensma-phonegap-day-eu-sept-14-2011, Retrieved o3/03/2011

[54] Distimo publication Full year 2012,Retrieved 02/03/2013

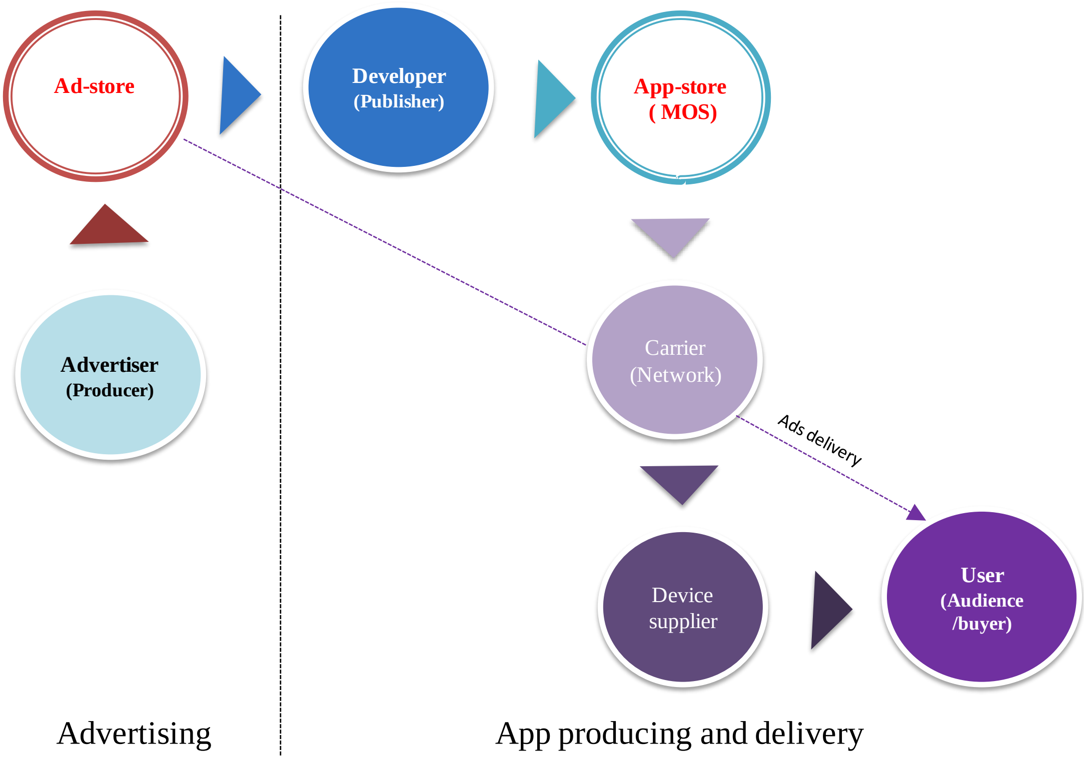


Figure 3- 14Participants in the mobile app market

The mobile network is widespread and there is no significant difference among different carriers (networks) for mobile network services. The mobile app consuming is part of mobile network behaviors for users. Thus the Carrier (network) is not taken as the main participant in the pricing strategy study for app store platform. Although mobile payment is also related with this ecosystem, it is not analyzed into this study due to its complex functioning system. It can be a future study area.

The advertiser can be goods (or service) vendor or mobile app developer who wishes to promote his apps. Enterprises like BMW and Coca-Cola advertise their products through mobile ads (Figure 3-15). Usually they develop their mobile ads through the professional advertising agencies or teams.

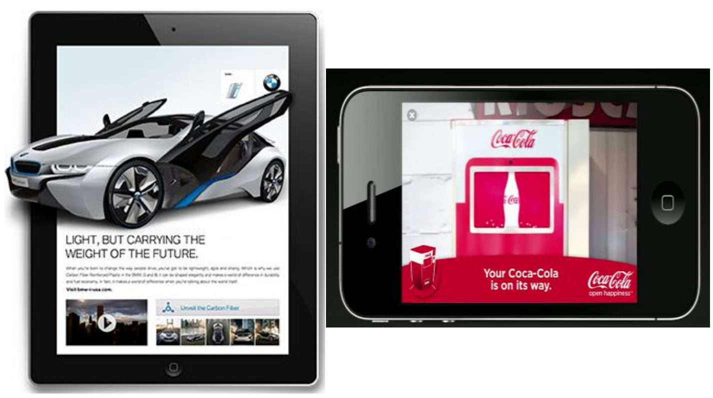


Figure 3- 15 3D mobile ad for BMW and Coca-Cola mobile ad

Mobile app ad publishers are app developers in mobile app ad market. Developers are also called publishers for mobile advertising. Therefore mobile app ads can be shown only through developer's apps to reach to users.

Ad-store platformcollects the ad demands of advertiser and publishes them through developer's apps. It works an intermediary for advertiser and developer.

Developer is an important participant with a dual (even triple) identity in the mobile app market ecosystem. Developer connects both app store platform and app ad platform. They work as application software developer and application ads publisher at the same time. They not only develop apps based on different mobile operating systems and submit them to app store platform. They also integrate ads SDK from app ad platform and publish ads for advertiser. Developers can also be advertisers who need to promote their apps. Advertiser can be the triple identity for some developers in mobile app world whereby the advertiser develops his app to promote his products (can be developer's other apps) or services.

App store platform audits, processes, and monetizes apps for developers and builds the storefront for connection with users to pass them apps.

Mobile network and mobile device constitute the infrastructure. Mobile devices work on the mobile operating system, that runs the apps, and they can be equipped with the means to connect with internet.

App store business model is a creative and dynamic ecosystem initiated by Apple for mobile app market especially for app developers.

Before the existence of app store, mobile network operators let mobile device manufactures and technology suppliers like Qualcomm support third-party developers with application environment based on specific devices or specific operating systems. Device platform fragmentation, poor device user experience, limitations of the wireless application protocol (WAP) interface, and high broadband access costs for end users were the four major unfavorable factors for developers.[55]

With the App-store model, there are significant jolt of energy for the entire mobile app market industry chain. For developers, they can succeed in developing with a great user experience instead of poor device user experience before. They are offered a direct revenue share contract and availability of internet over Wifi or cellular network. All that required is to download the application program interfaces (APIs) simply depending on different OS to develop their apps. For users, they have plenty of choices and perfect user experiences from using the apps. Today all apps can be created if needed.

App-store model brings in profits for the entire ecosystem.

[55] In the mobile app market,fortune favors the bold,Amdocs white paper,Retrieved 09/12/2011

3.2.2 Roles of participants

App-store platform's roles: supplying app developing package (SDK); distributing mobile apps; charging apps; paying for developers and supplying hosting service for developers. Hosting service usually includes users' app demands and feedback of downloaded apps. This can help developers to write suitable apps to satisfy users' needs and guide app pricing for developers. App store platform is an app marketing place through its app ranking or app recommendation list. In Apple App store, app ranking posts the most popular apps downloaded with positive ratings and good reviews. Apple App store recommends new popular apps by types or users' locations (Figure 3- 16). Users can see the heavily downloaded apps by others around.

Figure 3- 16 App recommendation in Apple App store

Ad-store platform's roles: supplying app advertising package (SDK); distributing mobile app ads through developer's apps; charging app ad spending from advertisers; paying for developers and supplying hosting service for developers.

Developer's roles: developing apps and pricing for them; Publishing app advertisements. Developers can be also advertiser who needs to promote his products at the same time.

User's roles: downloading apps and/or reading app ads; purchasing goods through app ads from advertisers.

Advertiser's roles: proposing mobile advertising demands; negotiating app ad spending; paying for mobile app ad platform; selling goods through app ads.

Device supplier's role: supplying mobile devices which support mobile app store platform directly or indirectly for users.

Carrier (network)'s roles: providing and managing mobile network services for users based on mobile devices.

3.2.3 Mobile app market ecosystem

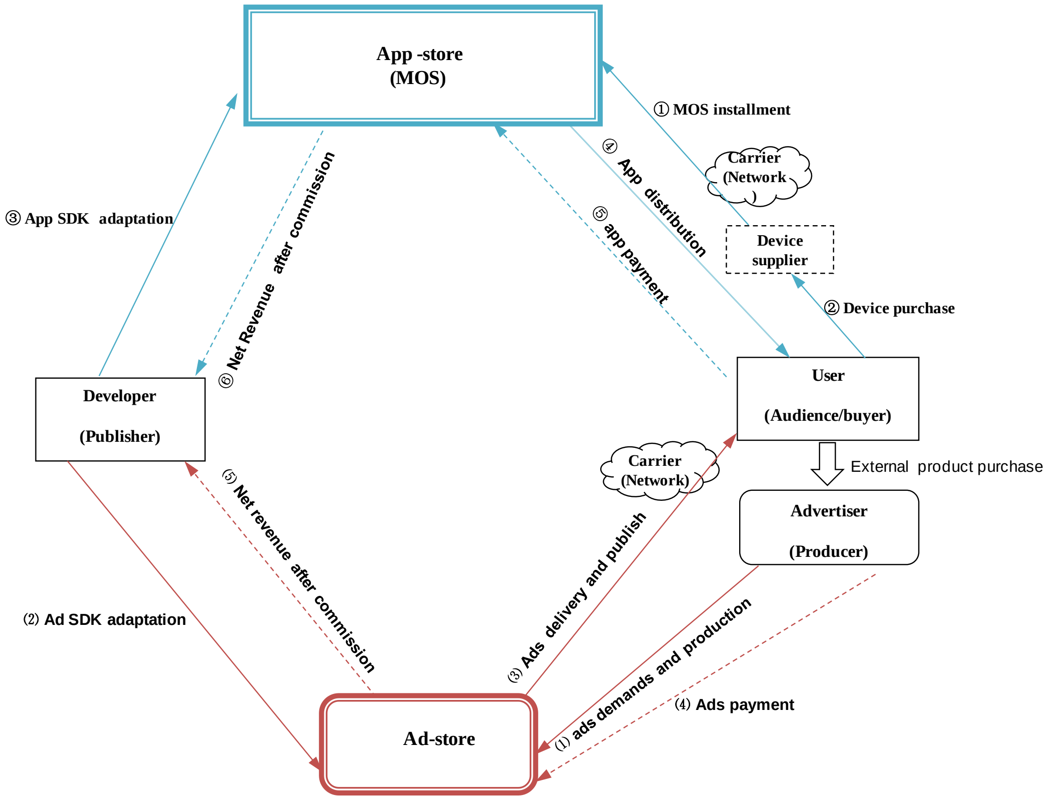


Figure 3- 17Ecosystem in mobile app market

In this study, mobile app market ecosystem was described through the application distribution on mobile devices. App-store and Ad-store are two interconnected two-sided platforms which produce two operation cycles (in blue and red).

To use applications on mobile device, it is necessary to have an intelligent terminal which runs on a mobile operating system (MOS for short).Intelligent terminal (or mobile device) could be a tablet, a smartphone, or any other device that can play this role. Generally, mobile device is distributed by integrating with a mobile operating system. We have considered mobile operating system as the app store platform in our study[56]. This mobile device integrated hardware and MOS is sold by an independent device supplier (manufacturer of hardware with a distribution network, network operator, electronics store, etc.). DS is a short for Device Supplier. To prepare mobile devices to receive apps, device supplier has to adopt one MOS to install on his mobile devices at a price or free first. The device supplier is normally singlehoming. Subsequently these MOS installed devices are sold to users.Users connect to the App-store platform running on the same MOS as the devices through carrier's mobile network (see process ① MOS installment in Figure 3- 17).

It is necessary to have a mobile device to receive the apps available on the device MOS for user (see

[56] In fact, except MOS app store (like Apple App store, Google Play, Windows phone store, Blackberry world…), MNO app store, TP app store and DM app store don't own their native MOS. Most of them adopt Google Android MOS due to Android's free availability and open developing environment.

process ②device purchase in Figure 3- 17). User is often singlehoming with holding one mobile device (except users with different MOS supported mobile devices). Generally, the device supplier distributes its terminal with a set of basic applications. Some device suppliers offer applications with additional functionality to improve their competitiveness for his devices[57].

The user then has the possibility to acquire applications (app) that are processed by App-store platform associated with its MOS (AppStore, Google Play ...). App-store provides developers with platform development kit (SDK) and developers pay for it at a price (see process ③app SDK adaptation). Developer usually connects with different App-store platforms and they are multihoming. Developer develops and submits applications to App-store platform through the SDK. User can acquire these applications via App-store from developers (process ④app distribution)..

This app acquisition can be free or paid. When the app is paid, user has to pay for App-store the app price and one part of this price will be delivered to developer (process ⑤and⑥). The user does not need to pay for app purchase or download fees for App-store using.In some cases, apps are paid with enhanced or additional features and this is called freemium upsell. There are also some apps which offer in-app purchase through selling virtual goods or subscriptions to create revenues. Certain apps carrying external[58] product information or service can generate external products sale revenues and increase attractiveness of these apps. This definitely boosts mobile devices sales.

Generally speaking, downloaded apps are free. Neither the developer nor the platform is paid from this transaction. The user pays nothing to the App-store. Due to the majority free apps in mobile app world, the first two-sided cycle must be supplemented by a second cycle which brings advertising effects through free ad-funded apps. Many apps (almost all the free apps) bring revenues from advertising via a second two-sided platform. This second two-sided platform here is Ad-store.

In the advertising process, advertiser submits his demands to Ad-store (process (1)). The advertiser is usually multihoming connecting to different Ad-stores. Ad-store platform collects and ranges advertising demands into the ad pool.

To build advertising channels, Ad-store provides ads developing kit (SDK) for developers to create ads publishing spaces within apps. Developer adopts ad SDK into his apps to build an ads display environment (process (2)).Ads SDK runs on also the same MOS with mobile device and App-store to make sure ads can be published within apps. Ad-store usually offers ads SDK supported different MOS.

When the user downloads an ad-funded app from App-store, ad pool will send one correspondant ad to this app through carrier’s mobile network (process (3)).

User reads clicks or installs the ad within the downloaded app. Ads publishing data feedback is sent to Ad-store. And advertiser pays ads expenses to Ad-store through CPM, CPC or CPI these advertising billing ways (process (4)).

Ad-store takes a commission on each transaction and delivers balance of the expenses to developers (process (5)).Ad revenues from ads publishing are shared between developer and Ad-store platform.

[57] For example, with a backup app data in the cloud with free storage space of a limited size. Platform or terminal supplier (manufacturer or distributor) can therefore acquire a subset of applications from developers for providing installed on terminals.

[58] External here means out of mobile app market.

3.3 App-store (app store)

3.3.1 Classification of App-store

App-store is also called app store. There are different ways to classify App-store. Mobile operating system owner, mobile network operator, device manufacture and independent app developer are the main players in this mobile app market ecosystem. App stores operated by the different mobile app ecosystem parters can be found in mobile app world.

Netsize[59] classified App-store into five types[60]:

- *Device-specific: stores that provide applications and content for a single brand of device* (ex. Blackberry world or Palm App catalog).

- *Platform-specific: stores that focus on a specific operating system or platform* (iOS, Android, Windows Phone, etc).

- *Operator-led: Stores run by a mobile network operator supporting devices the operator sells to subscribers with applications and content specific to those devices* (ex.China Mobile Market,L'application Cloud d'Orange).

- *Independent: Stores that offer apps and content for any device and any platform, and provide a service that supports developers with merchandising expertise (capabilities that include discovery, payment and delivery), as well as hosting services and mobile analytics that allow developers to better understand and serve their customers*(ex.Getjar,Appia,Handango).

- *Directories: Stores (primarily cross-device and cross-platform) that aggregate content and applications already on offer via other application stores, and typically don't support developers with payment, delivery or hosting* (ex. App boy, FastApp store).

Netsize classified app store comprehensively but there are no distinct and not easy to identify Independent app stores and Directories app stores.

Wikipedia classified App-store (mobile app stores) into Operating System-native platforms and Third-Party Platforms[61].

The professional mobile app store searching engine website *Guide to Mobile Application Stores* classified App-store (mobile app store) into Mobile OS Platforms and Third-Party platforms

[59] Netsize is a leading mobile communications and commerce enabler. Netsize solutions include mobile messaging, mobile payment, and mobile content management globally.
[60] Netsize Application Store Billing White Paper,2011
[61] http://en.wikipedia.org/wiki/List_of_mobile_software_distribution_platforms, Retrieved 02/03/2013

simple[62].

There are four classifications of app stores in this study, further to the above explanations:

Mobile Operating System (MOS App-store); Mobile Network Operator (MNO App-store); Third-Party (TP App-store) and Device Manufacture (DM App-store).

MOS App-store is the app store which has its native mobile operating system like Apple App store, Google Play, Blackberry world and Windows Phone store.

MNO App-store is operated by telecom operators like AT&T App centre, China Mobile Market and L'application Cloud d'Orange.

TP App-store is run by an independent organization which offers mobile app developing or mobile app marketing for developers. Cross platform TP app store and focus on one platform TP app store can be found in this type. (ex. Appia, App boy, Amazon, etc.)

DM App-stores run by mobile device manufacture include LG smart world, Dell Mobile App Store, Hicloud by Huawei[63] and others.

3.3.1.1 Mobile Operating System /MOS App-store

The first type is Mobile Operating System/MOS App-store like Apple App store, Google Android Market, Nokia Store, Blackberry World, Windows Phone store and so on. They have their native operating system and completed developing environment. They are the first group who started app store model in mobile app world and they constitute a strong hold in this market. They can be also called platform App-stores (Table 3- 3).

For more than 4 years Apple App store was ranked number one in the mobile app market with 775,000 available apps and 40 billion downloads as of January 2013. Apple App store built on its native closed Operating System—iOS and charges 99$ each year to the developer. Both the individual and company developers are encouraged to join. Users can browse and download free or paid applications from the iTunes store of Apple to their iOS devices like iPhone, iPad, iPod touch. Mac book has its own PC operating OS – Mac OS. Apple App store is available to a total of 155 territories around globe as of June 2012[64].

Google established Android market in October 2008, three months later than Apple App store. On March 6, 2012, with the merging of the Android Market and Google Music, the service was renamed Google Play. Users can browse and download music, books, magazines, movies, television programs, and applications from Google Play store to an Android or Google TV device or onto a

62 http://www.mobileappstorelinks.com/, Retrieved 02/03/2013
63 Huawei is a Chinese multinational networking and telecommunications equipment and services company headquartered in Shenzhen, Guangdong.It is the largest telecommunications equipment maker in the world, having overtaken Ericsson in 2012
64 http://www.complex.com/tech/2012/06/apple-app-store-available-in-32-new-countries Retrieved 20/01/2013

personal computer via its website. Android is a Linux-based open source operating system, developed by Google and Open Handset Alliance and can support many series of portable devices. Android open source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. It has a large community of developers writing apps[65]. Google Play closely followed Apple App store and already had 700,000 available apps and 25 billion downloads as of September 2012. It charges 25$ to individual or company developers. Google Play makes free-of-charge applications available worldwide, while paid applications are available in 129 countries[66].

Nokia Store, also as known Nokia Ovi store (*Ovi* means door in Finish) was announced by Nokia in May 2009. On May 16, 2011, Nokia announced the discontinuation of the Ovi brand and the services rebranded under the main Nokia brand. There were about 120,000 available apps and about 6 billion downloads as of August 2012. Nokia store users can download mobile games, applications, videos, images, and ringing tones to their Nokia devices. In February 2011, Nokia decided to use Windows Phone Operating System replacing Symbian to install Nokia Smartphones. Ovi store will still be available for present and future Symbian phones, whereas Ovi store and Windows Phone 7 Marketplace merged on the Windows Phone 7 platform. Ovi store is available in more than 180 countries, available in six local languages, and nine countries supported with operator billing as of July 2012[67]. Developers just need pay for 1 € to subscribe.

Blackberry World (Replacing Blackberry App world on 21th, January, 2013) appeared in April 2009 by Research In Motion (RIM) in Canada for a majority of Blackberry devices based on its Blackberry Operating System. On March 4, 2009, RIM officially named the store "BlackBerry App World" to replace BlackBerry Application Storefront. It had 99,500 available apps and 3 billion downloads till May 2012. As of September 9, 2010, Blackberry World was available in 113 countries and accepts payment in all 113 using a combination of PayPal, credit card, and carrier billing. Blackberry World supports English, French, Italian, German, Spanish, and Brazilian Portuguese six languages for its applications. Developers are free to connect with the Blackberry developing kit without paying for subscription fees.

Windows Phone Store (replacing Windows Marketplace for Mobile) was launched along with Windows Phone 7 in October 2010 in some countries. In August 2012, Microsoft official rebranded the "Windows Phone Marketplace" to "Windows Phone Store".[68] There were 150,000 available apps till October 2012 and about 1 billion downloads in Windows Phone Store as of December 2012. Developers must pay an annual subscription fee of $99 for unlimited paid apps and 100 free apps, thereafter, there is a fee of $19.99 per submission for free apps[69].Apps in 46 languages are available in about 196 countries and regions as of January 2013.

New mobile OS jump into the market all the time. Tizen OS is an operating system for devices including smartphones, tablets, in-vehicle infotainment (IVI) devices, and smart TVs governed by

[65] http://en.wikipedia.org/wiki/Android_%28operating_system%29 Retrieved 21/01/2013
[66] https://support.google.com/googleplay/bin/answer.py?hl=en&p=play_faq&answer=2490014 Retrieved 20/01/2013
[67] http://www.developer.nokia.com/Community/Wiki/Ovi_Publish_Payment_FAQ,Retrieved 20/01/2013
[68] http://en.wikipedia.org/wiki/Windows_Phone_Store,Retrieved 21/01/2013
[69]http://en.wikipedia.org/wiki/Windows_Phone_Store, Retrieved 21/01/2013

Intel and Samsung' Technical Steering Group (TSG[70])[71]. It aims to offer a consistent user experience across devices through its Linux based open source system. Linux kernel, the Enlightenment Foundation Libraries (EFL) and the WebKit runtime are the main components of Tizen. Application developers can use Javascript libraries jQuery and jQuery Mobile in Tizen's environment. The software development kit (SDK) allows developers to use HTML5 and related web technologies to write applications that run on a lot of types of devices. Tizen's WebKit-based browser ranks the highest on HTML5 standards tests of pre-release systems. The LiMo Foundation rebranded Tizen in January 2012 and the latest release is Tizen 2.0 in January 2013. Samsung's mobile OS Bada forms the native application framework of Tizen 2.0 and later. Android applications can run on Tizen devices with OpenMobile's Application Compatibility Layer (ACL).

[70] Tizen project resides within the Linux Foundation.
[71] http://en.wikipedia.org/wiki/Tizen_OS,Retrieved 05/02/2013

Table 3- 3 Mobile Operating System/MOS App-store

Name	Launched time	Status	Vendor	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Development tools	Permission of individual developer publish	Integrated development enviroment fees
Apple App store	10/07/2008	Live	Apple	i OS	775,000 (01/2013)	40 billion (01/2013)	500 million (01/2013)	56-71% (varies depending on the developer's country)	US$ 99/year	iOS SDK, Xcode	Yes	Free
Blackberry World	01/04/2009	Live	RIM	Blackberry OS	99,500 (05/2012)	3 billion (05/2012)	75 million (01/2012)	70%	Free	BlackBerry SDK	Yes	Free
Google Play	22/10/2008	Live	Google	Android	700,000 (10/2012)	25 billion (09/2012)	500 million (06/2012)	70%	US$25	Android SDK	Yes	Free
Nokia store	26/05/2009	Live	Nokia	Symbian,MeeGo,Maemo,S40	120,000 (08/2012)	~6 billion (08/2012)	885 million (03/2012)	70%	1 €	Qt SDK, Nokia Web Tools, Nokia SDK 1.0 for Java	Yes	Free
Palm/HP App Catalog	06/06/2009	Live	Palm/HP	Web OS	7,062 (06/2011)	108 million (08/2011)	2.6 million (07/2010)	70%	Free	Mojo SDK	Yes	Free
Samsung Apps	14/09/2009	Live	Samsung	BADA,Android,Windows Mobile	13,000 (03/2011)	100 million (03/2011)	5 million bada (03/2011)	70%	Free	Android SDK,BADA SDK,SmartTV SDK	Yes	Free
Windows phone store	21/10/2010	Live	Microsoft	Windows Phone	150,000 (10/2012)	~1 billion (12/2012)	19 million (09/2012)	70%	US$ 99/year/unlimited paid apps and 100 free application submissions Or free for students	Windows Phone Developer Tools, includes specialty versions of Microsoft Visual Studio, Expression Blend	Yes	Free
Windows store	26/10/2012	Live	Microsoft	Windows 8,Windows RT	35,000 (12/2012)	Undisclosed	Undisclosed	70% (or 80% if developer sales exceeds US$25,000 in a year)	Individuals: US$50/year or US$0/year for student, Companies:US$100/year	Visual Studio 2012 Express for Windows 8 or Visual Studio 2012 professional or higher	Partial: Only companies can publish desktop apps	Free
Download Fun/Download catalog	01/10/2002	Closed	Danger/Microsoft	Danger OS	0	0	0	40%	Free	Danger OS SDK	Yes	Free
Palm Software store	16/12/2008	Closed	Palm	Palm OS,Windows mobile	5,000 (12/2008)	Undisclosed	Undisclosed	60%	N/A	N/A	Yes	Free

(Source: Wikipedia[72], WIP[73] and others[74])

72 http://en.wikipedia.org/wiki/List_of_mobile_software_distribution_platforms, Retrieved 02/03/2013

73 http://www.wipconnector.com/apis, Retrieved 02/03/2013

74 http://www.mobileappstorelinks.com/, Retrieved 02/03/2013

In July 2011, Mozilla, famous for its desktop browser Firefox, plunged into the mobile OS market. Firefox OS (project name: Boot to Gecko also known as B2G) is a Linux-based open source operating system for smartphones and tablet developed by Mozilla[75] (Figure 3- 18). It is designed to allow HTML5 applications to integrate directly with the device's hardware using JavaScript. It has been installed on Android-compatible smartphones and on the Raspberry Pi[76] (Figure 3- 19).

Figure 3- 18 Firefox OS

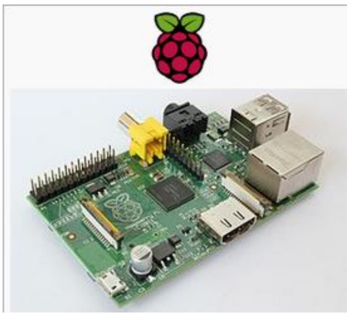


Figure 3- 19 Raspberry Pi computer model

Apart from Mobile Operating System/MOS App-store, we can find PC (personal computer) Operating System /PC OS supported App-store. Mac App store is one of the popular PC OS App-store. Mac App store based on Mac OS was established by Apple on June 6, 2011.There were about 10,000 available apps as of April 2012 and 100 Million downloads as of December 2011. It keeps Apple's classical 30%:70% revenue split with developers per sale. Developer has to pay for $ 99 each year for a subscription. Mac App store supports Mac OS X 10.6.6 and later and allows individual developer to publish their apps. It is free for integrated development environment. Being supports for both Mobile phone and PC, Windows store and Google Play were taken as the PC OS App-store. Windows store can even support game console XBOX. According to the report from Distimo, in November 2012, there were 84% paid apps In Mac App store and 14% paid apps in Windows store. Average price of all apps in Mac App store were $12.55 and $ 13.32 in

[75] http://en.wikipedia.org/wiki/Firefox_OS Retrieved 05/02/2013
[76] The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation.

Windows store. Downloads of the top 300 most popular free and paid apps for Windows store were three times more than Mac App store.

✧ **Conclusions of MOS App-store:**

Apple App store and Google Play dominate the mobile app market. Apple App store has a closed and mature ecosystem. Google sales soar through its open resource platform, free pricing strategy and multi-terminal adaptation. Blackberry keeps steady gains in its App world. Windows takes off by transition from Windows Marketplace for Mobile to Windows Phone store and profits by its rich PC operating system operating experiences. Nokia started to install Windows Mobile OS and Phone OS with hopes of winning back its place in the smartphone market, place that it lost previously after its feature phone became outdated.

Integration happens silently in the mobile app market. Google had acquired Motorola-the famous mobile manufacture in May 2012 to strength its terminal control position. Google bought Admob-a professional mobile display advertisement technology provider in November 2009 to boost its mobile ads and prolong its original ads advantage that dated to past internet days. Device manufactures Samsung and Intel collaborated together to form a new Tizen OS to try to reverse their losses in app store industry chain. Firefox OS officially showed up in July 2012 in the mobile app market.[77]

3.3.1.2 Mobile Network Operator /MNO App-store

The second Group is Mobile Network Operator (also called carrier)/MNO App-store, Like AT&T, Orange, China Mobile and Vodafone. These Mobile Network operators have plenty of mobile services operating experiences, huge user base and good operating billing system with wide network coverage. Although they do not have, they don’t have their native OS and their own portable devices (Or they can customize some MNO style mobile phones). They lack professionalism in managing their Smartphone’s users. Mobile Network Operators have restrictions in installing the applications into their app stores and are obliged to work with different OS operators and devices manufacturers. Usually, Mobile Network Operators merged their MNO App-store into MOS App-store based on different devices in their user’s phones (Table 3- 4).

As we can see in Table 3- 4, the MNO App-store does not have the Number 1 spot in the app store world whether in North America, Europe, South Africa or Asia. Some of them had dropped the MNO App-store and chose to be a portal to connect other App-stores with their users. Most of the MNO App-stores support Android OS.

In USA, AT&T App center was established in 2011 and there were only 3,683 available apps till to May 2011. Verizon App store was closed in January 2013.

In UK, Vodafone App select closed January 31, 2013 because of severe competition from MOS App-stores and especially form Amazon app store after its availability to UK. In France, the

77 In July 2012, Boot to Gecko was rebranded as 'Firefox OS' and screenshots began appearing in August 2012.

biggest carrier Orange has its own Orange App shop, launched in December 2009. There were 10,000 apps available in it as of February 2010. Orange app shop services are also available in Belgium, Egypt, France, Jordan, Poland, Portugal, Romania, Spain, Tunisia and UK.

In China, the three main carriers all have their own App-stores. China Mobile followed Apple App store quickly andlaunched Mobile Market /MM in August 2009. There were 95,000 available apps and 138 million active users who had a 590 million download till to November 2011. China Telecom struck Mobile Market through its E Surfing store later. The developing program by E Surfing had a better reception than MM. All Chinese MOS App-stores support Android and Symbian OS. Developing apps for IOS has not yet been done for Chinese carriers.

In Japan, the biggest carrier NTT DoCoMo takes its DoCoMo Market as a portal at the beginning. It keeps its i-Mode service and supports the Android OS and Windows Phone OS apps at the same time. Soft bank, the rival of NTT DoCoMo opened its Book store with the help of HP In December 2010. There were 372,000 books in its Book store as of July 2012.

In South Korea, SK Telecom had its T-Store with about 6,500 apps when it was launched in September 2009.T-store supplies apps based on Windows Phone OS, Symbian and Android. It also has the facility to connect with 100 wireless internet platforms for interoperability (WIPI for short).

In South Africa, MTN Play from the carrier MTN launched in 2009 had 16,000 free available apps as of September 2011.

Table 3- 4 Mobile Network Operator App-store/ MNO App-store

Mobile Network Operator/MNO app store												
Name	**Launched time**	**Status**	**Vendor**	**Country**	**Mobile Operating System**	**Available apps**	**Downloads**	**User base**	**Sharing ratio for developer per sale**	**Developer fees**	**Regional availablity**	**website**
AT&T App Centre	2011	Live	AT&T	USA	Blackberry OS,Symbian, Android,Web OS,Windows Phone	3,683(05/2011)	undisclosed	undisclosed	70%	Free or US$795 /year	USA	https://appcenter.wireless.att.com/
Verizon App Store (Repalcing V Cast Apps)	13/09/2011	closed in 01/2013	Verizon	USA	Android, Blackberry OS	~3000 (May,2012)	undisclosed	undisclosed	70%	No testing fees	USA	http://products.verizonwireless.com/
AppSelect	17/11/2011	closed on 31/01/2013	Vodafone	UK	Android(Europe) + Blackberry OS/Symbian (Africa)	undisclosed	undisclosed	undisclosed	70%	Free	Europe & Africa	Multiple
Orange App shop	09/12/2009	Live	Orange	France	Android, Symbian,Blackberry OS	10,000(02/2010)	undisclosed	undisclosed	70%	Free	Belgium, Egypt, France, Jordan, Poland, Portugal, Romania, Spain, Tunisia, UK	http://applications-mobiles.orange.fr/application/Le%20Cloud%20d%27Orange
TIM Store	02/11/2010	Live	Telecom Italia	Italy	Blackberry OS,Android, Symbian	~1000(2012)	undisclosed	undisclosed	70%	undisclosed	Italy	http://www.timstore.tim.it
Mobile Market	17/08/2009	Live	China Mobile	China	Android, Symbian,Windows Mobile,Ophone	95,000(11/2011)	590million (11/2011)	138million active users(11/2011)	70%	Free	China	http://www.mmarket.com/
Wo Store	17/11/2010	Live	China Unicom	China	Android, Symbian,Windows Mobile	16,000(11/2011)	60million (11/2011)	30 million(11/2011)	70%	Free	China	http://store.wo.com.cn
E Surfing	03/2010	Live	China Telecom	China	Android,Windows Mobile,WinCE,Symbian	150,000(11/2012)	300million (11/2012)	120million(11/2012)	70%	Free	China	http://www.189store.com/
DoCoMo Market (Portal)	04/2010	Live	NTT DoCoMo	Japan	Android, Windows Phone,I-Mode	undisclosed	undisclosed	Android:2.52 million (2010); i-Mode:50 million (2010)	undisclosed	undisclosed	Japan	http://www.docomo-market.info/
Softbank Bookstore	12/2010	Live	Softbank	Japan	Web OS	372,000 (07/2012)	undisclosed	undisclosed	undisclosed	undisclosed	Japan	http://mb.softbank.jp/mb/service/smartphone/bookstore/
T-Store	09/09/2009	Live	SK Telecom	South Korea	Windows Phone, Symbian, Android , Linux,100 wireless internet platforms for interoperability(WIPI)	~6500 (09/2009)	undisclosed	undisclosed	70%	undisclosed	South Korea	http://www.tstore.co.kr
M1 App Shop	12/05/2010	Live	M1	Singapore	Android, Symbian,Blackberry OS,IOS,Windows phone	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	Singapore	http://appshop.m1.com.sg/web/main.zul;jsessionid=B85C856CA719C2E7C0B53A10F627FBED#home
Airtel App Central	10/02/2010	Live	Bharti Airtel	India	Android,symbian,Windows mobile	103, 000 (May 2011)	40 million (May 2011)	121.7 million subscribers (March 2010)	undisclosed	undisclosed	India	http://www.airtel.in/applications/genericlead/apps/index.jsp
MTN Play (Portal)	2009	Live	MTN	South Africa	Android, BlackBerry OS, Symbian ,Windows Mobile	16,000 free apps (09/2011)	undisclosed	undisclosed	undisclosed	undisclosed	Africa ,Asia	www.mtnplay.com

(Source: Wikipedia[78], WIP[79] and others[80])

78 http://en.wikipedia.org/wiki/List_of_mobile_software_distribution_platforms, Retrieved 02/03/2013
79 http://www.wipconnector.com/apis, Retrieved 02/03/2013
80 http://www.mobileappstorelinks.com/, Retrieved 02/03/2013

To become more influential on the market, mobile network operators had to collaborate to create an operator-led Wholesale Applications Community (WAC for short) which was started by AT&T, Verizon, Vodafone and others stakeholders which launched its service in February 2011.

MNO App-store cooperates with OS operator and has explored new operating ways. In March 2010, MM-Ovi Store saw a joint branding arrangement between China Mobile and Nokia for an application store. MM-Nokia store (replacing MM-Ovi store) was put into stable release on August 12, 2011[81]. MM-Nokia Store was preloaded on all of Nokia's China-variant Symbian phones. There is no data charge for browsing or downloading from the store. In December 2012, Nokia and China Mobile had announced a new Nokia Lumia phone based on Windows 8 OS with the TD-SCDMA standard. Users can download their preferred apps both from Nokia store and China Mobile Market.

3.3.1.3 Third-Party /TP App-store

The third Group is the Third-Party App-store /TP App-store operator (Table 3- 5). The entire TP App-store is classified by their operating systems supported in my thesis. Most TP App-stores support cross-platform apps development. There are also TP App-stores which focus on just one operating system like Android, iOS, Blackberry OS and Windows phone OS.

Changes happen every day in this fast moving business. In 2012,there were 28 typical cross-platform TP App-stores (Table 3- 5), 18 Android TP App-store (Table 3- 6), 4 iOS TP App-stores, 2 Blackberry OS TP App-stores and 1 Windows phone OS TP App-store (Table 3- 7). Some were closed and some were merged or acquired by the more competitive ones.

(1) Cross-platform TP App-store

Appboy is an online community for mobile app users[82]. Registered users can share their app ideas on Appboy and can win an iTunes credit voucher each month or when get enough votes. Developers can promote their apps through their own personal app store (i.e.appboy.com/name).

Communication between users and developers is possible. Regular users can use their profile pages to promote their favorite apps, ideas, and create their own app store of which they will receive a 5% commission. Appboy will award the user $250 who has an idea with enough positive votes and develop an app based on the idea. Interaction between developers and users enables developers to receive many practical developing demands and attractive incentives allow users to become involved in the app producing and consuming system effectively.

[81] http://www.enet.com.cn/article/2011/0813/A20110813897166.shtml,Retrieved 21/01/2013
[82] http://www.mobileappstorelinks.com/Appboy-App-Store-Guide.shtml, Retrieved 21/01/2013

Table 3- 5 Cross-platform TP App-store 1

Name	Launched time	Status	Vendor	Country	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Regional availablity	website
Appboy	15/02/2010	live	Appboy	USA	Android,Blackberry OS,Web OS,IOS	243,915 (05/2011)	undisclosed	undisclosed	Link through to other sites	undisclosed	worldwide	http://appboy.com
AppCentral (Replacing Ondeego)	11/09/2009	live	Ondeego	USA	Blackberry OS,IOS,Android,Windows Phone	undisclosed	undisclosed	undisclosed	70%	Free	North America,Europe (06/2011)	http://www.appcentral.com/
AppCity	01/05/2011	live	AppCity	France	IOS,Android,Windows Phone	~25,000 (06/2011)	undisclosed	undisclosed	undisclosed	undisclosed	worldwide	http://promo.appcity.com/
Appia	27/06/2008	live	Appia	USA	iOS,Android,Windows Mobile,Symbian,Web OS	~140,000 (01/2013)	~100million (06/2011)	400million (01/2013)	60% less transaction fees	Free	worldwide	http://www.appia.com/
Appitalism	16/09/2010	live	Mobile Streams	USA	iOS,Android,Windows Phone,Symbian,Mac OS	~1million (2012)	~3million (04/2011)	~15,000 (06/2011)	undisclosed	Free	USA,Canada,Europe,Latin America,Asia Pacific,Middle East and Africa	http://www.appitalism.com
Appolicious	2009	live	Appolicious	USA	iOS,Android	533,893 (05/2011)	undisclosed	undisclosed	70%	Free	worldwide	http://www.appolicious.com/
Djuzz (portal)	03/02/2010	Closed on 31/12/2012	BuzzCity	Singapore	Android,Windows Phone,Symbian,Blackberry OS,Web OS	8,000+ (02/2011)	80 million (02/2011)	320,000 users per day (02/2011)	100%	Free	India,Indonesia,Thailand,Malaysia,UK,France,Germany,USA,Mexico,South Africa,Kenya	http://m.djuzz.com
ExplorePDA	2004	live	ExplorePDA	USA	Android,Windows Mobile,Symbian,Blackberry OS,Web OS,Palm OS	1,500 (2012)	10 million (05/2010)	120million (05/2010)	75%	Free	worldwide	http://explorepda.com/
FastApp	12/03/2009	live	FastApp	Canada	Android,Symbian,Blackberry OS,IOS	441,904 (2012)	undisclosed	undisclosed	100%	Free	worldwide	http://www.fastapp.com

(Source: Wikipedia[83,] WIP[84] and others[85])

[83] http://en.wikipedia.org/wiki/List_of_mobile_software_distribution_platforms,Retrieved 02/03/2013
[84] http://www.wipconnector.com/apis, Retrieved 02/03/2013
[85] http://www.mobileappstorelinks.com/, Retrieved 02/03/2013

Table3-5 Cross-platform TP App-store 2

Name	Launched time	Status	Vendor	Country	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Regional availablity	website
Flypp	14/12/2009	live	Infosys	India	Android,Symbian,Blackberry OS,IOS	200,000 (2012)	undisclosed	undisclosed	depends on operator	Free	worldwide	http://www.infosys.com/flypp/pages/index.aspx
GetJar	31/12/2004	live	Getjar,Accel partners	USA	Android,Windows Mobile,Symbian,Blackberry OS,Palm OS,IOS	857,097 (01/2013)	3billion+ (01/2013)	undisclosed	undisclosed	Free	worldwide	http://www.getjar.com/
Handango (replacing PocketGear)	13/12/2000	live	Appia	USA	Android,Windows Mobile,Symbian,Blackberry OS,Palm OS,IOS	140,000+ (05/2012)	100million+ (2012)	millions of customers per month	80%	Free	worldwide	http://www.handango.com/
Handmark	03/11/1999	live	Handmark	USA	Android,Windows Mobile,Blackberry OS,Palm OS	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	worldwide	http://store.handmark.com/
Handster	01/06/2009	live	Opera	USA	Android,Windows Mobile,Symbian,Blackberry OS	35,000 (2012)	20million (2012)	undisclosed	90%-50% depending ondistribution channels	Free	worldwide	http://www.handster.com/
Maopao	01/09/2010	Live	Sky-mobi (Established in 2005)	China	Android, Symbian,Windows Mobile	770 apps +61,000 content titles(09/2010)	3.6 billion cumulative downloads (09/2010)	500 million (11/2011)	70%	Free	China	http://www.maopao.com/
Mobango	01/12/2004	live	Mauj Mobile	UK	Android,Windows Mobile,Symbian,Blackberry OS,IOS	100,000 (01/2013)	1 billion (01/2013)	8 million (01/2013)	all free apps	Free	worldwide	http://www.mobango.com/
MobileRated	02/10/2006	live	Mobile Rated	Canada	Android,Windows Mobile and CE,Symbian,i-Mode	55,000 (12/2010)	300million (12/2010)	undisclosed	undisclosed	Free	worldwide	http://www.mobilerated.com/
Mjelly	20/03/2010	live	Mjelly	UK	Android,Windows Mobile,Symbian,Blackberry OS,IOS	undisclosed	1million (06/2011)	undisclosed	undisclosed	Free	worldwide	http://mjelly.com
Mobihand	2004	Closed in September ,2012	Mobihand	USA	BlackBerry, Palm, Symbian, Windows Mobile and Android	5,000 (06/2009)	undisclosed	millions of customers (2012)	60-80%	Free	worldwide	http://www.mobihand.com/

Table3-5 Cross-platform TP App-store 3

Name	Launched time	Status	Vendor	Country	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Regional availablity	website
Mobile2Day (replaced by Handango)	27/06/2008	Merged into Handango	Appia	Germany	Symbian OS, Palm OS, Windows Mobile, BlackBerry, Android, webOS	undisclosed	undisclosed	undisclosed	60% less transaction fees	Free	worldwide	http://www.handango.com/
MobSpot	15/03/2010	Closed	MobSpot	USA	Android, BlackBerry OS, iOS,Palm OS, Symbian, webOS, Windows Mobile	undisclosed	undisclosed	undisclosed	undisclosed	Free	worldwide	http://www.mobspot.com/
OperaMobile	03/03/2011	live	Opera/Appia	USA	Android, Java, Symbian, BlackBerry OS, Windows Mobile, iOS	140,000 (03/2011)	700,000 per day (03/2011)	undisclosed	50% for Java; 70% for others	Free	worldwide	http://apps.opera.com/
Nexva	01/03/2010	live	Nexva	USA	Android, BlackBerry OS, iOS, Palm OS, Symbian, webOS, Windows Phone,Tizen OS	5,000 (06/2011)	undisclosed	undisclosed	70%-85%	Free	worldwide	http://www.nexva.com/
OpenAppMkt	30/07/2010	live	OpenAppMkt	USA	iOS,Android	undisclosed	undisclosed	undisclosed	80%	Free	worldwide	http://openappmkt.com/
Phoload	03/09/2008	live	Phoload	UK	Android,Symbian	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	http://www.phoload.com
WhiteApp	05/10/2009	live	PutlTout	UK	iOS,Android,Symbian	undisclosed	undisclosed	undisclosed	undisclosed	Depends on platform as resigning needed	worldwide	http://www.whiteapp.com/directory/
Zeewee	09/03/2011	live	Movile	USA	iOS,Android	1 million (06/2011)	undisclosed	400,000 (04/2011)	undisclosed	undisclosed	USA	http://www.zeewe.com/zeewe/web/
91 ZhuShou	2007	live	NetDragon Websoft	China	iOS,Android,Symbian, Windows Phone ,Windows CE	740,000+ (09/2012)	9.5 billion (09/2012)	~176 million (09/2012)	All free apps	Free	China	http://zs.91.com/

AppCentral is the first multi-platform App-store for the enterprise. AppCentral integrates AppFlow and AppGuard to make mobile enterprise applications easy to disbtribute, provide and secure.[86]

Appia creates app stores for clients and distributes apps to several series of app stores. Since its founding in 2008, it has rolled out a network of stores and run a number of operator decks before smartphones truly emerged. Appia is its own marketplace while simultaneously acquiring PocketGear, TP App-store and PocketGear's other operated app stores. Handango app store was acquired by Appia from PocketGear in February 2010.[87] Appia merged PocketGear's another Mobile2Day TP App-store into Handango brand later. PocketGear was rebranded Appia in February 2011 and shifted to a White-Label App Marketplace. In fact, PocketGear, Mobile2Day and Handango were the 15th,16th and 17th app stores in the Top 70 app stores in May 2011 according to the report of Netsize[88]. After a series of acquirements, Appia claims that there are over 140,000 mobile applications and Over 32,000 application developers in its market. More than 50 marketplaces and 2 of the 3 top carriers are supported by Appia.

Djuzz is an ad supported free mobile games portal run by mobile advertising network and social networking site BuzzCity. It closed 31/12/2012 with no comment from Buzzcity. In March 2012, BuzzCity had claimed that Djuzz hosted 19,000 games by the end of 2011 and the company recorded 90 million app downloads during the year, of which 48.6 million app downloads were games[89].

GetJar rose to prominence in the pre-smartphone days by distributing J2ME apps and is the largest and open app store in world offering mobile applications for almost all the handset and app store platforms in more than 200 countries.[90] Getjar focuses on providing the analytics and tools to help developers to better merchandise and monetise their applications. GetJar claimed that it was the world's largest free app store with over 2 billion downloads as of January 2013.

Explorepda.com is the premier provider of mobile content solutions and services to the wireless industry.

Handster is an Application Store solution company offering a white label platform and a branded Application Store (Handster.com). The platform supports Google Android, BlackBerry, Symbian, Windows Mobile and Java applications. In September 2011, Handster was acquired by Opera Software[91].

Maopao, LBS (Location Based Service) based website founded in September 2010 by Ski-mobi in China aims to supply low-end users with mobile applications, games and community. It can supply

[86] http://www.wipconnector.com/appstores/entry/appcentral , Retrieved 21/01/2013
[87] Handango was acquired by PocketGear On 23th, February 2010 and make PocketGear became the world's largest open cross-platform
[88] Netsize-Application store billing- white paper 2011
[89] http://www.medianama.com/2012/11/223-buzzcitys-mobile-gaming-apps-portal-djuzz-to-shut-down-by-december-31/,29/11/2012
[90] Netsize-Application store billing- white paper 2011
[91] http://iphone.handster.com/about.php ,Retrieved 29/01/2013

apps for Chinese customized platforms like Sky platform, Woqin platform and Kuyu platform users. Users can browse Englilsh version websites with Google Translate.

Maopao established a leading mobile social network community in China, the Maopao Community which provided applications, mobile social games and content with social network functions to the registered members.

In August 2011, Maopao had started supply the fashion share and management platform (http://www.emop.cn/) through the Chinese version microblog—Weibo. Sina weibo and Tencent weibo are the top 2 microblog in China[92]. Users can receive their customized products information from the largest Chinese B2C online platform Taobao through weibo and publish their own product information to their Weibo contacts by Maopao fashion share platform. Successful transaction took place in Taobao system. Maopao fashion share platform claimed that they had more than 380 million users as of February 2013. It is a profitable digital advertisement platform connected B2C online store and Social Network tools.

MOBANGO is the first Universal Mobile Community that allows cell phone users to publish, convert, and share with friends all kinds of user generated content -via the web and mobile devices- for personalizing and empowering the new cell phone's generation[93].

Mobile rated is a free cellphone games and applications and supports devices fed for free mobile games.

Mobihand with eight years history had served millions of worldwide customers and delivered hundreds of millions of downloads. In September 2012 it closed under heavy competitition and pressure specially form RIM focusing on Blackberry World. The fact that a relatively small nmber of large companies dominate the distribution makes it extremely difficult for independent/TP app distributors. [94]

Phoload is a comparatively new site proposing free games & applications to a large number of mobile platforms, including Android. It encourages more people to download mobile softwares and use their existing phone to its complete potential.[95]

91zhushou collects and supplies cracked version apps for IOS, Android, Symbian, Windows phone and Win CE users in China. It has its native popular apps like Xiongmao kan shu (Panda reading) and 91 lai dian xiu (91 calls show)[96]. Most of iPhone users in China download 91zhushou app.

✧ **Conclusions in cross-platform mobile app market:**

18 cross-platforms App-stores in 25 are from USA. 7 are from Europe countries: UK is the leader,

[92] Sina weibo was established in August,2009. There were 250million weibo subscribers till October, 2011.
[93] http://www.mobileappstorelinks.com/Mobango-App-Store-Guide.shtml,Retrived29/01/2013
[94] http://www.berryreview.com/2012/09/07/mobihand-shuts-down-its-app-stores-backup-your-apps-now/, Retrieved 29/01/2013
[95] http://freakify.com/5-famous-websites-to-download-free-mobile-games/, Retrieved 29/01/2013
[96] 91 lai dian xiu is call management software with calls attribution show,call firewall and sns sharing fuctions.

and then is Germany, France and others. China is catching up.

Android is the most popular mobile operating system for mobile network operators followed by Symbian, Blackberry and Windows Phone OS.

Most of the cross-platform app-stores supply worldwide services.

(2)Android TP App-store

In Android TP App-store world, there are 10 app stores from China which explains why my thesis focuses on the comparative research between Europe, US and China. For downloads, Hi Market My app, Mumayi are the top 3 app stores. For subscribers, Tencent My app, 360 手机助手 and Hi Market are the top 3 till December 2012 (Table 3- 6).

MacthFuel, known as Andspot before, provides daily app videogame recommendations to android users. Mikandi focuses on adult-themed applications.

Slideme provide apps for device manufactures. SlideME's App-Store client 'SAM' is preloaded on almost all respected manufacturers devices. It also offers solutions to niche market. Appoke was a French Android app store closed in January 2013.

(3) IOS & Blackberry OS & Window Phone OS TP App-store

For IOS TP App-store, Cydia is a popular one. It is an unofficial IOS application store only available to users with jailbroken IOS devices (Table 3- 7).

Lima is a browser-based apps installer for jailbroken iphones. Users can download apps which are not available in the official Apple App store within the Apple's safari browser.

PremierAppShop is a legal iPhone application store deliverying apps usable offline through a browser based shopfront.[97]

BB Nation supplies apps, themes, ringtones and games. CrackBerry store powered by Mobihand promotes the apps through the Crackberry community.

AmmApp is a Russian Window Mobile app store powered by General software. Over 1,500 apps are sorted by category, tags, keywords and system requirements[98].

[97] http://www.mobyaffiliates.com/blog/mobile-app-stores-list/,29/01/2013
[98] http://www.mobileappstorelinks.com/AmmApp-Store-Guide.shtml,Retrieved 29/01/2013

Table 3- 6 Android OS TP App-store

aMarket	2007	live	mAPPn (mobile App network	China	Android	80,000 (02/2012)	2billion+ (01/2013)	10million+ (01/2013)	undisclosed	Free	China	http://www.gfan.com/app/amarket/
Amazon	03/2011	live	Amazon	USA	Android	68,156 (01/2013)	undisclosed	undisclosed	70% of the sale price of the app or 20% of the list price	$99 free in the first year	Worldwide	http://www.amazon.com/mobile-apps/b/ref=sa_menu_adr_app4?ie=UTF8&node=2350149011
AndroidPit	08/07/2010	live	Fonpit AG	Germany	Android	6,000 (10/2010)	10million (date unavailable)	1million (2012)	70%	Free	Worldwide	http://www.androidpit.com/
AnZhiMarket	06/2010	live	力天无限	China	Android	80,000 + (03/2012)	180+ million per month	25million (03/2012)	undisclosed	Free	China	http://www.anzhi.com/
App China	2010	live	北京掌汇天下科技	China	Android	120,000 (12/2012)	2billion (12/2012)	40million (12/2012)	70%	Free	China	http://www.appchina.com/
Appbrain	02/03/2010	live	App Tornado GmbH	Switzerland	Android	35 (01/2013)	50million+ (01/2013)	undisclosed	as per Android Market	undisclosed	Worldwide	http://www.appbrain.com/
Appslib	08/2009	live	AppsLib	China-Hong Kong	Android	38,771 (01/2013)	undisclosed	undisclosed	70%	Free	Worldwide	http://appslib.com/
Appoke	25/05/2010	Closed on 31/01/2013	Appoke	France	Android	7,624 (01/2013)	undisclosed	undisclosed	undisclosed	Free or a user fee	Worldwide	http://www.appoke.com
Camangi	04/12/2009	live	Camangi	China-Taiwan	Android	100 + (06/2010)	100,000 (01/2011)	undisclosed	70%	Free	USA/Japan/Taiwan	http://www.camangimarket.com/index.html
HiMarket	29/09/2009	Live	NetDragon Websoft	China	Android	450,000 (12/2012)	4billion (12/2012)	45million (12/2012)	70%	Free	China	http://apk.hiapk.com/
MatchFuel (replacing AndSpot)	10/06/2010	live	Andspot	USA	Android	undisclosed	undisclosed	undisclosed	80%	Free	North America	http://andspot.com/
Mikandi	29/11/2009	live	Mikandi	USA	Android	undisclosed	undisclosed	80,000 (12/2009)	65%	undisclosed	Worldwide	http://mikandi.com/splashPage
Mumayi	2011	live	Mumayi	China	Android	300,000 (12/2012)	2.4billion (12/2012)	20million (12/2012)	70%	Free	China	http://www.mumayi.com/
MyApp (replacing Tencent App Center)	28/04/2011	Live	Tencent	China	Android	100,000+ (03/2012)	3billion (01/2013)	80million active users per month	undisclosed	Free	China	http://android.myapp.com/
Nduoa Market	05/2010	live	Ndoo	China	Android	9,000 (03/2011)	undisclosed	8million (01/2013)	70%	Free	China	http://www.nduoa.com/
SlideMe	11/04/2008	live	SlideMe	USA	Android	14,020 (10/2011)	undisclosed	undisclosed	80-98% (varies depending on user payment method)	Free	Worldwide	http://slideme.org/
Wandoujia	12/2009	live	北京卓易讯畅科技	China	Android	200,000 (04/2012)	1billion (04/2012)	30million (04/2012)	undisclosed	Free	China	www.wandoujia.com
360手机助手	2011	live	360	China	Android	100,000 (12/2012)	2.8 billion (12/2012)	70 million (12/2012)	70%	Free	China	http://www.360.cn/shoujizhushou/

Table 3- 7 IOS & Blackberry OS & Windows phone OS TP App-store

Type	Name	Launched time	Status	Vendor	Country	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Regional availablity	website
IOS app store	Cydia	02/2008	Live	Cydia	USA	iOS	30+ (06/2011)	undisclosed	4.5million users per week	undisclosed	Free	Worldwide	http://cydia.saurik.com/store/
	Lima	05/2011	Live	Infini Dev Team	Holland	iOS	undisclosed	1.4million (01/2013)	undisclosed	undisclosed	undisclosed	Worldwide	http://www.Infini-Dev.com
	PremierAppShop	07/01/2010	Live	Premier App Shop	USA	iOS	6 (06/2010)	undisclosed	undisclosed	undisclosed	undisclosed	Worldwide	http://premierappshop.com/
	SexAppShop	12/2009	Live	Premier App Shop	USA	iOS	thousands (2012)	95 million (2012)	undisclosed	undisclosed	undisclosed	Worldwide	http://www.sexappshop.com/
Blackberry OS app store	BBNation	07/07/2010	Live	Motek Mobile	USA	Black berry OS	500 (06/2011)	4million (06/2011)	1.6 million (06/2011)	undisclosed	undisclosed	Worldwide	http://www.bbnation.com/
	Crackberry	01/02/2007	Live	Smartphone Experts	USA	Black berry OS	700 (01/2013)	hundreds of thousands per month	tens of thousands per month	undisclosed	undisclosed	Worldwide	http://crackberry.com/
Windows Phone app store	AmmApp	12/2009	live	General Software	Russia	Windows Mobile	1,500 (09/2010)	undisclosed	undisclosed	Free apps only	Free	Worldwide	http://site.ammapp.ru/eng

3.3.1.4 Device Manufacture /DM App-store

Device Manufacture /DM App-store is not dominant in the mobile app market (Table 3- 8). Cisco, Dell, HTC, Sony, Huawei and Lenovo all have their own app stores based on Android to offer the apps to their users. Meizu is a Chinese native mobile manufacture and aims to supply the cheaper but powerful smartphones in China.

WAC is the abbreviation for operator-led Wholesale Applications Community started by AT&T, Verizon, Vodafone and others. It launched its service in February 2011. The first launch group includes China Mobile, MTS, Orange, Smart, Telefonica, Telenor, Verizon and Vodafone. WAC supports HTML5.At launch, there were already 12,000 apps built using WAC standards. Unlike consumer-facing app stores like iTunes or the Android Market, WAC apps aren't sold in a single standalone store which end users access on their own. Instead, these are wholesale apps will be launched into the participating operators' own App-store - those are the ones that are typically pre-installed on the devices themselves.[99]

[99] http://readwrite.com/2011/02/14/operators-launch-wac-wholesale-app-store,Retrieved 29/01/2013

Table 3- 8 Device Manufacture /DM App-store

Name	Launched time	Status	Vendor	Country	Mobile Operating System	Available apps	Downloads	User base	Sharing ratio for developer per sale	Developer fees	Regional availablity	website
CISCO AppHQ	11/07/2011	live	CISCO Systems	USA	Android	undisclosed	undisclosed	undisclosed	70%	$99 per annum	worldwide	https://marketplace.cisco.com/apphq
CoolMart	07/2009	Live	Yulong	China	Android,WinCE	50,000+ (08/2011)	100million (08/2011)	806,485 (02/2012)	undisclosed	Free	China	http://www.coolmart.net.cn/developer/coolmart/index.jsp
Dell Mobile App Store	08/2010	live	Dell (run by PocketGear)	USA	Android,Blackberry OS,Windows Mobile,Palm,Symbian	40,000 (04/2011)	undisclosed	undisclosed	60%	undisclosed	worldwide	http://dellmobileappstore.com/DellLanding.jsp?siteId=2622
Hicloud (智汇云)	05/05/2010	live	huawei	China	Android	undisclosed	undisclosed	10million+ (2012)	70%	Free	China	http://app.hicloud.com/
HTC	13/09/2010	live	HTC	Taiwan	Android	100,000 (2012)	undisclosed	undisclosed	N/A	Free	worldwide	https://www.htcsense.com/
LePhone App store	19/04/2010	live	Lenovo	China	Android (le Phone OS)	120,000 (10/2012)	200million (10/2012)	undisclosed	70%	Free	China	http://www.lenovomm.com/appstore/html/home.html
LG Smart World (replacing LG Application Store)	13/07/2009	live	LG Electronics	South Korea	Android in USA,Windows Phone in Asia	1,400 for Windows Mobile (2009)	undisclosed	undisclosed	undisclosed	undisclosed	worldwide	http://www.lgworld.com/web.gateway.dev
Meizu App Center	16/11/2009	live	Meizu Technology	China	Android(Flyme), WinCE 6.0(My mobile)	undisclosed	357+million (01/2013)	undisclosed	70%	Free	China	http://app.meizu.com/
Motorola Shop4Apps	21/01/2010	live	Motorola Mobility (Acquired by Google in 2012)	USA	Android ,Ophone	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	Argentina,Brazil,China,Mexico	http://www.motorola.com/Consumers/US-EN/SHOP4APPS/US-EN
Sony Entertainment Network	08/2011	live	Sony Network Entertainment International	USA	IOS,Android	18million tracks of music (01/2013)	undisclosed	undisclosed	undisclosed	undisclosed	worldwide	http://www.sonyentertainmentnetwork.com/
WAC	2010	live	Group of telecommunicators worldwide	UK	Android,WAC Standards	12,000 WAC apps (02/2011)	undisclosed	undisclosed	70%	undisclosed	worldwide	http://www.wacapps.net/

(Source: Wikipedia[100], WIP[101] and others[102])

[100] http://en.wikipedia.org/wiki/List_of_mobile_software_distribution_platforms,Retrieved 02/03/2013
[101] http://www.wipconnector.com/apis, Retrieved 02/03/2013
[102] http://www.mobileappstorelinks.com/, Retrieved 02/03/2013

3.3.2 Introduction of main App-stores

3.3.2.1 Apple App store

Apple App store (for iphone) launched by APPLE. Inc on June 27, 2008 came into existence via an update to iTunes. The Apple App store is a digital application distribution platform for iOS[103]. Users can browse and download applications from the App Store that were developed with the iOS SDK published through Apple, INC (Figure 3- 20). Developers can publish apps for iPhone, iPad, iPod touch and other iOS devices like Apple TV. They can also develop apps for iTunes. All iOS apps are sold exclusively through the iTunes Store.

iTunes is an application that supports the purchase, download, organization and playback of digital audio and video files and is accessible for both Mac and Windows-based computers. iTunes is integrated with the iTunes store which allows users to discover, purchase, rent and download digital content and applications. App store and iBook store are included in iTunes store. Users can access Apple App store through either a Mac or Windows-based computers or through an iOS devices[104].

Figure 3- 20 iOS and apps in Apple App store on iPhone

Apple App store is worldwide and developped country-specific stores for different variants. There were 800,000+ apps in Apple app store as of January 2013. There were 214,582 active Publishers in the US App Store on March 4, 2013 compared to 106,249 of September 19, 2011.[105] There were 410 million iOS devices that had been sold as of July 2012. At the end of January 2013, iOS users have downloaded over 40 billion apps from its App Store. Apple App store had created a new model of online application store (Figure 3- 21).

[103]IOS(known as iPhone OS before June 2010) is Apple's mobile operating system. Originally developed for the iPhone, it has since been extended to support other Apple, Inc. devices such as the iPod touch, iPad and Apple TV.
[104] Apple annual report 2012
[105] http://148apps.biz/app-store-metrics/,Retrieved 02/03/2013

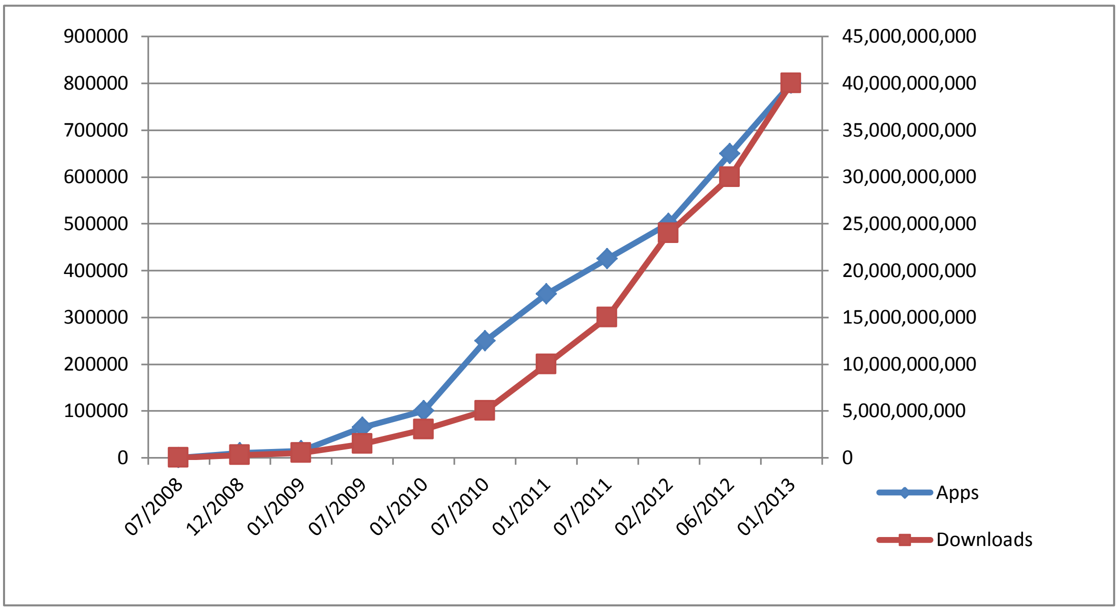


Figure 3- 21 Application and downloads in Apple App store from 2008 to 2013

As of January 2013, Apple paid its iTunes App Store developers a cumulative $7 billion, with $5 billion just in 2012. Because Apple retains 30% of all revenue, leaving 70% for developers, Apple's share since 2008 was around $3 billion out of a total of $10 billion. However, those payouts to developers weren't included in its reported $12.9 billion in iTunes revenues for 2012.[106]

3.3.2.2 Google Play

Google Play, formerly known as Google Android Market, is an online software store developed by Google for Android OS devices. It allows users to browse and download music, magazines, books, movies, television programs, and applications published through Google. Users can also search for and read detailed information about apps on the Google Play website. Apps can be installed from the Android device or the Google Play website. Google announced the Android Market on August 28, 2008. On March 6, 2012, with the merging of the Android Market and Google Music, the service was renamed Google Play. Google Play makes free-of-charge applications available worldwide, while paid applications are available in 129 countries as of January 2013[107].

[106]http://appleinsider.com/articles/13/02/11/apples-itunes-revenues-dont-include-7-billion-paid-to-app-developers, Retrieved 02/03/2013

[107] Google Play Help. Support.google.com. Retrieved 7 March 2012.

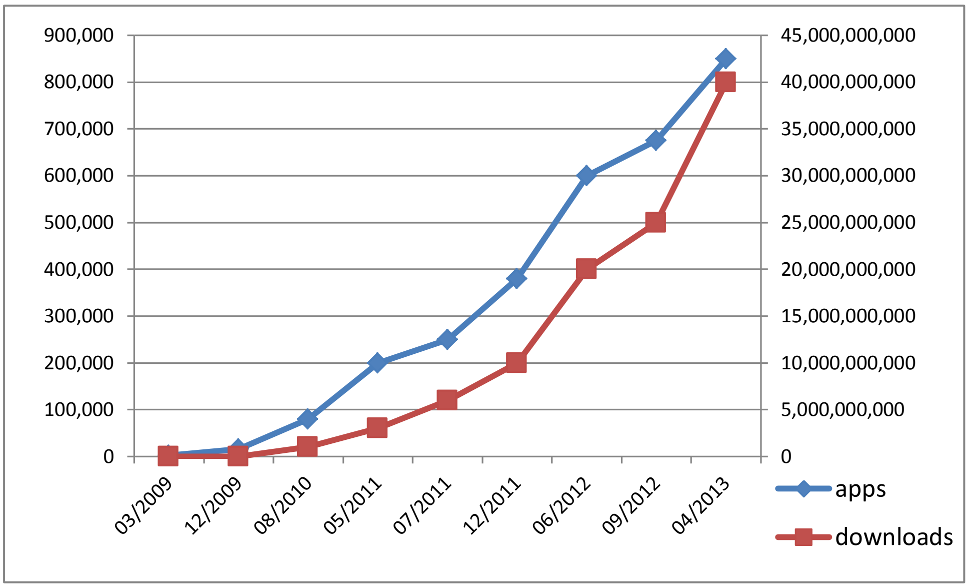


Figure 3- 22 Apps and downloads for Google android from 2009 to 2012

(Source: Wikipedia[108])

There were 500 million Android device activations as of September 11, 2012.[109] Japan and South Korea lead Google play's tremendous growth (Figure 3- 23). Google Play's revenue doubled in Q5 compared to Q3 in 2012.[110] 67% of Google Play revenue came from non-US markets in June 2012.

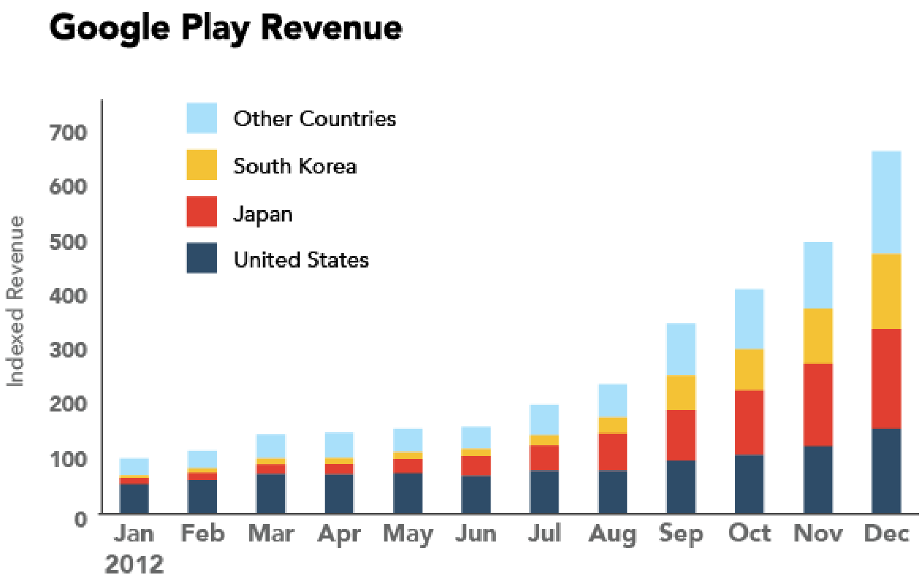


Figure 3- 23 Google Play Revenue by county in 2012

(Source: App Annie intelligence, Google Play January Revenue index set to 100)

Google Play offers applications to android devices which have been accepted by most mobile manufacturers, a definite advantage for its global reach network.

108 http://en.wikipedia.org/wiki/Android_Market 20/10/2011
109 http://www.businessinsider.com/500-million-android-activations-2012-9,Retrieved 02/03/2013
110 http://techcrunch.com/2013/01/30/japan-south-korea-led-google-play-app-to-revenue-to-double-from-q3-to-q4-2012-but-apple-still-revenue-leader/,Retrieeved28/02/2013

3.3.2.3 Blackberry World

On April 1, 2009, Blackberry World, previously known as Blackberry App world, was launched by Research In Motion (RIM) for a majority of BlackBerry devices. On January 21, 2013, BlackBerry announced that it rebranded the BlackBerry App World to simpler BlackBerry World as part of the upcoming release of BlackBerry 10 operating system.[111]

In September 2012, RIM announced that App World had more than 105,000 apps. There were 1billion downloads as of July 2011 and 3 billon one year later (July 2012) in Blackberry World (Figure 3- 24).

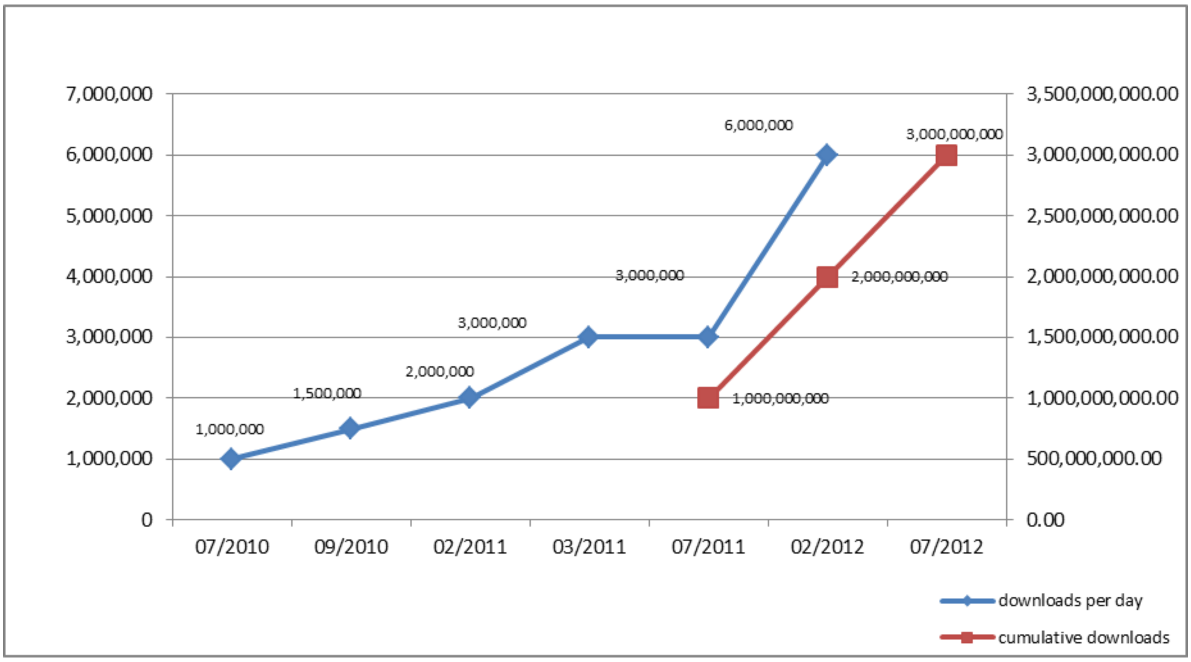


Figure 3- 24 Downloads per day and cumulative downloads for Blackberry World

(Source: wikipedia[112])

Unfortunately, Blackberry's revenue dropped dramatically by 25.2% in 2012 in comparison with 2011. The three main explanations being the rupture of service of Blackberry phones, the failure of Blackberry tablet Playbook at the end of 2011, and intense competition from Apple and Google. Blackberry's parent company-RIM's stock fell nearly 90% from 2009 to 2011.[113] The brand value of Blackberry dropped 39% from January 1, 2011 to January 30, 2012.[114]

3.3.2.4 Windows Phone store

Windows Phone store was introduced on October 6, 2009, formerly known as Windows Phone Marketplace (for Windows Phone 7) or Windows Marketplace for mobile at opening of the store.

[111] http://en.wikipedia.org/wiki/BlackBerry_World,Retrieved02/03/2013
[112] http://en.wikipedia.org/wiki/BlackBerry_World ,Retrieved 04/03/2013
[113] http://www.yidonghua.com/post/13612.html ,26/11/2012 Retrieved 02/03/2013
[114] BEST GLOBAL BRANDS REPORT 2012 from Interbrand, Retrieved 02/03/2013

Till October 2010, the Windows Phone SDK was downloaded over half a million times. As of December 2012, the Marketplace had more than 150,000 apps available. Apps from Windows Phone store are available for use directly on Windows phones (Windows mobiles' versions earlier than 6.5 require downloading a free Windows Phone store application) and on personal computers.

On February 15, 2010 Microsoft announced its next generation mobile platform named Windows Phone 7; it has its own separate app store, Windows Phone Marketplace for it; apps are not interchangeable between WM6.x and WP7.[115]

In August 2012, Microsoft official rebranded the "Windows Phone Marketplace" to "Windows Phone Store". The Marketplace section was changed to "Apps and Games".[116]

3.3.2.5 Nokia store

In May 2009, the Nokia Store was launched worldwide, previously known as Nokia Ovi store. On May 16, 2011, Nokia announced the discontinuation of the Ovi brand and the services rebranded under the main Nokia brand. Customers can download applications to their Nokia devices. Some of apps are free; paid apps can be purchased using credit card or through operator billing in selected operators.

The daily number of downloads reached 10 million in August 2011, as 158 developers reached over 1 million downloads for their Applications. In February Nokia announced it would use Windows Phone 7 as its primary Operating system, while Ovi store will still be available for the actual and future Symbian phones. At the same time, Ovi store and Windows Phone 7 Marketplace will be merged on the Windows Phone 7 platform. There are 116,583 apps as of December 2011.[117]

FromJanuary 1, 2011 to January 30, 2012, Nokia's brand value Showed a steady 16% decline and its revenue decreased 20.5%. Nokia's stock declined more than 50% in the Q1 2012 compared to 2011. Samsung shook up the market by recuperating all the market shares lost by Nokia to become the top one mobile devices manufacture in Q1 2012.

Nokia expects to regain the market shares with the Windows Phone OS and and will have to put in hard efforts to do so as it has lagged behind on the market and has definitely lost much ground.

3.3.2.6 China Mobile Market

China Mobile Market, MM for short, was launched in August 2009. It is a MNO app store. The 138 million active users downloaded 590 million apps from MM up to November 2011. Applications were about 95,000 in November 2011 (Figure 3- 25, Figure 3- 26).

Till December 2012, there were 140,000 apps, 240million registered users with 900 million cumulative downloads in China Mobile Market. MM began to collaborate with KT (Korea Telecom,

[115] http://en.wikipedia.org/wiki/Windows_Phone_Store,Retrieved 04/03/2013
[116] http://en.wikipedia.org/wiki/Windows_Phone_Store,Retrieved 02/03/2013
[117] http://en.wikipedia.org/wiki/Nokia_Store,Retrieved 04/03/2013

South Korean integrated wired/wireless telecommunication service provider), NTTDocomo, France Telecom and Nokia from June 2012.

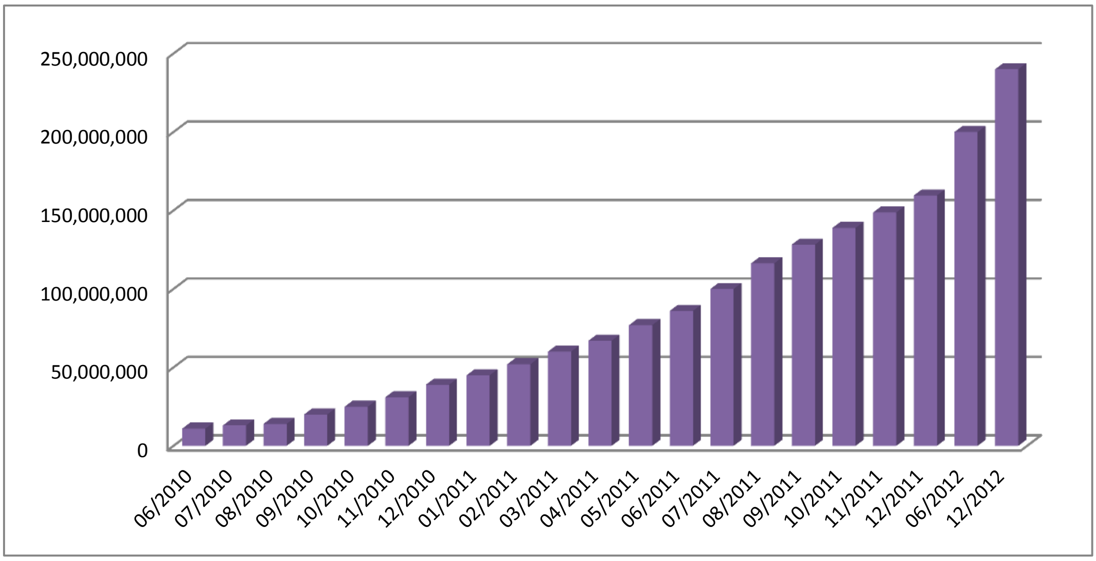


Figure 3- 25 China Mobile Market Registered users 2010-2012

(Source: http://dev.10086.cn[118])

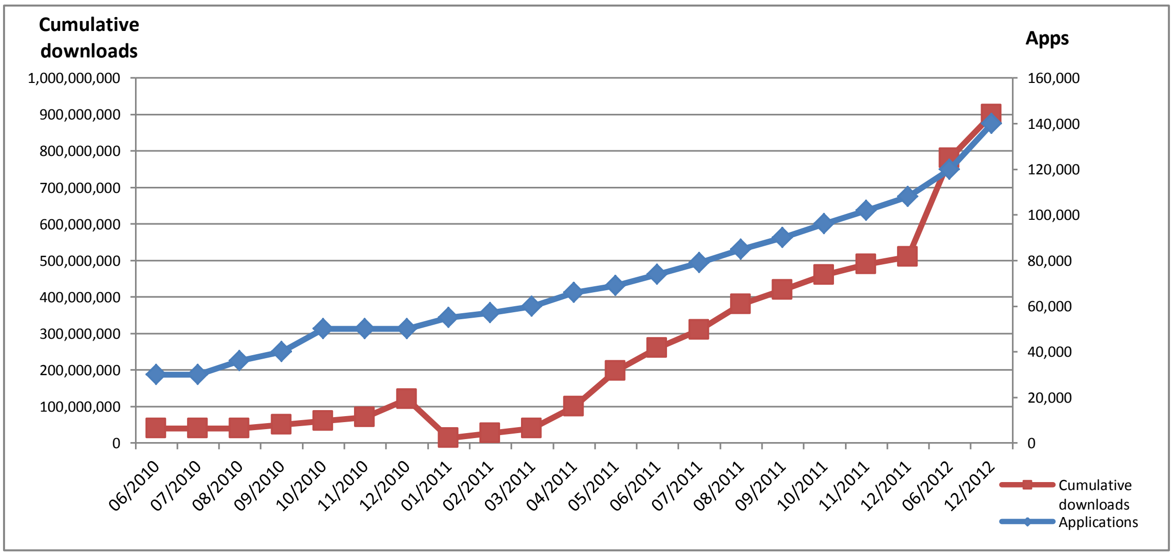


Figure 3- 26 China Mobile Market apps and cumulative downloads 2010-2012

(Source: http://dev.10086.cn)

[118] http://dev.10086.cn/news/MMnews/,Retrieved 02/03/2013

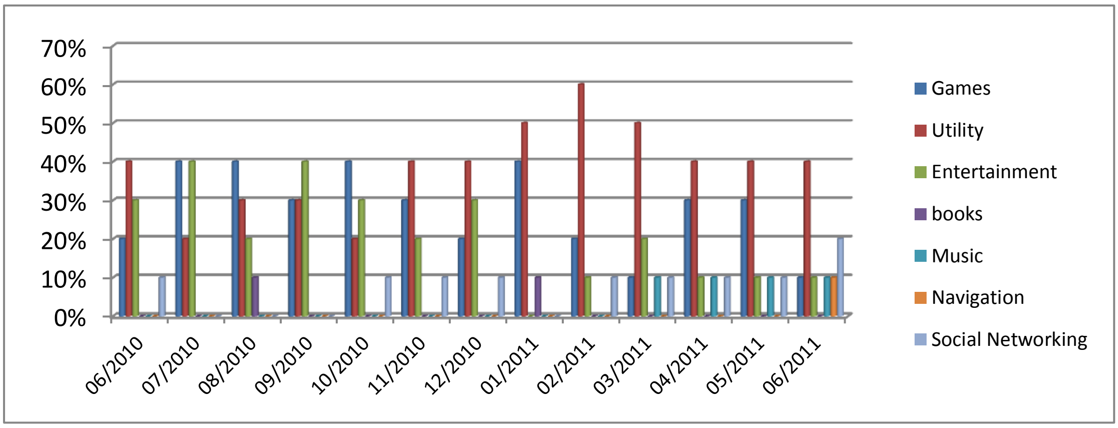


Figure 3- 27 Top 10 free and paid applications category in China mobile market 2010-2011
(Source: http://dev.10086.cn[119])

Games, Utilities and Entertainment were the three main categories in China Mobile market. Utilities increased considerably from 2010 to 2011.

3.4 Ad-store

Ad-store platform targets the publisher (app developer) who can supply ads displays and advertiser who needs to place ads through apps.

If we compare Ad-store and traditional ads platforms, there will be noticeable differences. A traditional ads platform faces mainly two sides – advertisers and audiences. And usually they control the media or ad network to deliver advertisements directly to their audiences.

Ad-store does not control the media directly. App developers come to Ad-store to offer advertising places as media. Mobile ads have to be delivered within publisher's mobile apps through mobile networks. Ad-store can monitor, track and evaluate the ads performance. When audiences read, click or install apps through mobile app ads, developers will be paid by Ad-store.

3.4.1 Classification of Ad-store

We can classify Ad-stores in three sections: into In-app store Ad-store, Third-party Ad-store and Aggregator Ad-store (Table 3- 9). In-app store Ad-stores are the strongest with their considerable advertising revenue. At the same time they effectively drive the app store development and subsidize the free app downloads in mobile app store. Third-Party Ad-store support cross-mobile operating systems and has a powerfull place in mobile app ad market. Third-party app ad platforms targeted at the vertical app segment like games fully satisfy and fufill the professional ads needs for advertisers and developers. The Aggregator Ad-store can access multiple ad networks and greatly simplify and optimize the ad performance for both advertiser and developer.

[119] http://dev.10086.cn/news/MMnews/,Retrieved 02/03/2013

Table 3- 9 Classification for Ad-store

Type	Features	Example
In-app store Ad-store	1 Operated by mobile app store; 2 Advertising mainly for its own mobile app store	iAd, Admob, MobWIN[120]
Third-party Ad-store	1Operated by traditional ad network or mobile ads agency; 2Advertising for apps from different app stores; 3Supports Cross-mobile operating systems with various ads display forms or focuses on special mobile app market segment	Millennial Media, InMobi[121], LeadBolt[122], Domob[123], Chart boost[124], Play heaven[125]
Aggregator Ad-store	1Performance based ad exchange agency; 2 Cross-Ad-stores platforms;	Mediation[126], Mobclix[127], Guohead.com[128]

(Source: http://www.cww.net.cn and Wikipedia)

iAd is a mobile advertising platform developed on April 8, 2010 by Apple Inc. for its iPhone, iPod Touch, and iPad line of mobile devices allowing third-party developers to directly embed advertisements into their applications. iAd facilitates integrating advertisements into applications sold on the iOS App Store. If the user taps on an iAd banner, a full-screen advertisement appears within the application, unlike other ads that send the user into the Safari web browser. Ads are promised to be more interactive than on other advertising services, and users will be able to close them at any time, returning to where they left their app.[129]

AdMob is a mobile advertising company founded in USA in 2006. Google acquired Admob in November 2009 for 750 million $ successfully defeating the bid of Apple. AdMob acquired the company AdWhirl, formerly known as Adrollo, which is a platform for developing advertisements in iPhone applications after the acquirement by Google. AdMob is one of the world's largest mobile advertising platforms and claims to serve more than 40 billion mobile banner and text ads per month across mobile Web sites and handset applications. It offers Ads for Android, iOS, webOS, Flash Lite, Windows Phone 7 and all standard mobile web browsers. It claims that it can reach over 100,000 apps and sites.

[120] Mobwin is an Ad-store platformfor Tencent in China. Tencent owns its mobile app store named my app.com.
[121] InMobi is a performance based mobile ad network backed by Soft Bank and Kleiner Perkins Caufield & Byers. The company was founded in 2007 in India with offices in several countries.
[122] LeadBolt is a mobile advertising network. The company was founded in 2010 in Sydney, Australia by Dale Carr. Originally founded as a web focused CPA Network in the niche area of Content Locking, in 2011 it launched its mobile advertising platform.
[123] Domob is a Chinese mobile app ad agency which was launched in March, 2013.
[124] https://www.chartboost.com/overview, Retrieved 02/03/2013
[125] http://www.playhaven.com/, Retrieved 02/03/2013
[126] Admob Mediation replaced its own aggregator app ad platform Adwhirl in September, 2013.
[127] http://www.mobclix.com/, Mobclix is a American mobile ad exchange agency launched in March, 2008.
[128] Chinese mobile ads optimization agency, http://www.guohead.com/home.html
[129] iAD, http://en.wikipedia.org/wiki/IAd,Retrieved 02/03/2013

Chart boost and Play heaven are two striking game app advertising platforms. Chart boost, founded in 2011, aims to solve the difficult and high promoted cost for mobile games app promotion problem. The developer can advertise and promote his own apps by implanted ads into other developer's app. This spread so quickly that there were more than 8,000 games in Chart boost's platform one year after its establishment. Chart boost displays ads through full screen and boot-up interstitials .This gives users not only a better experience but greatly improves the click through rate (CTR) and eCPM (effective click per thousand impressions.

3.4.2 App ad billing methods

Typically, app ad is a relatively small CPM (cost per thousand impressions) that is under one dollar and a CPC (cost per click) that can be a few dollar in the mobile app market. CPM, CPC and CPI are the commonly used app ad billing methods.

3.4.2.1 CPM

Cost per mille (CPM), called pay per mille (PPM), cost per thousand (CPT) (in Latin mille means thousand) is a measurement in traditional advertising and online advertising. CPM reflects the cost per 1000 views or impressions of an ad for advertiser. CPM also means cost per thousand impressions[130].

CPM in the mobile app market means the cost per 1000 impressions of the ad for an app. Revenu is generated from in-app advertising. Advertising can be self-sourced by the developer, or it can be done through a professional ad provider. The App advertiser pays per impression (PPM) or per ad displayed.[131] CPM is useful in comparing the relative efficiency of different advertising opportunities or media and in evaluating the costs of overall campaigns.[132]

CPM is easier to tally up views than clicks-through's (CPC).It is more efficient for ad space provider to fill the ad space than it is by self-sourcing. Ads provide a source of continued revenue for ad space providers.

There are some disadvantages for CPM. Ad space providers take a share of the advertising revenue for the app advertiser. A large base of users is required to generate significant revenue. Users may be discouraged by ads.

3.4.2.2 CPC

The Cost Per Click (CPC) (also called Pay Per Click (PPC)) is the amount spent to have an advertisement clicked.[133] CPC displayed advertisements, also called "banner" Ads, are shown on web sites, search engine results or mobile app with related content that have agreed to show ads.

[130] http://en.wikipedia.org/wiki/Cost_per_mille, Retrieved o2/03/2013
[131] Mobile Monetisation A revenue stream Framework,19/07/2011,Retrieved 02/03/2013
[132] CPM, http://en.wikipedia.org/wiki/Cost_per_mille,Retrieved02/03/2013
[133] CPC, http://en.wikipedia.org/wiki/Cost_per_click, Retrieved02/03/2013

CPC means the cost every time a user clicks on the ad inside of an app (in-App) in the mobile app market. CPC works in the same way as CPM. The only difference is the app advertiser pays for ad space provided per click not per thousand impressions. More revenue is generated per click than per view or impression. However there, user's attention can be diverted and there is the risk of occupying an ad space with an ad that generates neither clicks nor revenues.

3.4.2.3 CPI

The Cost Per Install (CPI) means the app advertiser pays per install[134]. Cost Per Install is a relatively new marketing mechanism and is the mobile equivalent to CPA (cost per acquisition) in the web marketing world. Chart boost and Play heaven supply CPI supported software installed into apps. Agency fees for Playheaven through CPI ranged from \$ 0.8 to \$ 3 in 2012.

There is another way for advertiser to pay for the publisher or for the Ad-store platform - CPA. Cost Per Acquisition/Action or CPA (also known as Pay Per Action or PPA) is an online advertising pricing model, where the advertiser pays for each specified action (a purchase, a form submission, and so on) linked to the advertisement.[135]

3.5 Description of participants in mobile app market

Participants except App-store and Ad-store will be described in this section.

3.5.1 Mobile Operating System

A mobile operating system, known as mobile OS, operates a smartphone, tablet, PDA, or other digital mobile devices. Mobile OS can deal with the wireless versions of broadband and local connectivity, mobile multimedia formats and different input methods, and with the advantage it is simpler than the operating system for desktop computer or laptop. Mobile OS combines features of PC OS with touchscreen, cellular, Bluetooth, WiFi, GPS mobile navigation, camera, video camera, speech recognition, voice recorder, music player, near field communication, personal digital assistant (PDA) and other features[136]. Mobile OS is both a core part and major force in the mobile app market.

The increasing importance of mobile devices has triggered competition among software leaders like Google, Microsoft and Apple and mobile industry leaders Nokia, RIM (Research in Motion) and Palm.

The mobile operating system for Google is Android OS; for Microsoft are Windows Mobile and Windows Phone OS; for Apple is iOS; for Nokia is Symbian OS and MeeGo[137]; for Rim is

[134] 5 ways free apps make money, http://www.bluecloudsolutions.com/blog/5-ways-free-apps-money/,Retrieved 02/03/2013

[135] CPA, http://en.wikipedia.org/wiki/Cost_per_action, Retrieved02/03/2013

[136] http://en.wikipedia.org/wiki/Mobile_OS, Retrieved 02/03/2013

[137] MeeGo is a Linux-based open source mobile operating system project and now developed by Nokia,Linux foundation,Intel,Novell and AMD.

blackberry OS and for Palm is Web OS. Palm Web OS was purchased by HP in April 2010 and now is HP Web OS. The mobile operating system for Samsung is Bada (Table 3- 10).

Android, Bada and webOS were built on top of Linux, and iOS was derived from the BSD and NeXTSTEP operating systems, all related to Unix.

Table 3- 10 Main features for the main mobile operating system in September 2011

	iOS	**Android**	**Web OS**	**Windows Mobile**	**Windows Phone**	**Blackbery OS**	**Symbian**	**Bada**
Company	Apple	Open Handset Alliance (Google)	HP/Palm, inc	Microsoft	Microsoft	RIM	Nokia	Samsung
OS Family	Mac OS/Unix-like	Linux	Linux	Windows CE 5.2	Windows CE 7	Mobile OS	Mobile OS	Proprietary RTOS or Linux
Supported CPU architecture	ARM	ARM,MIPS, Power Architecture, X86	ARM	ARM	ARM	ARM	ARM	ARM
Programmed in	C,C++, Objective-C	C,C++	C	C++	Many,NET (Silverlight/ XNA)	Java	C++	C++
License	Proprietary EULA except for open source components	1.0-2.x,4+: Free and opensource; 3.X Honeycomb: closed source	Free and opensource except closed source modules	Proprietary	Proprietary	Proprietary	Eclipse Public License	Proprietary
Package manager	iTunes	APK	App catalog (official) Preware (3rd party homebrew)	Windows Mobile Device center/Active Sync	Zune software	Blackberry Desktop Manager	Nokia Ovi suite	N/A
Wireless system updates	5+	Yes	Yes	No	No	Yes	Yes	No

(Source: Wikipedia[138])

3.5.1.1 Market share of mobile OS

Apple was the first to introduce iPhone in 2007 thereby opening a new century of mobile operating systems for smartphones and other devices that focus on finger-operated touch based interaction.

[138] http://en.wikipedia.org/wiki/Mobile_operating_system,Retrieved 09/09/2011

Google then entered the smartphone market by Android OS through forming the Open Handset Alliance with 79 software, hardware and telecom operators in world in November 2007. The smartphone market flourished in May 2010 resulting in a 17.3% of all mobile phones sold[139]. This triggered an intense burgeon and stiff competition of various mobile operating systems by software companies, manufactures and mobile operators all over the world. IOS and Android both made dramatic increases.

Symbian's sharp plunge was disappointing. Blackberry, the top one brand went down 39% of its brand value in 2012 compared to 2011. Windows Mobile OS left quietly and Windows Phone OS is hardly catching up. Bada's OS climbed with market shares of 1.2%, 2% and 2.3% in 2010, 2011 and 2013.

During the past 5 years, iOS increased rapidly by 8.2% in 2008 to 14.4% in 2009 (Figure 3- 28). However, there was a mere 0.2% increase from 2011 to 2012 when Android suddenly took an amazing share of the market. Now iOS takes nearly one fifth of the mobile OS market share.

Google android rocketed up with two-thirds of the mobile OS market share that represented 66.2% in 2012. We can call 2010 the golden Android year with an increase of 7 times. Market share doubled in 2011. It continued to increase by 20% compared to iOS's 0.2% from 2011 to 2012.

Until 2010, Symbian had taken the biggest share of the mobile operating system market until 2010. However its market share declines dramatically as time goes by. Now it just has only 4.2% in mobile OS world.Android with an amazing growth pattern from 3.9% in 2009 to 46.5% in 2011 replaced Symbian to be the number one. As of February 2011, Nokia announced a partnership with Microsoft ended the development of Symbian OS, the most popular feature phone OS, by the end of 2011 in favor of Windows Phone.[140]

It is sad to see blackberry's decline after reaching a peak. It reached the peak in 2009 with 19.9% market share. 2007 to 2009 were good times but 2012 was tough with a 5% decrease.

Web OS was introduced by Palm in January 2009 and was purchased by HP in April 2010. In March 2011, HP announced plans for a version of webOS for the end of 2011 to run within the Microsoft Windows operating system, and to be installed on all HP desktop and notebook computers in 2012. But In August 2011, HP announced that Web OS device development and production lines will be halted[141].

Although Windows is the software giant of the desktop computer, it did not do as well in the smartphones market. Windows Mobile OS had fallen down from 2007 to 2011. It disappeared in 2012 and was replaced by Windows Phone OS. Windows Phone OS had reached 2.5% in 2012.

[139] Foresman, Chris ,"Mobile market up, smartphones up, Android and iPhone way up",20/05/2010
[140] http://en.wikipedia.org/wiki/Mobile_operating_system,Retrieved 09/09/2011
[141] http://en.wikipedia.org/wiki/WebOS

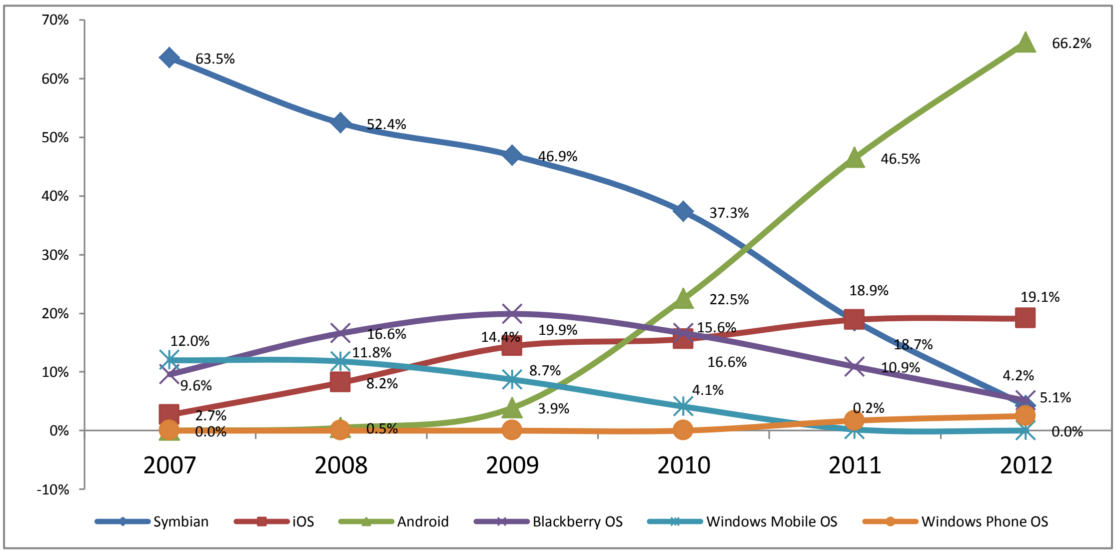


Figure 3- 28 Mobile OS (installed in smartphones) market share 2007-2012

(Source: Gartner[142])

3.5.1.2 Geographical distribution of mobile OS

There are geographical differences of mobile OS adoption vary consideraly. The survey from digital marketing agency iCrossing UK showed us distribution and changes in 15 countries from 2010 and 2011 (Figure 3- 29, Figure 3- 30).

Compared to mobile OS market share distributions for USA, UK, Germany, France, Russia, Japan and China in 2010 and 2011, we can find that iOS declined in its market share with the exceptions of USA(increased 7%) and China (increased 1%). iOS was in white color in 2011 and black color in 2010.

2011 was a big year for Android, with the massive growth in most of countries especially in UK (increased 10%) and in China (increased 19%). We can see the green color that represents Android in Figure 3- 29. Android rocketed up with 19% in Russia market in 2011. And Android in Japan had doubled to 46% in 2011 compared to23% in 2010.

BlackBerry was actively present in USA and UK, only to lose a significant part of the market in the States and declined by 26% in one year.

Symbian were succesfull in China and Russia with 40% and 41% in 2011. However, there were still the decreases for Symbian in Russia with 6% and in China with 19% from 2010 to 2011. Symbian in Germany and France dropped to much smaller market shares representing only 5% and 4% in February 2011.

In 2012 Android continued to increase and stabilized in 2013 (Figure 3- 28). iOS had worked on maintaining its global market share in 2012 and 2013.

142 http://en.wikipedia.org/wiki/Mobile_OS,http://www.gartner.com/,Retrieved 02/03/2013

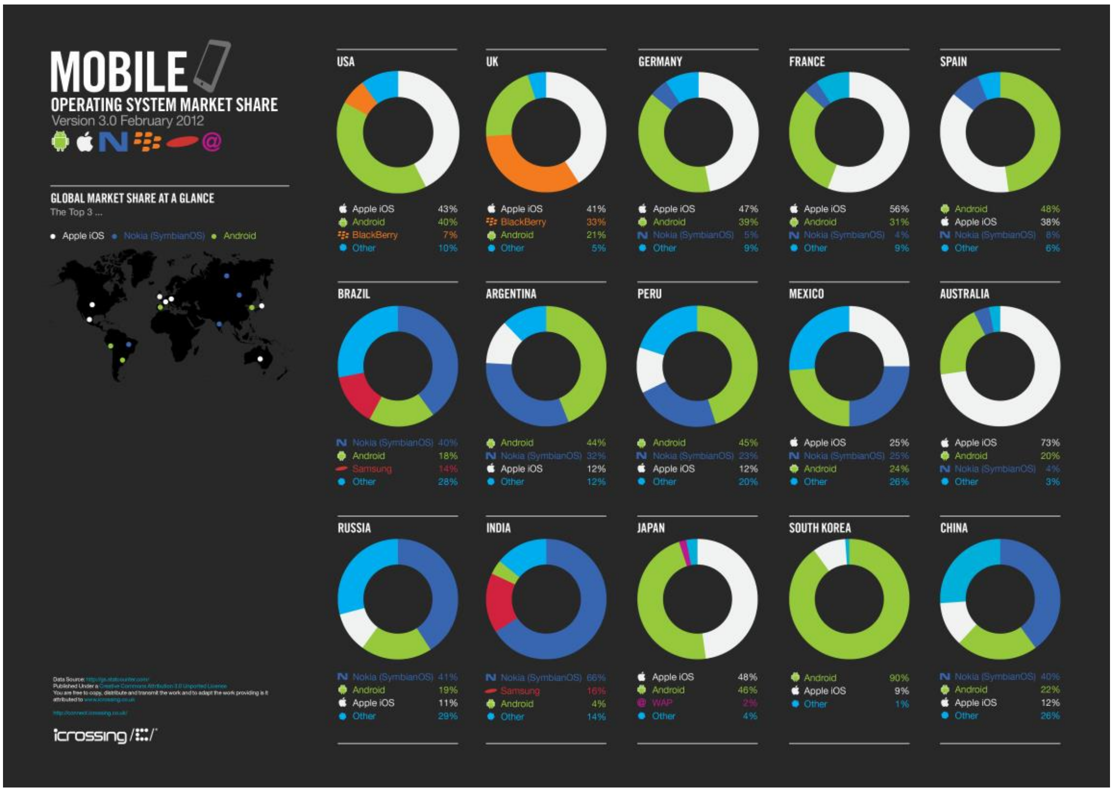


Figure 3- 29 World mobile OS market share in 2011

(Source: icrossing[143])

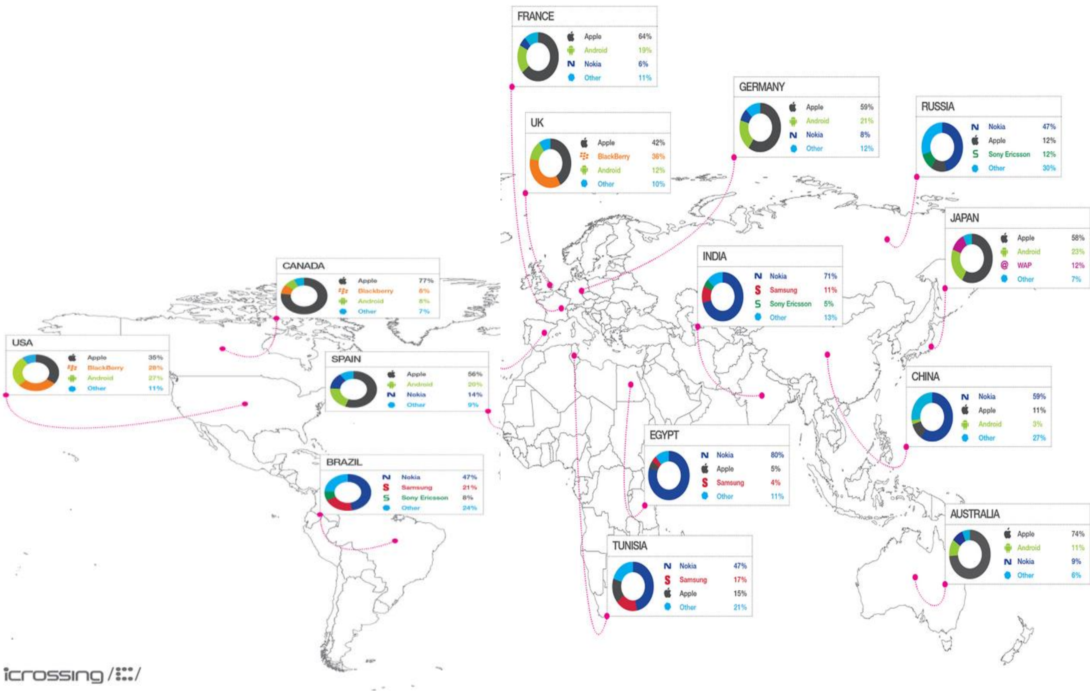


Figure 3- 30 World mobile OS market share in 2010

(Source: icrossing[144])

143 http://connect.icrossing.co.uk/2012-mobile-market-share-infographic_7962,Retrieved 02/03/2013

3.5.2 Developers

Developers or publishers for app store can be either individual or enterprise .Both called third-party developers. As of February 9, 2013, there were about 536,596 Publishers according to XYO[145]'s report. Thanks to the global developer report from mobile app analytic company 'Vision mobile' in 2013, we can abstract some common features of app developers. There were 3,400 developers in Vision Mobile's online survey.

3.5.2.1 Main features of app developers

- iOS and Android are the duopoly platforms for developers.

In January 2013, Android was the leader in the market with 72%, an increase of 4% from January 2012, while iOS took 61% with a 5% increase according to Vision Mobile's report 2013[146]. The third one is Blackberry.

Geographically, Android is leading in Asia and Europe. Android and iOS are almost parity in North America. Developers for Windows phone and Blackberry are well placed in North America. There are still developers interested in Windows Phone OS besides iOS and Android for making money in USA.

- Blackberry generated the most on the average revenue per app per month; iOS generated 35% more than Android.

According to Vision Mobile's report 2013, BlackBerry comes out on top in terms of average revenue nearly $3,900 per app per month for developers. iOS developers generate about 4% less revenue than Blackberry with $3,744 per app per month. Android developers generate about $2,434 per app per month with 35% less than iOS[147]. It is evident that the biggest revenue makers are iOS and Android.

iOS wins over Android due to superior demographics (Apple users are less price sensitive), superior content (higher ratio of paid apps to free apps), tablet domination (where per app prices are higher) and frictionless payment (400 million accounts on file with one-click payment).

- HTML5 as a technology took the third place for mobile app developments. It is the complement for iOS and Android platforms. Statistics show that the HTML5 is becoming stronger with 5.72% of iOS developers and 56% of iOS developers using its platform[148].

[144]http://www.readwriteweb.com/mobile/2011/02/mobile-operating-system-market-share-feb-2011-infographic.php,Retrieved 03/03/2012
[145] http://xyo.net/app-downloads-reports/,Retrieved 02/03/2013
[146] Developer Economics 2013: The tools report, Retrieved 02/03/2013
[147] http://www.visionmobile.com/blog/2012/06/report-developer-economics-2012-the-new-app-economy/, Retrieved 02/03/2013
[148] N=2327

- 78% of developers concentrate on cross-platform app developments. And the majority opts for IOS as their first choice.

  78% of developers use 2 or more platforms. Developers concentrate more and more on platforms. On the average, mobile developers use 2.6 mobile platforms in the beginning of 2013, compared to 2.7 in 2012 and 3.2 in 2011 according to Vision mobile's research. iOS is the first choice for about 42%of developers vs. 31% for Android because of the integral ecosystem and high monetization advantages for iOS(Figure 3- 31).

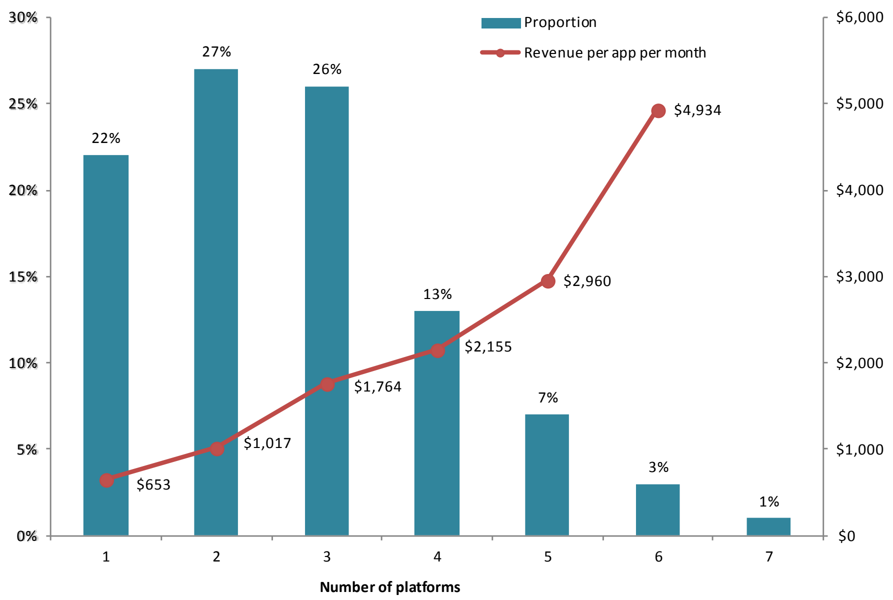


Figure 3- 31 Cross-platform developer revenue per app per month

(Source: Vision mobile, n=1639 weighted[149])

- Top 10 world app developers in January 2013

For Android, Google Inc is the biggest developer famous for its sensational app YouTube. The bigger Game developer Gameloft published more apps for iOS than Android. Imangi Studios, LLC were presented on both Android and iOS by its well-known game Temple Run (Figure 3- 32, Figure 3- 33).

[149] Vision mobile, Developer Economics 2013: The tools report,Retrieved 02/03/2013.

Developer	Number of apps published	Paid apps	Free apps	Most downloaded app	Key country	Downloads in January 2013
Google Inc.	79	0	79	YouTube	US (41%)	249,000,000
Imangi Studios	2	0	2	Temple Run	US (44%)	24,900,000
Facebook	3	0	3	Facebook	US (39%)	21,600,000
NAVER	71	1	70	LINE:Free calls & Messages	TW (39%)	21,300,000
Outfit 7	30	13	17	Talking Tom cat 2 Free	KR (21%)	16,900,000
Gameloft	81	42	39	UNO™ FREE	US (23%)	13,400,000
Kiloo Games	5	1	4	Subway Surfers	US (26%)	14,500,000
GO Launcher EX	109	16	93	GO Locker	US (35%)	12,900,000
Italy Games	12	0	12	3D Bowling	US (40%)	12,600,000
Miniclip.com	24	1	23	Hambo	US (26%)	11,500,000

Figure 3- 32 Top 10 Android app world developers in January 2013

(Source: XYO[150])

Developer	Number of apps published	Paid apps	Free apps	Most downloaded app	Key country	Downloads in January 2013
Gameloft	242	120	122	Assassin's Creed Altair's Chronicles Freel	US (22%)	21,800,000
NAVER Japan Corporation	58	2	56	LINE Play	JP (95%)	20,400,000
RedSpell	12	2	10	Words with free EZ Cheats-auto cheat with OCR for words with Friends game (HD version supported)	US (96%)	19,900,000
游道易Yodol	25	9	16	火药猴	CN (100%)	17,800,000
GungHo online Entertainment, Inc	16	1	15	パズル＆ドラゴンズ	JP (99%)	17,900,000
WeMade Entertainment CO.,LTD	8	0	8	캔디팡 for Kakao	KR (90%)	17,800,000
Electronic Arts	324	205	119	The Simpsons™ . Tapped out	US (31%)	10,800,000
Zynga	51	15	36	Words with friends Free	US (78%)	13,200,000
FDG Entertainment	53	30	23	Cover Orange	US (54%)	8,040,000
Imangi Studios, LLC	15	2	13	Temple Run	US (35%)	14,500,000

Figure 3- 33 Top 10 iPhone app world developers in January 2013

(Source: XYO[151])

[150]http://xyo.net/android-publishers/?country=ANY,Retrieved02/03/2013
[151]http://xyo.net/iphone-publishers/?country=ANY, Retrieved02/03/2013

3.5.2.2 Developers for the main app stores

All the main App-store platforms have supplied the developing technologies, resources and support for developers. I will focus on the app store for Apple, Google, Windows, Nokia and China Mobile.

Apple App store

Apple App store has a website http://developer.apple.com/ for developers.

- Developing environment and procedures in Apple App store

All applications developed for Apple App store are based on the iOS SDK or Mac SDK. The Software Development Kit for iPhone OS was announced in March 2008. The SDK allows developers running Mac OS X 10.5.4 or higher on an Intel Mac to create applications using Xcode that will natively run on the iPhone, iPod Touch and iPad[152]. Apple App store provides access to the Apple SDK, tools, support and forums for all developers.

The following three basic procedures are for creating an application in Apple App store: development, test and distribution. Developers can choose the price for their applications and get 70% of sale revenues from Apple without paying credit card fees, hosting fees and marketing fees. There is no charge for free apps.

- Distribution ways in Apple App store

Apple App store charged $99/year subscription fee with standard package or $299/year subscription fee with enterprise package with the iphone SDK. The applications which run on the Apple devices have to be signed only after the developers had subscribed in Apple App store.

There are two distribution programs for third-party developers: standard and enterprise. Applications distributed through the standard program only can be submitted and sold through Apple App store. The enterprise program (ios Enterprise Develop Program/iEDP) allows corporate developers to get access to the Apple SDK, as well as some additional resources that enable development of in-house iOS applications. The apps can be distributed to employees, members and contractors of a company or organization without using the iTunes App Store. Before September 2010, the enterprise program allowed only the organizations with 500 or more employees and now any organization with a DUNS [153](Data Universal Numbering System) number can join this program.

- Developers for Apple App store

[152] http://en.wikipedia.org/wiki/App_Store_(iOS)
[153] DUNS is a system developed and regulated by Dun & Bradstreet (D&B), that assigns a unique numeric identifier, referred to as a "DUNS number" to a single business entity. The DUNS database contains over 100 million entries for businesses throughout the world.

As of March 4, 2013,there were about 215,656[154] active developers in Apple App store in US which took 40% of 536,596 total global developers (Figure 3- 34).

Apple App store doubled the revenue for developers from June 2011 to June 2012. As of January 2013, it reached to $7 billion. Because Apple retains 30% of all revenue, leaving 70% for developers, Apple's share since 2008 was around $3 billion out of a total of $10 billion (Figure 3-35).

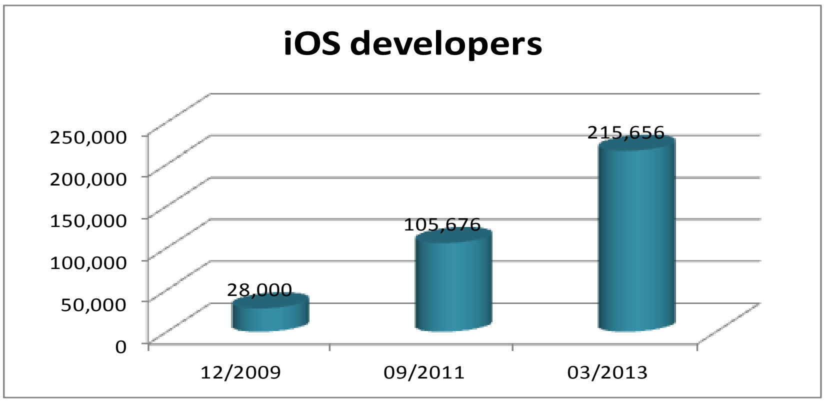


Figure 3- 34 iOS developer numbers 2009-2013

(Source: 148Apps.biz)

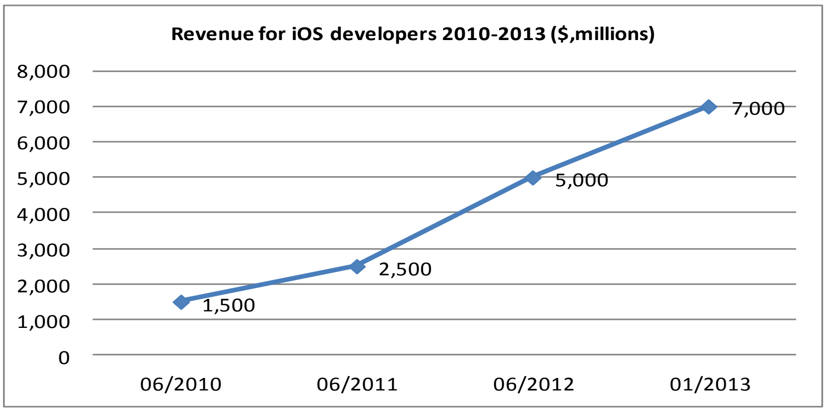


Figure 3- 35 Revenue for iOS developers 2010-2013

(Source: Tech Crunch[155])

Google play **Google Play**

Google has its own app store—Google Play with the website:http://developer.android.com.

Google Play was launched in October 2009 one year later than Apple App store. It has the major feature of being compatible with different types of devices and supply the applications, like htc, Samsung and so on. As of August 2011, the Android operating system was installed in 130 million

[154] http://148apps.biz/app-store-metrics/,Retrieved04/03/2013

[155]http://techcrunch.com/2012/06/11/apples-app-store-hits-30-billion-downloaded-apps-paid-out-5-billion-to-developers/,Retrieved 02/03/2013

total devices.

Google has its own operation system Android for mobile devices such as smart phones and tablet computers. It is developed by the Open Handset Alliance led by Google. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Android consists of a kernel based on the Linux kernel, with middleware, libraries and APIs written in C and application software running on an application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run compiled Java code. Android has a large community of developers writing applications ("apps") that extend the functionality of the devices. Developers write primarily in a customized version of Java [156](Figure 3- 36).

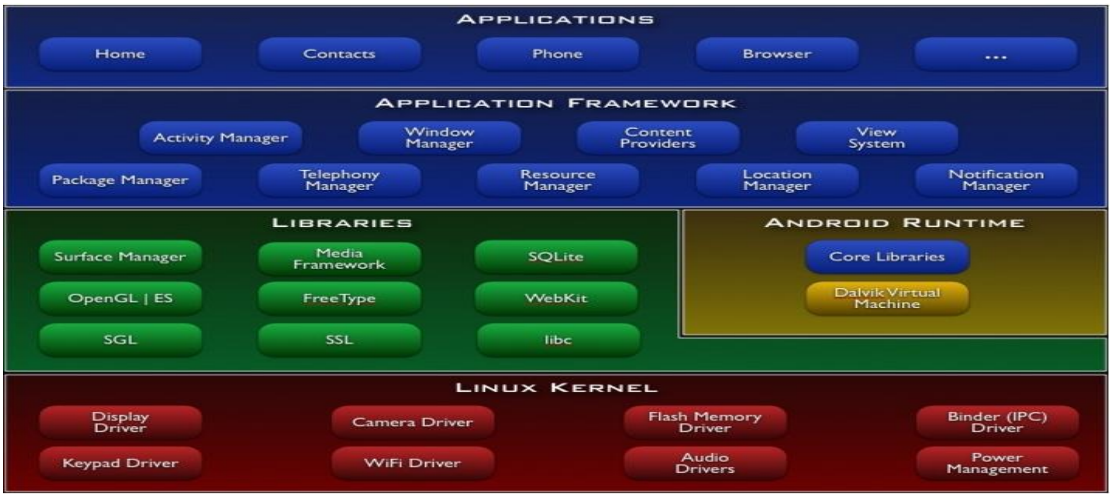


Figure 3- 36Google Android architecture

(Source: Google developer website)

The revenue share is also 70-30 like Apple App store.

Google Play charges a subscription fee of $25 to sign up as a developer. There is no enterprise program for developers in Google Play.

As of October 19, 2012, developers in 32 countries may sell applications on the Android Market[157].

Windows Phone store

Windows market place for mobile and Windows Phone 7market place/WP7 market place were launched separately in October 2009 and October 2010. In August 2012, Microsoft official rebranded the "Windows Phone Marketplace" to "Windows Phone Store".

[156] http://en.wikipedia.org/wiki/Google_Android, Retrieved 09/10/2012
[157]http://en.wikipedia.org/wiki/Google_Play,Retrieved02/03/2013

Windows Phone store is a service by Microsoft for its Windows Mobile platform that allows users to browse and download applications that have been developed by third parties. The service is available for use directly on Windows Mobile 6.x devices.[158]WP7 is mainly for devices based on Windows Mobile 7.x or higher. It is the main app store for Windows now. Apps are not interchangeable between WM6.x and WP7.

As to the inscription fee, Windows Phone store charged developers $99 and WP7 market place charged free for the 5 first apps and additional are $19.99.

Apple and Goggle have more developers than Windows.

Nokia store

In May 2009, the Ovi Store was launched worldwide. Ovi is the Finnish word for "door". On 16 May 2011, Nokia announced the discontinuation of the Ovi brand and the services rebranded under the main Nokia brand “Nokia store”.

Nokia has its own operating system- Symbian. In February 2011, Nokia announced that Windows phone 7 os would be the principal os for the Nokia handsets. Ovi store will still be available for future Symbian phones, whereas Ovi store was merged on the Windows Phone store in February 2011. Developers will not able to publish apps or app updates to Nokia store from 2014.

Developers or Independent Software Vendors (ISVs) may join the Ovi programme for a fee of 1 €.

Nokia keeps 30% of the developers' revenue from sales of their product. However, if the product is purchased using Operator Billing, then between 40%-50% of the price paid by the consumer is first given to the operator.[159]

China Mobile Market

China Mobile Market/MM is the first MNO app store. Individual developers had reached to 3.72 million in June 2012 compared to 43 thousand in June 2010. Enterprise developers were 7,696 in June 2012 compared to 1,910 in June 2010. Individual developers had produced 55% of app revenues in January 2012 (Figure 3- 37, Figure 3- 38).

In-app advertising generates most of revenues for Chinese app developers due to users’s strong sensitivities for app prices in China.

158 http://en.wikipedia.org/wiki/Windows_Marketplace_for_Mobile, Retrieved02/03/2013
159 http://en.wikipedia.org/wiki/Ovi_(Nokia),Retrieved 02/02/2013

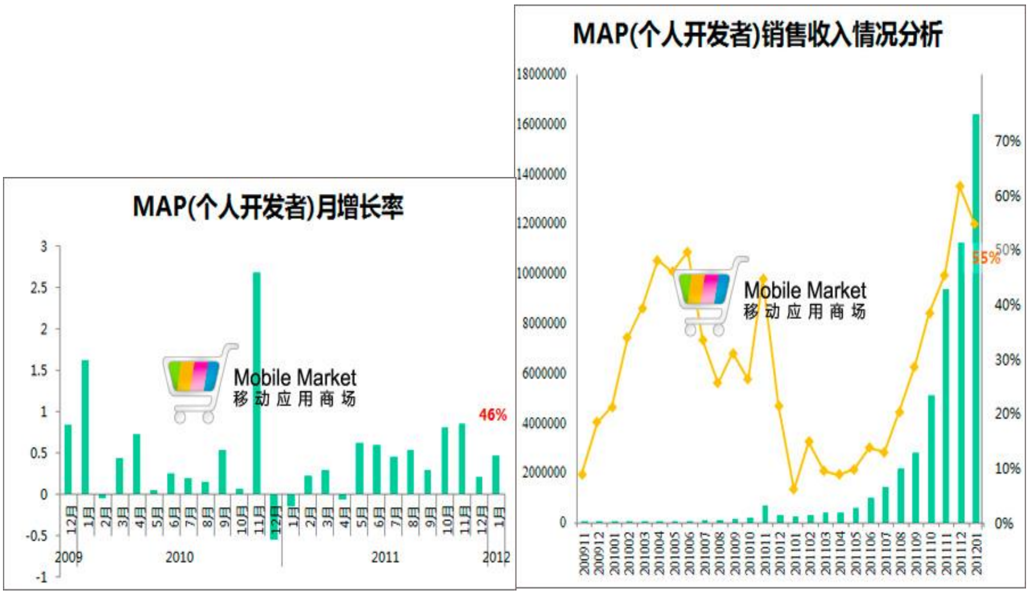


Figure 3- 37 Monthly growth rate and monthly sales for individual developers in MM
(Source: Develop center for MM[160])

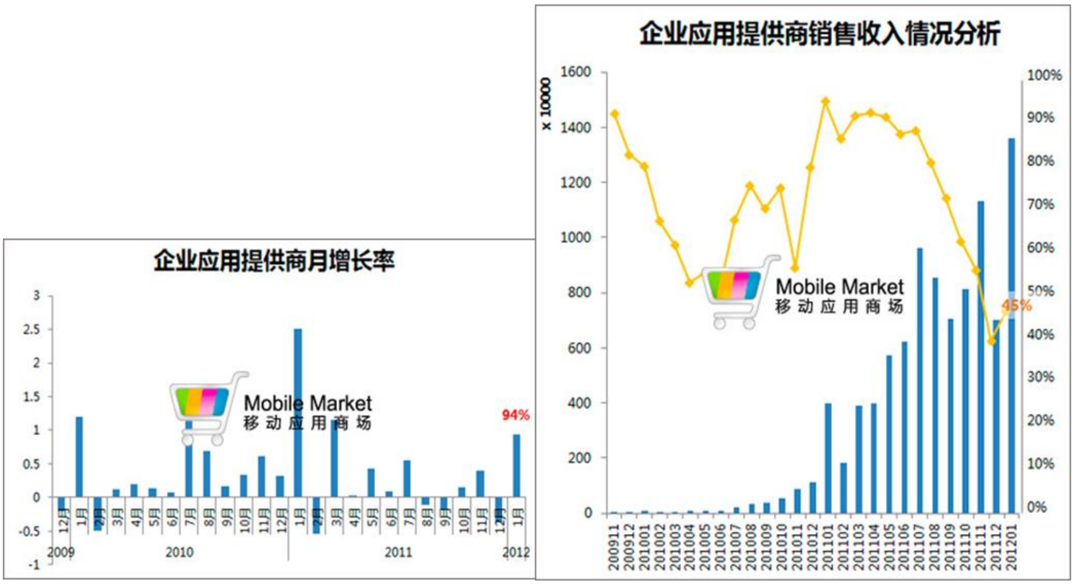


Figure 3- 38 Monthly growth rate and monthly sales of enterprise developers in MM
(Source: Develop center for MM[161])

3.5.3 Users

App users are persons who browse and download the applications from app store based on different mobile devices. There are free and paid apps in various categories available in App-store. In December 2009, there were about 56 million Apple App store users of which 33 million were iphone users and 23million were ipod touch users. Up untill January 7, 2013, there were 500 million

160 http://dev.10086.cn/news/MMnews/10914.html,Retrieved 02/02/2013
161 http://dev.10086.cn/news/MMnews/10914.html,Retrieved 02/02/2013

active Apple App store accounts[162].

Games and Social networking apps are the two most popular ones for users[163].

American users prefer Video and Navigation apps.On the other hand, Chinese users prefer News and Weather apps while South Korea users prefer Finance/Banking apps (Figure 3- 39).

53% of Chinese mobile app users in Nielsen's Mobile consumer survey claimed that they had clicked the ads on smartphone. That is, then, explains the popularity for free ad-funded apps in China.

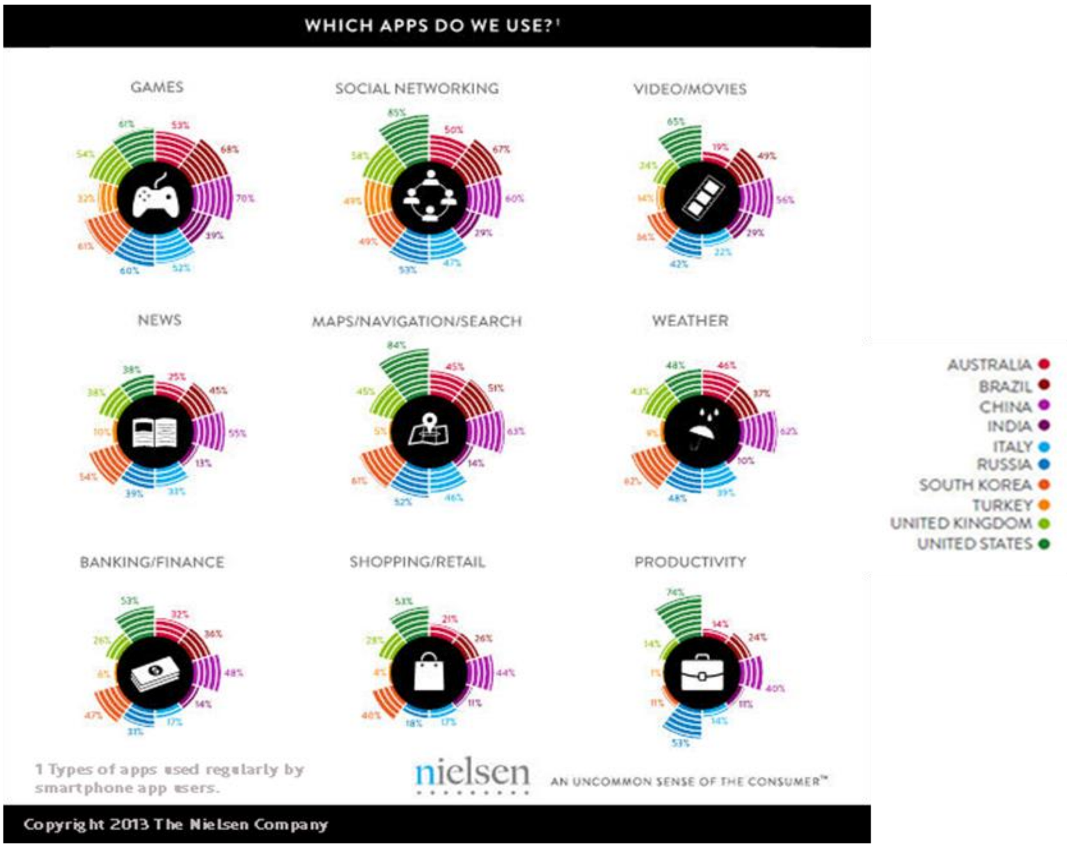


Figure 3- 39 Mobile consumer report 2013

(Source: Nielsen)

Users are highly engaged with apps. With American users spending 127 minutes per day on Apps in March 2013, compared to 80 in 2010, the success of apps is overwhelming[164]. Android and iPhone users download 9 new apps per month in 2010. The average global app downloads reached to 25 per month in 2013[165].

[162]http://www.apple.com/pr/library/2013/01/07App-Store-Tops-40-Billion-Downloads-with-Almost-Half-in-2012.html,Retrieved02/03/2013

[163] Media Company Nielsen's Mobile consumer report in February 2013

[164] Admob-metrics-May-2010. Survey based on 963 respondents in February 2010.

[165] http://mashable.com/2013/09/05/most-apps-download-countries/, Retrieved02/10/2013

3.5.4 Mobile (portable) device and device supplier

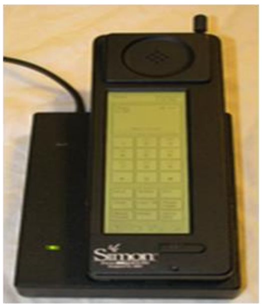
In the mobile app market, mobile devices refer to those that run on the mobile operating system.

Typical mobile devices include smartphones, personal digital assistants (PDAs), tablet computers and information appliances, or what are sometimes referred to as smart devices, with or without embedded systems, or other portable devices and wireless devices[166].

3.5.4.1 The history of smartphones

A smartphone, a high-end mobile, is unique in that it runs on a mobile operating system. This is its key feature and top selling point[167].

IBM Simon, the first smartphone, contained a calendar, address book, world clock, calculator, note pad, e-mail client, and had the ability to send and receive faxes, games and perform mobile phone functions. It was released in 1993 with a touch screen to select telephone numbers by fingers or create fax and memo with an optional stylus. The text entered was with a unique on-screen 'predictive' keyboard.



IBM Simon

Nokia 9210 communicator

Apple iPhone

Figure 3- 40 Different age Smartphone

(Source: Wikipedia)

Nokia had the Nokia communicator line with the composit functions of the Personal Digital Assistant (PDA) and it was Nokia's best selling phone in 1996. Nokia communicator based on the GEOS V3.0 operating system featured email communications and text-based web browsing.

In 1997, Ericsson's concept phone GS88 was the first labeled as a smartphone.

In the late 1990s,Palm OS,Blackberry OS or Windows CE/Pocket PC operating systems started integrating the mobile phone functions ,messaging features and supports for third-party applications with their PDA.

[166] http://en.wikipedia.org/wiki/WebOS, Retrieved 28/11/2011
[167] http://en.wikipedia.org/wiki/Smartphone ,Retrieved 28/11/2011

In 2000, Ericsson R380, based on the Symbian OS (open operating system) was the first device marketed as a smartphone with s touch screen.

Nokia was the undisputed leader in the construction. In the same year 2000, Nokia communicator released its color screen and Symbian OS Nokia 9210 communicator. And then Nokia introduced the series of Nokia communicator products: Camera and Wifi Nokia 9500; GPS Nokia E90; Multimedia Nokia N95 in 2007; stylus-free capacitive touchscreen and new Symbian OS Nokia N8 in 2010. Nokia used Windows mobile Operating System instead of Symbian Operating System in October 2011.

In 2001, Palm released Kyocera 6035 which integrated PDA and wirless phone fonctions.

In 2002, Hand spring announced the Palm OS Treo smartphone with web browsing, email, calendar, and contact organizer with mobile third-party applications fonctions. Rim introduced email-capable mobile phones and then evolved into its first smartphone optimized with wireless email.

In 2007, Apple Inc released its first smart phone-iPhone based on Apple Operating system (ios). IPhone had the multi-touch interface, web browsing and supports of Web 2.0 third-party applications. Subsequently iPhone evolved into the second generation which installed App store and supplied plenty of applications. In October 2011, Apple released iPhone 4s which greatly improved the camera capabilities. Apple now is one of the most powerful mobile device suppliers.

In 2008, Google released its Android Operating System which supported the HTC,Motorola ,Samsung and other mobile devices. Google Play integrated with Google's proprietary applications such as maps,calendar, Gmail and full HTML web brower. It can well support the third-party applications. Google Android OS is the number one by market share which replaced the old number one Operating system from 1996 to 2011- Symbian OS. Google announced that it would acquire Motorola Mobility for $12.5 billion in August 2011 and the acquisition was closed in May 2012. Google supercharged its Android ecosystem.

3.5.4.2 Smartphone market

Smartphone supported Android OS had an enormous increase from 2009 to 2012 (Figure 3- 41). It took 66.2% in Smartphone market in 2012 with a demonstrated amazing increase compared to 3.9% in 2009 (Figure 3- 42). Because of the Open Handset Alliance, Google Android was popular and in demand. That means Google's software will be offered freely under "open source" licensing terms, meaning that handset manufacturers will be able to use it at no cost and be free to add new features to differentiate their products. There were three main groups of the Android OS users: first, the handset companies including HTC, LG, Motorola and Samsung. Second,Mobile operators like China Mobile,NTT Docomo and KDDI In Japan, T-Mobile and Sprint in America,T-Mobile in Germainy,Telecom Italia in Italy and Telefonica in Spain. Third, the other hardware companies in the Open Handset Alliance like Intel, Broadcom and so on.[168] Samsung and part of LG, Sony

[168] Google Enters the Wireless World, http://www.nytimes.com/2007/11/05/technology/05cnd-gphone.html?ex=1352005200&en=d7a169e184415788&ei=5088&partner=rssnyt&emc=rss,Retrieved 02/03/2013

Ericsson and Motorola mobile phones used Google Android OS. The pattern of Android devices changed after the Google's acquirement of Motorola mobile in 2012. Samsung had focused on its Tizen OS for its Smartphone.

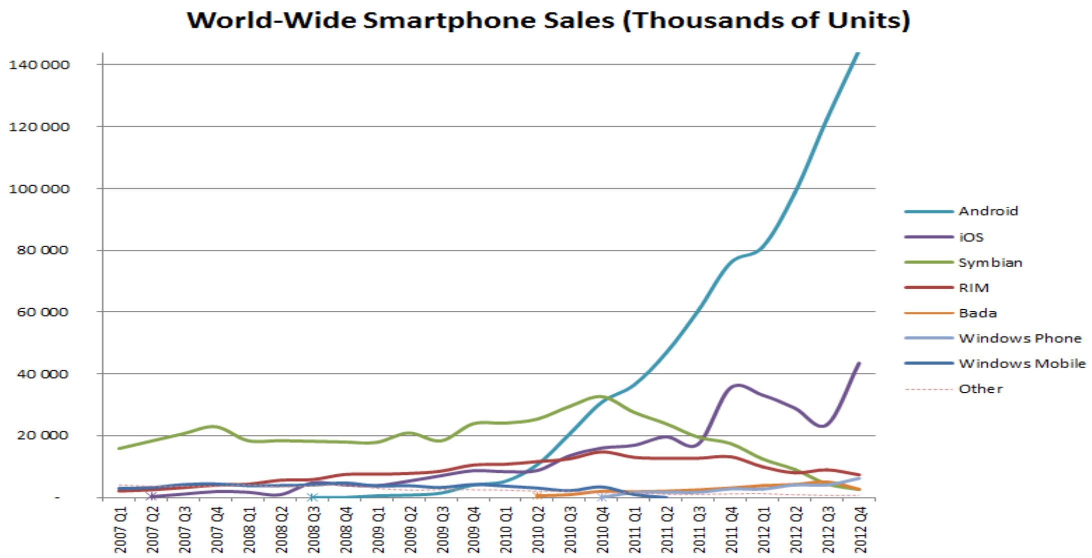


Figure 3- 41 Worldwide Smartphone units sales 2007-2012

(Source: Gartner[169])

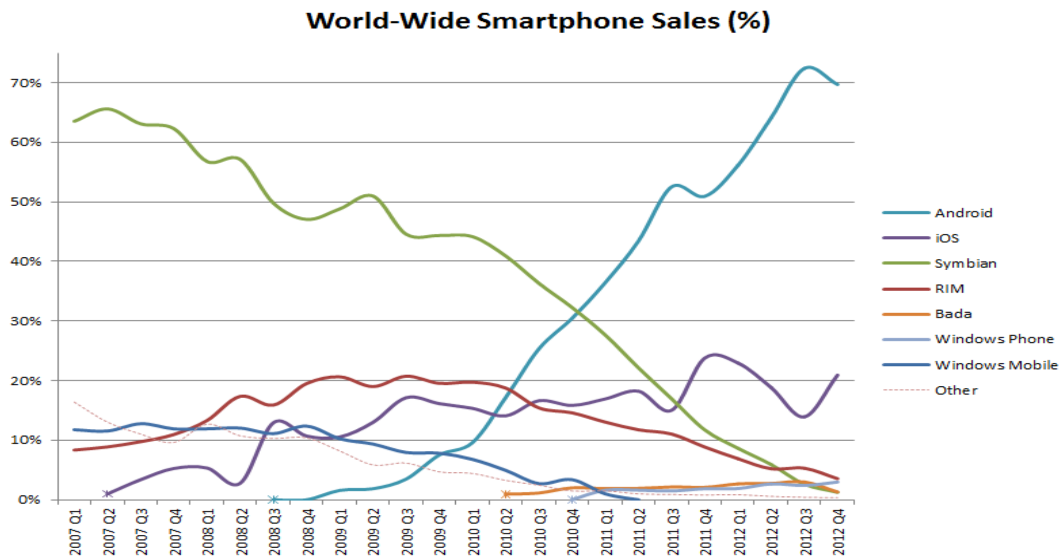


Figure 3- 42 Worldwide Smartphone sales percentage distribution 2007-2012

(Source: Gartner[170])

Apple focused on middle and high-end of the portable devices market. Its market share increased greatly from 8.2% in 2008 and 19.1% in 2012 with its creative and attractive devices like Mini iPad emerged in the market. Growth rate for Apple was mild compared to Android supported Smartphone.

Nokia was the leader of telecom industry up until 2011. Nokia mobile phones took 63.5% in 2007

[169] http://en.wikipedia.org/wiki/Mobile_OS,Retrieved 02/03/2013
[170] http://en.wikipedia.org/wiki/Mobile_OS,Retrieved 02/03/2013

while iOS only had 2.7% and Android Smartphone had not yet entered the market. Its mobile sales totaled 461,318 thousands of units in 2010.Nokia mobiles are popular in Asia (except Japan) thanks to its good quality, reliable service and market penetration strategies. However, after 2011 it was passed over by Google Android smartphone. In February 2011, Nokia decided to apply Windows Mobile OS to its new smartphone.

RIM was one of the early rulers with a 9.6% market share in 2007. 2009 was the harvest year for Blackberry with a 19.9% market share just followed Nokia in 46.9%. Sadly, Blackberry Smartphones began to plunge in 2010. It just took 5.1% market share till 2012. RIM's blackberry smartphones were widely accepted in North America. It guarded its steady position in the smartphone market. Howver to keep abreast of the smartphone war, the company needs to amplify its innovocations with intensity and creativity.

In 2007 and 2008, Windows Mobile OS supported Smartphone took 12% and 11.8%. It declined to 0.2% in 2011 because of replacement by Windows Phone OS. Windows Phone OS just took 2.5% in the Smartphone market in 2012. In February 2011, it announced its decision to work with Nokia. The objective of this integration is to reach a flourishing increase after accessing Nokia's vast customer base for Windows.

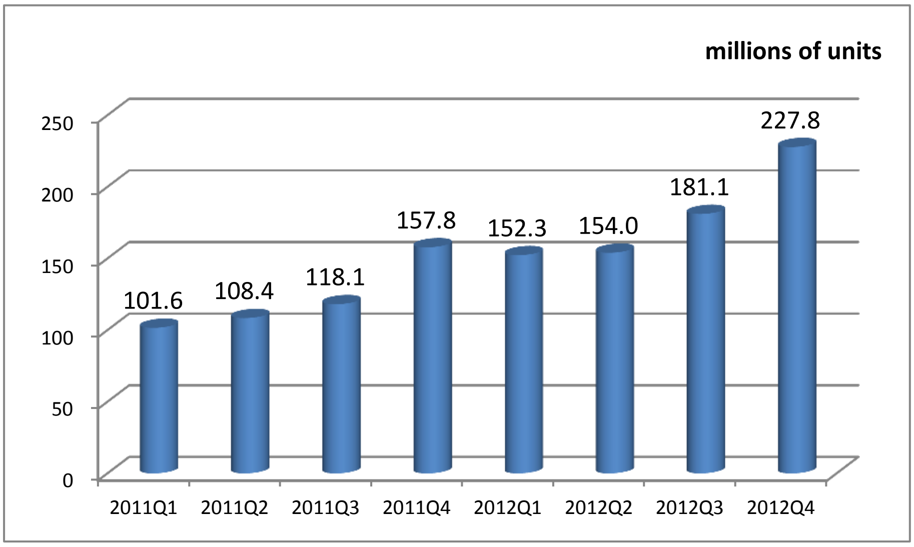


Figure 3- 43 Worldwide Smartphone shipments in 2011 and 2012

(Source: IDC[171])

[171] http://en.wikipedia.org/wiki/Mobile_OS,Retrieved 02/03/2013

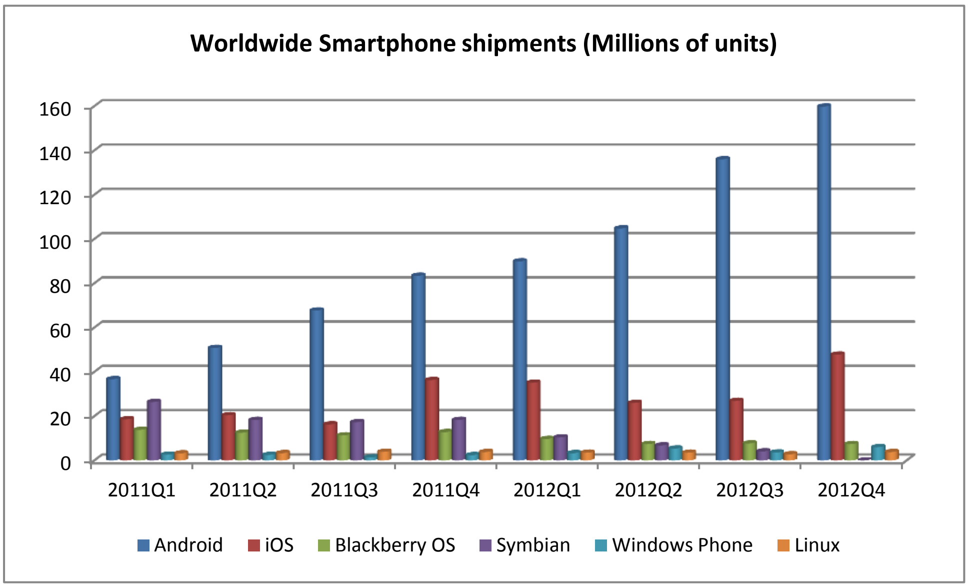


Figure 3- 44 Worldwide Smartphone shipments by OS 2011-2012

(Source: IDC[172])

Worldwide Smartphone shipments in 2011 reached 485.9 millions of units and in 2012 were 715.2 millions of units (Figure 3- 43, Figure 3- 44). Android smartphone led in the smartphone shipments and followed by Apple.

3.5.4.3 Device supplier market

Mobile device suppliers (vendors) can be hardware manufactures, mobile network operators, Electronics stores and others.

The hardware manufacture that owns its own distribution network is the big player. Especially for hardware manufactures that have their native MOS like Apple, Samsung, RIM, Windows, Nokia, Sony,HTC,Huawei and others. These manufacturers command the mobile device sales.

Mobile network operator (Carrier) is an important channel for mobile device sales equipped with strong advantages like user bases, network operations and distribution networks. Almost all the carriers supply mobile devices. Carriers are very receptive to customizer mobile devices. Carrier can monitor their content operation on mobile devices. There are also app developers working with carriers to preload their apps into devices.

Electronic stores are excellent channels for mobile device sales. Best Buy in US, Darty in France, Suning in China and Amazon (worldwide) are the traditional reknown electronic stores. Their widespread distribution networks are their strong points.

[172] http://en.wikipedia.org/wiki/Mobile_OS ,Retrieved 02/03/2013

3.5.5 Mobile network and Mobile network operator (Carrier)

3.5.5.1 Mobile network standard

With the vast growing popularity of mobile devices, it is clear that the mobile network standards are reuiqred for the multiple accesses.

Mobile network operators achieve both coverage and capacity for their subscribers through cellular network. Large geographic areas are split into smaller cells to avoid line-of-sight signal loss and to support a large number of active phones in that area. All of the cell sites are connected to telephone exchanges (or switches), which in turn connect to the public telephone network (Figure 3- 45).

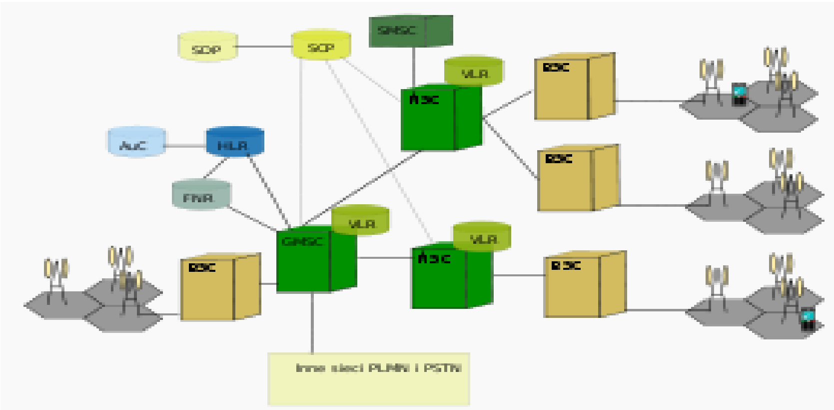


Figure 3- 45 GSM network architecture

(Source: Wikipedia)

There are a number of different digital cellular technologies, including: Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EV-DO), Enhanced Data Rates for GSM Evolution (EDGE), 3GSM, Digital Enhanced Cordless Telecommunications (DECT), Digital AMPS (IS-136/TDMA), and Integrated Digital Enhanced Network (iDEN)[173].

3.5.5.2 Mobile network operator (Carrier)

Mobile network operator (MNO), known as mobile phone operator, carrier service provider (CSP), wireless service provider, wireless carrier, or cellular company, or mobile network carrier. The carrier is a telephone company that provides services for mobile phone subscribers[174].

USA is the cradle of app store. Verizon wireless and AT &T are the two mobile network operators (MNO). Verizon wireless uses the CDMA[175] technology with 98.2 million subscribers in January 2013. AT &T uses GSM[176] technology with 107 million subscribers as if January 2013 (Table 3-

[173] http://en.wikipedia.org/wiki/Mobile_network 19/10/2011
[174] http://en.wikipedia.org/wiki/Mobile_network_operator 19/11/2011
[175] Code division multiple access
[176] Global System for Mobile Communications

11).

Table 3- 11 Major Mobile network operators in USA, China and West Europe

Mobile network operator (Carrier)	Main markets	technology	Total subscribers (in millions)
Verizon wireless	USA	CDMA	98.2 (01/2013)
AT & T Mobility	USA	GSM	107.0 (01/2013)
Orange	France	GSM	226.3 (09/2011)
China Mobile	China	GSM	703.46 (11/2012)
China Unicom	China	GSM	202.89 (01/2011)
China Telecom	China	CDMA	129.25 (01/2011)
Vodafone	UK	GSM	439.61 (12/2011)
T-Mobile	Germany	GSM	129.14 (03/2012)

(Source: wikipedia[177])

China Mobile is the largest MNO with a great number of subscribers. There were 703.46 million subscribers in November 2012 which left the second one-China Unicom with 202.89 million subscribers in January 2011 in the dust. Apple worked with China Unicom to supply the Apple portable devices for the subscribers of China Unicom.

Orange is the biggest MNO in France with 226.3 subscribers in September 2011.

Vodafone is the second largest MNO in world supplying mobile services in UK with 439.61 subscribers in December 2011.

T-Mobile is a Germany MNO operating mobile network in west Europe and USA.

App-store users browse, download and use their applications in the portable devices through mobile network operated by mobile network operators in different regions. Users in USA can download their favorite apps from the mobile network by Verizon wireless or AT &T. Users in China can use their apps through the mobile network by China Mobile, China Unicom or China Telecom.

3.6 Mobile app market is a two-sided market

Based on the definition of two-sided markets in Rochet and Tirole (2004), the volume of transaction realized on the platform depends on the reallocation of its total price between the two sides. In the mobile app market, the App-store platform charges developers and users, the actual volume of app transactions depends on the reallocation of total price between the two sides. When app store platforms charges Δa more fees from user side and at the same time decreases the same Δa fees from developer side, app downloads from users will decrease quickly. Volume of transaction therewith declines. This also happens vice-versa.

177 http://en.wikipedia.org/wiki/List_of_mobile_network_operators ,Retrieved 02/03/2013

The Ad-store platform charges developers and advertisers. The volume of app advertising transactions depends on the reallocation of the total price between developer and advertiser sides.

In the mobile app market, the developers, the advertisers and the users are three groups of end users. App-store and Ad-store are the two Two-sided platforms. App-store shares revenues from apps sales with developers. Ad-store share app advertisement revenues with developers.

We can observe the importance of network externalities, roles of App-store platform and Ad-store platform, and asymmetric platform pricing strategies in the mobile app market. And we confirm that mobile app market is clearly a two-sided market. There are three groups of end users that affiliated with two Two-sided platforms, and it is flourishing and dynamic.

3.6.1 Network externalities in mobile app market

In the mobile app market, the network externalities not only exist among different sides/groups, platforms, but also within the same side. Network externalities even exist between free and paid apps, apps and mobile devices, apps and external product. The app market ecosystem is, without a doubt, a fascinating world of network externalities.

The developers and the users are two distinct sides that connect with App-store.The developers and the advertisers are two sides that connect with Ad-store. The users are the audiences who purchase products from advertisers through Ad-store's advertisements.

The developers (mobile application developers or app ad publishers) are people who write computer programs for App-store or publish app ad from Ad-store to users. Developers in the mobile app market write application programs based on the mobile operating system to run on smartphones, tablet computers and other mobile devices. Developers can be individuals or enterprises. Developers also connect with Ad-store and implant ad developing SDK into their apps to publish advertisements from Ad-store for advertisers. Developesr can be also the advertisers at the same time.

The users (app consumers/ad audiences/buyers) are people who download applications from App-store to their portable devices and/or read app advertisement. The users (buyers) are also the customers who purchase products from app advertising.

The advertisers submit advertising demands to Ad-store platform and publish their ads through developer's apps. The advertisers aim to sell goods through app advertising to users.

The device suppliers sell mobile devices integrated hardware and MOS to users.

The App-store platform works on app distribution for developers and users. The Ad-store platform focuses on in-app advertising for advertisers within developers' app contexts.

Network externalities include direct (within side) network externalities and indirect network externalities exist in the mobile app market like other two-sided markets.

Network externalities between developers and users, developers and advertisers, developers and device suppliers, and advertisers and users will be explained below. Network externalities between free apps and paid apps, apps and mobile devices, and apps and external products will be analyzed.

There are also network externalities between App-store and Ad-store.

3.6.1.1 Network externalities between developer side and user side

(1) Direct network externalities:

For users, benefit of one mobile app to one user increases with the increase of number of other users who use the same app. The developers will improve users' using experiences with the increasing app sales. Inter-side network externalities are obvious especially among the same app users. For example, social networking app-We Chat[178]. Users can send texts, pictures, voice messages, and video calls or publish information through We Chat. Like standard telecom network, more users of We Chat will bring bigger social circles and make their communications more convenient.

The developer receives better developing environment, technical supports and service from the platform with the increase of number of other developers who use the same platform. Values of using App-store for developers increases. These are direct network externalities which are both positive for developer side and user side. Competition in developer side may cause some negative direct network externalities but this will improve social welfare. In my study it was no possible to include direct network externalities due to time limits.

(2) Indirect network externalities:

For indirect network externalities, users get diverse and personalized better app when there are more mobile app supply from more developers. Driving forces will encourage more development when there are more uses of apps from more users. Both the membership externalities and usage externalities between user side and developer side are positive. Positive network externalities from user side to developer side makes developers benefit from the numbers and app uses of users. Positive network externalities from developers to users let user side benefit from the numbers and app supplies of developers.

Indirect network externalities account for explain the existence of App-store. There are two sides with indirect network externalities in mobile App-store. App-store is necessary to internalize the network externalities[179] between developer side and user side. Asymmetric information and transaction cost (like payment and marketing cost) make it difficult for two sides to internalize the network externalities on their own. The developers and the users cannot reach effective bilateral transactions under asymmetric information and transaction cost.

3.6.1.2 Network externalities between developer side and advertiser side

Direct network externalities in advertiser side can be negative. Advertising costs to publish ads through the popular Ad-store will increase when there are more advertisers. Same for the developer side, ad units will decrease if there are more developers with ad places. But more developers could increase the competitiveness of Ad-store to attract more advertisers.

Indirect network externalities between the advertiser and the developer side are obvious. Increase in

[178] We Chat is a Chinese social networking app by Tencent and it was published in January, 2011.

[179] Special for indirect network externalities.

the number of members from one side will automatically improve the benefits for the other side.

3.6.1.3 Network externalities between developer group and device supplier group

Network externalities exist also between developer and device supplier two groups.

Direct network externalities can be positive or negative among developers. Direct network externalities are positive in device supplier group. A monopoly device supplier can maximize its profits and yet competition decreases the average profit.

Indirect network externalities are positive between the two groups. Developers wish to preload their apps into mobile device before users' purchases. This is also an effective way to promote mobile apps. Apple App store and Apple's native products[180] are usually preloaded into iOS mobile devices. Nike+iPod app is another preloaded example in Apple App store. Google Play app store and Google Map are usually preloaded into Android supported mobile devices. Developers can accept to pay for device supplier to preload their apps.

App preload can ensure app discovery by users. However, users do not like so many preloaded apps which could be useless and bog down the mobile device. Also app preload has to get the permission from the mobile network operator (or carrier). This means costs for app preloads and it is not easy to get carrier's permission. As of February 2012, it was no longer preloading apps by American carrier Sprint onto its devices.

Some developers work with device suppliers to offer incentives to encourage users. Cloud storage app Dropbox worked with Samsung device manufacture and HTC device manufacture to offer certain free storage spaces for their device users. This can be taken as indirect network externalities between developers and device suppliers.

3.6.1.4 Network externalities between advertiser group and user group

The advertisers publish advertisements to reach more audiences to promote sales of goods in the mobile app market. Those users who read app ads are the potential customers for the advertisers.

Direct network externalities are usually negative among advertisers. In user side, more users who read app ads have positive effects on others. Large scale users can improve bargaining power and better after-sale services.

For indirect network externalities, more advertisers with more app ads may produce negative utility to users. But more users can provide a bigger potential customer group for advertisers. This is positive. The advertisers prefer to connect with the Ad-store which has a big developer base capable of delivering their app ads to more users.

3.6.1.5 Network externalities between free apps and paid apps

Network externalities exist between free and paid apps. Small amount or free consumption mode is frequent in the mobile app market. A stead increase of enduring free apps proves that free apps bring in revenues and vitality to mobile app market.

Direct network externalities for free apps can be positive or negative. More free apps in app store

[180] Like iTunes store and Game center.

will bring more visits thereby increasing the discovery chances for other free ones. But more free apps may lead to competition in free apps group. This is the same to paid apps. More paid apps can build a good paying environment for app consuming but could also bring competition among paid apps.

For indirect network externalities, free apps can attract more users to App-store and create more potential paid app users. More paid apps may diminish the platform joining desire for users and decrease platform attraction and free apps usage.

From the correlation analysis from our mobile app using survey[181] done during December 2012 and February 2013 in France and China, we found that free downloads are significant related to app use frequency, paid downloads and paid fee. Free app downloads increase app use frequency, number of paid app downloads and paid fee for app use. There are significant indirect network externalities between free apps and paid apps.

3.6.1.6 Network externalities between Apps and mobile devices

Customers are attracted to mobile devices as the app volume and diversity expands. Mobile app distribution brings in mobile device sales.

Mobile device which facilitates app receiving and use entices users to download apps. Increasing mobile device sales supply more potential app downloads. Inevitable this encourages developers to offer more apps.

It is extremely positive indirect network externalities between apps and mobile devices.

Direct network externalities are negative for apps. Discovery rate and download times will decrease if there are more rival apps. Same for mobile devices, mobile device's shipments will decrease if there are more competed mobile devices.

3.6.1.7 Network externalities between Apps and external product

Apps in particular the Traffic and Utilities apps can bring external products sales through the app distribution. These out-of-app product supported apps increase brand awareness directly by app using and drive external product sales indirectly.

Sales of external products promoted through app can improve app downloads.

Indirect network externalities are positive between apps and external products.

3.6.1.8 Network externalities between App-store and Ad-store

Both App-store and Ad-store share revenues with the developers. These two platforms also have the same final customer group-users. Ads are published within app's contexts. Increase of developers and apps in App-store will bring more potential ads display spaces and push up Ad-store's revenues.

Ad-store's development will attract more developers to come into mobile app market. There will be more and various apps and thereby assuring App-store's revenue growth.

There are massive strong indirect network externalities between the two platforms.

Direct network externalities could be negative for the two platforms due to the stronger competition

[181] Detailed information can be seen in chapter 5.

when there are more platforms. However, competition for App-store or Ad-store can bring positive network externalities to users like (lower app price and more personalized ads).

3.6.1.9 Conclusions

Network externalities exist widely in the mobile app market. Indirect network externalities between two sides have significant effects for the platform (Table 3- 12). App-store gets mobile device holding users on board which will then attract developers to come to App-store to supply apps based on the indirect network externalities between the two sides. Ad-store collects advertisers with advertising demands on board and that will bring developers to access to Ad-store to supply app display places due to the positive indirect network externalities between the two sides.

Table 3- 12 Network externalities in the mobile app market

Group 1	Group 2	Direct network externalities in group 1	Direct network externalities in group 2	Indirect network externalities between group 1 and 2
Developer	User	+/-	+	+
Developer	Advertiser	+/-	-	+
Developer	Device supplier	+/-	-	+
Advertiser	User	-	+	*(1 to 2)* – *(2 to 1)* +
Free apps (Ad-funded apps)	Paid apps	+/-	+/-	*(1 to 2)* + *(2 to 1)* -
Apps	Mobile devices	_	_	+
Apps	External products	_	_	+
App-store	Ad-store	_	_	+

3.6.2 Functions of App-store platform and Ad-store platform

App-store platform is the intermediary which provides developing supports to developers and app sale service (including payment, app marketing and others) to users in the mobile app market. The App-store platform can effectively reduce the transaction costs like searching, payment and transaction security for users. The App-store platform liberates the developers and supplies all developing elements and app marketing services to developers. Developers just need to concentrate on the app developing. App-store platform internalizes the network externalities between developer side and user side. Platform determines the price to user and developer for platform operations.

Pricing structure is asymmetric in the mobile app market like other two-sided markets. Mobile Ad-store works also as an intermediary go between the advertisers and developers.

3.6.2.1 App-store platform to developer and user

Developers who supply apps need to come first to App-store platform. To attract them, platform invests in this side to lower the cost of participation for them to use App-store platform. App-store platform develops app developing tools (SDK) and provides other assistance to help them to write apps more easily with the mobile operating systems. In fact, developers are also asked to pay for platform annual membership fee to access App-store platform. However, compared to the considerable app sales revenue, the membership fee is negligible. So developers can be taken as the subsidized side and are highly valued by user side when there is volume. With sufficient various apps supplied by developers in App-store platform, users will access to platform to download and use apps. As of now, both the two sides are on board.

The users are price sensitive (About 55% and 70% of apps in Apple App store and Google Play in 2012) or we can say they have a high price elasticity of demand for mobile apps. According to Eisenmann, Parker and Van Alstyne (2006[182]), price sensitive side is usually charged less than the other side by platform. In the mobile app market, App-store platform charges no usage fee from users each app download. We can say that the App-store platform also subsidizes the user side.

Mobile devices are the carriers for running of apps. Users have to purchase mobile devices for using app from App-stores. Mobile devices purchasing fees constitute the costs for users. It influences App-store platform's pricing to the user side due to the users' strong sensitivities to charges.

In the mobile app market, App-store platform subsidizes developers for app developing and also subsidies users for app downloads, its main revenue comes from paid app sales revenue share of developer side.

App downloads in volume from App-stores contribute to the boom of Ad-stores.

3.6.2.2 Ad-store platform to advertiser and developer

In mobile app advertising world, advertisers are buyers who need to pay for ads publishing. Publishers are developers who intend to make profits from displaying advertisements for advertisers. Developers are taken as sellers of their advertising places supplies. Ads are delivered to users (audiences) through apps. Mobile Ad-store connects the advertiser side and the developer side.

Ad-store platform is also a two-sided market. There are two distinct groups: advertisers and developers. Indirect network externalities exist between the two sides. Advertiser's ads can have broader and more efficient reach when there are more ad-carried apps from developers. Developers will get better paid by ad revenue if there are more advertisers. Direct network externalities in advertiser side and developer side may be negative like traditional media industry.

[182] Eisenmann, Parker and Van Alstyne ,Strategies for two-sided markets, Harvard Business Review,2006

Mobile Ad-store works as an intermediary to internalize the externalities between advertiser and developer sides. Volume of app advertisements transaction will change if mobile Ad-store changes its pricing structure to the two sides. When Ad-store increases the revenue share with developer, developer's participation will decrease and vice versa.

For Ad-store, it supplies advertising SDK and other hosting services to encourage developers to join platform. The developer side functions as the subsidized side and financial side for the platforms. The advertiser side is free charged to join Ad-store. Ad-store's revenue generates mainly from ads revenues share with developers.

3.6.3 Pricing structure is non-neutral in mobile app market

If we assume the volume of app transaction is v, app price ρ is constant, v changes with App-store platform's pricing structure to two sides not with total charge from two sides. Membership fees are not considered into this study. Charges to developers are usage fees. Revenue share with developers can be taken as the usage fee. The platform can modify the revenue share split to change the charges to developers. When the platform increases the revenue share with developers, participation of developers and supply of apps will decrease, users will not have enough choices for apps, and transaction volume will decrease. When the platform decreases revenue shares with the developers, the volume of transaction are pushed up.

Transaction costs or prohibition (or constraint) put by platform on the pricing of transaction between end-users from two sides affect the pricing structure's neutrality[183].

Pricing structure for mobile App-store platform is non-neutral with the following reasons.

(1) Developers and users cannot reach effective direct negotiation. There are a large number of developers and users. It is hard to find an agency that can fully represent the benefits of both developers and users. So both of the two sides will try to maximize their own benefits during the negotiation. In addition to asymmetric information, an effective outcome about app transaction through negotiation is hard to achieve. This is a condition for non-neutrality of pricing structure.

(2) Transaction costs exist for both developers and users and this is another condition for non-neutrality of pricing structure. Developers have transaction costs and cannot pass it to users. Users have opportunity costs of replacing portable devices.

(3) App-store platform can impose constraint clauses to developers in the mobile app market.

Apple App store and Amazon app store impose restrictions on app developers to digital content submission. App prices in Apple App store and Amazon app store are not allowed to be higher than the any other platforms including each other. Both Apple and Amazon impose a most favored

[183] Rochet and Tirole (2004), Two-Sided markets: An Overview

customer clause to app developers[184]. So developer cannot pass the mark-up of price from App-store platform to user.

3.6.4 Market type for Mobile app market

Like the credit card system and computer operating system, the mobile app market is a demand-coordinators two-sided market according to the classification of Evans (2003).

The developers and the users interact through App-store platform. Mobile apps generate indirect network externalities across these two sides. More app users rely on App-store platform are more valuable to developers ,and more apps run on App-store platform the more valuable they are to users. The developers and the advertisers affiliate with the Ad-store platform for in-app advertising. These two sides greatly benefit from the strong indirect network externalities between them.

Pricing structures in the credit card system, computer operating system, mobile data services, and video game console provide us with useful revelations for App-store platform pricing. Platform pricing in the newspaper and yellow pages can well guide the Ad-store pricing.

3.6.5 Market structure for mobile app market

There are, in the mobile app market, three groups of end users who connect to two platforms. Developers, users and advertisers (or producers) are the end users. App-store and Ad-store are the two platforms.

Developers are usually multihoming.They subscribe and submit apps for several App-stores. They connect to more than one Ad-store platforms to publish advertisements through their apps. So developers can also be publishers.

Users are generally singlehoming because of the limitation of their single holding of mobile devices. With the penetration of tablets, there are some users who with their mobile phones and tablets are simultaneously multihoming.

Advertisers accept mobile apps as new distribution channels for their products. They often connect to two or more Ad-stores. They are multihoming. Ad-store tries to get both developers and advertisers on board. Advertisers' products advertisements are published through developers' apps to users. Users can purchase the correspondent products from advertisers when they read the ads in their downloaded apps.

In this study, user side will be considered as singlehoming.Developers and advertisers are multihoming.

When users download paid apps directly, developers share the app sales revenue with App-store. When users download free ad-funded apps, developers share ads publishing revenue with Ad-stores.

[184] Gans.J.S,(2012),Mobile application pricing, Information Economics and Policy,24(2012):52-59

It is a complicated market in mobile app world. This study aims to clarify how this market works and how the monetary relations function in the ecosystem.

We can get the market structure for mobile app market (Figure 3- 46).

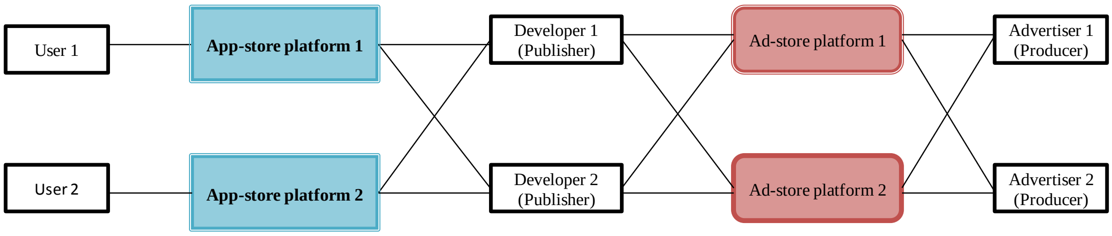


Figure 3- 46 Mobile app market's structure

Relatively few platforms compete in two-sided markets because of indirect network effects on the demand side and fixed costs of establishing platforms. This happens to the mobile app market where exist few monopolies exist. Apple App store and Google Play are the two giants followed with Window store and Blackberry world. The two dominant Ad-stores iAd and Admob are operated by Apple and Google. Mobile Ad-store and App-store work together to bring a thriving app world.

3.6.6 App store platform's economic behaviors

3.6.6.1 App store platform's role

- How does app store platform work?

As we can see the App-store platform's role (Figure 3- 47), App-store platform dominates the mobile app market and coordinate all the other industries chain members to run the mobile app market.

The App-store platform normally is preloaded into mobile devices and the users can go to App-store directly when there is mobile internet access through mobile operator's network. Some of App-store platforms operate their own Ad-stores like iAd for Apple and Admob for Google.

For mobile devices, Apple produces iOS supported devices itself. Google acquired Motorola mobile in order to produce Android special devices. The telecom operators often seek devices OEMs from mobile device manufactures. China Mobile worked with Nokia to produce its carrier customized mobile phones. A Third-Party App-store works more like pure intermediary and focuses on merchandising the mobile apps.

After all the prophase building work such as platform infrastructure construction, the App-store platform has to encourage and impel app development to developers.The App-store platform supplies expanding supports that can include developing environment, documentation and app auditing and processing. When an app is submitted to App-store, App-store platform sets to work immediately on merchandising it with services like app discovery, payment and delivery to users.

Some of app store platforms like Google supply mobile user analytics to developers for better customer comprehension. The platform shares the revenue with the developers after the transaction has been completed.

For the user side, App-store platform supplies registration, searching, payment supports and customer services. App-store platform offers app ranks and comments for users.

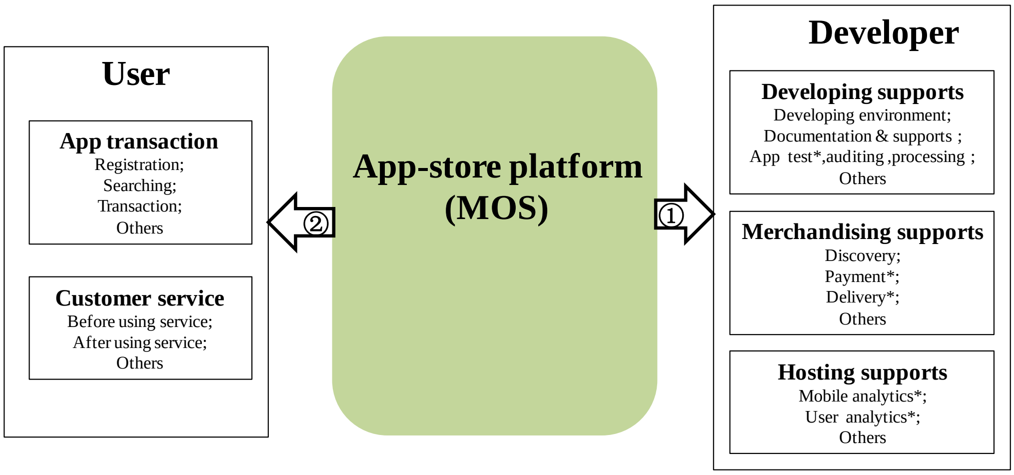


Figure 3- 47 App store platform's role
(Note: There are professional development tools and services providers in the mobile app market.)

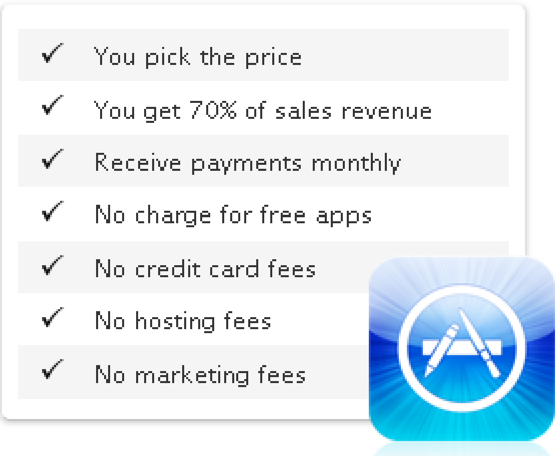


Figure 3- 48 App distribution for developer in Apple App store iOS developer program[185]

The App-store platform coordinates all the members in the mobile app market ecosystem, and provides professional supports to those parties developing apps and transaction services to users for increased app consumption.

App-store platform successfully expands the transaction range for both developers and users.Likewise it handles transaction costs for developers and users. In this way, developers are not required to make heavy marketing investments. Users select apps without visiting numerous websites. Transaction costs like accessing the content, completing the app transaction and

[185] iOS developer program, https://developer.apple.com/programs/ios/distribute.html,Retrieved02/03/2013

transaction security for users are reduced by the App-store platform. With one single touch, the platform simplifies the purchases and offers serucity and additional benefits to the customers. Developers have the potential to sell more to those clients who otherwise would have to pay high transaction costs[186].

- App store platform's cost

For the App-store platform, there exists the huge mobile operating system, mobile app Ads system, payment system, mobile app searching and matching technologies as fixed expenses.

The transaction absorbs various transactions costs like commission charges (ex. interchange fee in credit card system) to bank, marketing and distribution fees.

3.6.6.2 App store platform's asymmetric pricing strategies

The App-store platform faces developer and user two sides. In order to attract users on board, platform has to make a lower price to this side and then satisfy the developer side through the effects of network externalities[187].

The App store platform makes asymmetric pricing strategies in the mobile app market.

3.6.6.3 App store platform's subsidy and support

The App-store platform provides developers with subsidies such as development, merchandising and hosting supportss.

For Apple App store and Google Play platform, they all offer free software development kit and Application Programming Interface (API) to developers.

3.6.6.4 App store platform's product differentiation

Based on users' various app requirements and price elasticity of demand, like most digital content platform, App-store platform can supply apps in different categories and different versions. Vertical differentiation can be found in this market. Free or paid versions are offered for users to select their preferences.

Platform position encourages app differentiations. Apple App store aims for the middle or high – end users using the Apple devices. Only 56% are free apps in Apple App store in March 2013 compared to 79% in Google Play.

Only 56% of apps in Apple App store in March 2013 are free apps compared to 79% of free apps in Google Play. Apple App store just supplies apps for Apple brand devices and Google Play works for

[186] Gans. J.S. (2012),Mobile application pricing,Informtion Economics and Policy,24(2012):52-59
[187] Explanation of app store platform makes lower price to user side in chapter 4.

Samsung and a series of other devices. Blackberry World just offers apps for Blackberry devices. Windows Phone store works with Windows, HTC and Nokia devices.

The variations in app prices and single or multiple devices supported modes are the horizontal differentiation for App-store platforms.

3.6.6.5 App store platform's exclusivity

As per our explanations in Chapter 2, platform's exclusivity is not obviously effective for platform in two-sided markets because exclusivity may cause the end-user go to the rival platform. Exclusivity is often offered through exclusive contract by platform to the multihoming side in two-sided market.

The developer side is multihoming. For current, Apple App store and Amazon app store impose most favored customer clauses to app developers. And app price on these two platforms is not allowed to be higher than the price on any other platforms. Apple App store is the dominant MOS app store and Amazon app store is the mighty TP app store. Developer's multihoming behaviors (submitting apps for different app stores) can be easily observed. Apple App store and Amazon app store impose terms or exclusivity in the mobile app market. This may limit the vitality of developers who none the less can still submit apps to other app stores provided they respect the special client clauses.

3.6.6.6 App store platform's vertical integration and horizontal interconnection

The purchase of Motorola mobile by Google was a vertical integration. Learning from Apple's 'App store driving mobile device sales' revenue model, Google acquired Motorola mobile in 2012.Previously, in April 2009, Google had acquired the popular mobile app advertisement platform Admob in 2009. Google absorbed these manufacturers in order to build up their sales and to attract more supplies from the developers. Controlling the operating systems and devices was a wise management and strategic decision.

In February 2012, Apple acquired Chomp, an app search and discovery company.

The network effects in this market are plentiful and positive. There are barriers for new entrants. It is an oligopoly market. There is no platform interconnection between the dominant MOS app stores like Apple App store and Google Play. The two app store platforms are not mutally compatible because of the distinct mobile operating systems.

For the non-MOS app store, especially for MNO app store, platforms interconnection can be found. Users can access to Android or iOS mobile apps in China Mobile Market (MM for short). This is considered then a horizontal interconnection in the mobile app market.

3.6.7 Developers and users' economic behaviors

3.6.7.1 Developers' economic behaviors

Developers normally register on one or more App-store platform freely or paid for an annual registration fees first.

Once the app is created, prices are set. Normally, App-store platform offers a list of app price tier for developers to choose (Table 3- 13). In the Apple App store, there are 87 price tiers.

When the app is downloaded and generates profits, developers receive the app sales revenue shares from App-store platform. For the payout schedule and threshold, payments are not immediate and often there is a minimum wait.

Table 3- 13 Example of Apple App store's app price tier for developers in different countries

	U.S. – US$		Canada – CAD		Mexico – MXN		Australia – AUD		New Zealand – NZD		Japan – JPY	
Tier	Customer Price	Your Proceeds	Customer Price	Your Proceeds	Customer Price	Your Proceeds	Customer Price	Your Proceeds	Customer Price	Your Proceeds	Customer Price	Your Proceeds
Tier 1	0.99	0.70	0.99	0.70	13.00	9.10	0.99	0.63	1.29	0.90	85	60
Tier 2	1.99	1.40	1.99	1.40	26.00	18.20	1.99	1.27	2.59	1.81	170	119
Tier 3	2.99	2.10	2.99	2.10	39.00	27.30	2.99	1.90	4.19	2.93	250	175
Tier 4	3.99	2.80	3.99	2.80	49.00	34.30	4.49	2.86	5.29	3.70	350	245
Tier 5	4.99	3.50	4.99	3.50	65.00	45.50	5.49	3.49	6.49	4.54	450	315
Tier 6	5.99	4.20	5.99	4.20	79.00	55.30	6.49	4.13	8.29	5.80	500	350
Tier 7	6.99	4.90	6.99	4.90	89.00	62.30	7.49	4.77	9.99	6.99	600	420
Tier 8	7.99	5.60	7.99	5.60	99.00	69.30	8.49	5.40	10.99	7.69	700	490
Tier 9	8.99	6.30	8.99	6.30	119.00	83.30	9.49	6.04	12.99	9.09	800	560
Tier 10	9.99	7.00	9.99	7.00	129.00	90.30	10.49	6.68	13.99	9.79	850	595

Normally, developers for Apple App store get paid monthly with the payments one month later[188]. Minimum payment threshold in Apple App store was $ 150 in 2012. Payment is not made if the minimum threshold is not respected. Google Play pays developers a few days after the end of one month with no minimum.

Apple App store supports apps volume purchase programs for businesses and education. High Revenues can be rapidly made through this program. iOS developers can develop customer B2B apps providing unique, tailored solutions directly to business customers who are enrolled in the volume purchase program[189].

In some TP app stores like Appboy, developers can directly collect advices or comments from the registered customers.

[188] For example, a developer can be paid in beginning of March for app sales revenue in January in Apple App store.
[189] Volume Purchasing for iOS Apps, https://developer.apple.com/programs/volume/,Retrieved 02/03/2013

3.6.7.2 Users' economic behaviors

To access the platform, the users must reigster.Once one user has an account in one App-store, he can search and download the apps needed. Most of apps have both free (trail) version and paid (complete) version. Usually there are no Ads in paid apps. Utilities and Productivity apps are often paid.

When downloading a paid app which generates revenue directly, the customer pays the app by credit card, telecom operator's billing, mobile prepaid app card, PayPal or other ways.

When user downloads a free app, the revenue model is complicated. Free app can generate revenue by in-app advertising, freemium or in-app purchase. Most of the free apps revenues depend on in-app advertising. For in-app advertising, Ad-store receives 30% of advertising revenues from advertiser.

App-store platform keeps 30% of revenues through in-app purchase and freemium upsell. Free apps encourage users to check out the App-store more frequently than it would with just paid apps in App-store platform.Users have the opportunity to give comments and recommendations of the downloaded app.

3.6.8 Features in the mobile app market

Concluded from the above descriptions in the mobile app market, we can deduce the primary features in in this unique, ever growing ever expanding market.

- MOS App-stores occupy the dominant position in the mobile app market based on their native Operating Systems, the key factor in this ecosystem. Great advantages like availability for apps, user bases and downloads make MOS App-stores extremely attractice. Apple App store, Google Play, Windows Phone store and Blackberry World are in the first tier in the mobile app market. TP App-store is the active and numerous one in the mobile app market.

- The mobile app market is an intriguing oligopoly. Apple and Google have taken 46% of Smartphone market share which accounts for 98% of portable device industry profits across the top 8 handset OEMs[190]. More than 80% of mobile apps are iOS or Android apps. Roughly 90% of mobile app market profits belong to Apple App store and Google Play.

- From the very beginning, mergers and acquisitions happen happen rapidly and frequently. Palm software store, Mobihand, Vodafone AppSelect were closed down. Handango, handster, PocketGear were acquired. As time goes by, the weaker and less competitive ones disappear.

- HTML5 apps are burgeoning. HTML5 is a new technology that allows developers to build rich web-based apps that run on any device via a standard web browser. HTML5 is distributed

[190] Vision Mobile,Developer Economics 2013,05/03/2013

through the rules of the open web, not through App-stores which are controlled by App-store owners. The new, daring challenge to Apple is to change the rules and network effects.

- It is an active market place with intense competition. To capitalize on this rapidly expanding market, mobile network operators, device manufactures, media companies and consumer brand owners are seeking to build end-user loyalty and increase revenues through their App-stores. Work with one total solution provider or App-store is a practical and effective way.

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4.1 Two-sided markets references review

The study of two-sided markets began in the 1990s. Before the formal study of two-sided markets, there are already some papers which had addressed specific issues of some two-sided markets.

There are mainly four parts in two-sided markets study: network externalities, platform pricing determinants and strategies, empirical industry study and regulation and social welfare.

4.1.1 Network externalities

Markets with network externalities first attracted the attention of the economists[191]. In the classic network externality study (Katz and Shapiro) 1985, Farrell and Saloner 1986, Arthur 1989), demand economies of scale cause growth in an existing stock of consumer value as new consumers join the network. Various authors have used network effects to explain the popularity of QWERTY and VHS (Arthur 1994), ad subsidies of content in “circulation industries” (Chaudhri 1998), and the importance of standards and switching costs in network economies (Katz and Shapiro 1985; Shapiro and Varian 1998, 1999).

The recent literature on two-sided network externalities (Armstrong 2002, Caillaud and Jullien2003, Rochet and Tirole 2003) make a rigorous form of indirect network effects based on the study of Katz and Shapiro (1985), Liebowitz and Margolis (1994). Indirect effects are consumption externalities from purchasing compatible products such as razor and razor blade; hardware and software.These systems lead to pecuniary externalities, efficiently handled through the pricing system (Liebowitz and Margolis 1994).

In contrast, two-sided networks yield true externalities in which one end user chooses a good affecting another end user’s choice of a different good. In two-sided networks, coordination across markets matters. Coordination within markets may have little effect.

Rochet and Tirole (2003) focused on competing credit card markets. They model two-sided network externality using multiplicative demand and symmetric spillovers, and nicely capture ”multihoming” which means the decision to carry multiple credit cards from competing networks.

Caillaud and Jullien (2003) considered a matchmaking intermediary- dating services. Using linear demand and a Bertrand pricing model, they explained why agents register with more than one service, as in the case of multihoming credit card services. Under competition, two-sided network externalities lead one firm to corner the market, or multiple firms to share the market with zero profits. They also showed how transaction costs reduce total surplus.

Reisinger Markus (2004) analyzed a two-sided market in which two platforms compete against each other. The advertisers exert a negative externality on users. If platforms charge advertisers only, a

[191] Evans David, Markets with two-sided platforms,2008

higher degree of competition for users can lead to higher profits because competition on the advertisers' side is reduced. If platforms charge users as well, profits might increase or decrease. Decrease profits occur because of increased competition through the additional instrument of the user fee.

Gokce Kurucu(2008)[192] studied in a monopolist platform in a two-sided market with negative intra-group network externalities which means end users on each side prefer the platform to be less competitive on their side; If the market's negative network externalities are substantial, that is, if an end user's disutility given the size of the end user pool on his side is high (enough), then the profit-maximizing strategy for the platform will be to match the highest types of one side with all of the agents on the other side, by charging a relatively high price from the former side and allowing free entrance for the end users of the latter side. However, if the network externalities on one side are not substantial, platform will maximize profits by matching an equal number of end users from each side.

4.1.2 Platform pricing determinants and strategies

The following are the determinants which influence the platform pricing in two-sided markets.

- Price elasticity of demand (Rochet and Tirole (2004); Armstrong (2006); Bolt and Tieman (2008));

- Network externality (Katz and Shapiro (1985, 1994); Farrell and Saloner (1986), Arthur (1989); Armstrong(2002);Caillaud and Jullien(2003),Rochet and Tirole(2003),Reisinger Markus(2004)[193] Gokce Kurucu(2008)[194]);

- Singlehoming or Multihoming(Caillaud and Jullien(2002); Wright (2002);Gabszewicz and Wauthy(2004);Armstrong and Wright (2004);Armstrong (2006); Belleflamme and Toulemonde (2007[195]));

- Products Differentiation/Variety (Armstrong and Wright (2004); Hagiu (2009));

- Producer's market power (Hagiu (2009));

- Interconnection of platforms (Armstrong (2001[196]),Doganoglu and Wright (2006); Jullien (2008);Soltani (2008)[197]);

- Commitment(Hagiu (2006))

192 Gokce Kurucu, Negative network externalities in Two-Sided Markets: A competition approach ,2007
193 Reisinger Markus, Two-Sided Markets with Negative Externalities,2004
194 Gokce Kurucu, Negative network externalities in Two-Sided Markets :A competition approach,2007
195 Belleflamme Paul and Toulemonde Eric, Negative Intra-group Externalities in two-sided markets, 2007
196 Armstrong Mark, The Theory of Access Pricing and Interconnection,2001
197 Soltani Houda, Vertical compatibility in two sided-markets,2008

Other factors exist such as difficulty of monitoring transactions; difficulty of charging for two sides; type of platform (Hagiu (2006)) and operating cost of platform which also influence the platform pricing strategies. And they have been mentioned in the formulas of two-sided market platform pricing strategies.

Other papers focusing on price allocation (distribution): Weisman Dennis (Weisman, 2010), Kaiser and Wright (Kaiser and Wright, 2006), Hagiu Andrei (Hagiu, 2009).

In two-sided markets, it is prevalent to charge two different interdependent fees: a membership fee for joining the platform and a usage fee for using the platform.

The particular pricing feature in two-sided markets is shown in Table 4- 1. Asymmetric pricing in two-sided markets is the pricing structure in two-sided markets. Asymmetric pricing is common. Most of two-sided platforms appear to get the preponderance of their operating profits mainly from one side. Some special two-sided platforms charge prices which are below marginal cost or below Zero.

Table 4- 1 Pricing structure in two-sided markets[198]

Platform	**Side**	**Membership fee**	**Usage fee**
Real estate	Buyer	×	×
	Seller	×	√
Newspaper	Reader	√(≦MC)	×
	Advertiser	×	√
Super market	Consumer	×	×
	Supplier	√	×
DoCoMo iMode	User	√	√
	Content provider	×	√
Operating system	Buyer	√	×
	Software developer	√(<MC)	×
Video game console	Player	√(≦MC)	×
	Game developer	√(<MC)	√
Payment card system	Card holder	√(<MC)	×
	Merchant	×	√
Mobile app store	User	× or √*[199]	×
	Application developer	√(<MC)	√

(Reference: Evans David (2008))

For real estate, the usage fee for sellers refers to the fee for selling a house.For newspapers, profits of the platform mainly come from the advertisers. Video game console manufacturers typically

198 √and × indicate the side pays or does not pay for membership fee or usage fee. MC means marginal cost of platform in two-sided markets.

199 √* here indicates membership fee are charged when app store platform that also supplis mobile device imposes terms on developers to charge a positive platform access (often the mobile device purchasing cost) from users.

receive virtually their entire gross margin from licensing access to the software and hardware platforms to game developers [200]; they sell the video game console at close to or below manufacturing cost[201]. Players do not pay a fee for using the console. For payment card system, cardholders are usually charged a small annual fee [202] and merchants are charged an interchange fee per transaction. Interchange fee makes main profits for payment card associations. For mobile app store, users are either charged no fee or part of mobile device purchasing fees as membership fees. The developers are charged low membership fees to access platform and usage fees per transaction. Usage fees are usually app sale revenue shares.

4.1.3 Empirical industry studies

Around the year 2000, the debates which were triggered by a series of antitrust cases against some international credit card networks in payment cards markets (Visa, MasterCard) had pushed the practice of setting an interchange fee by cooperative credit card networks. Katz (2001), Rochet and Tirole 2002), Schmalensee (2002), Wright (2004),(2003a), (2003b), Gans and King (2003),all these authors agree that credit card services have special characteristics, making conventional practices of antitrust policy partly not applicable to this industry.

The interchange fee in payment card system is the pioneer case study in two-sided market. There are plenty of pricing studies in this area. Bergman (2006); Calabrese, Gastaldi, Iacovelli and Levialdi(2008); Chakravorti(2010); Chakravorti and Roson (2006); Liu (2007); Levinson; VanHoose (2009); Verdier (2006); Wright (2010). These authors have studied about externalities, welfare, completion, multihoming, cost and other facts in payment card system.

There are also the studies intermediation services (Caillaud and Jullien (2001, 2003)), mobile telephony termination charges (Wright (2003), Armstrong (2003)),or the media market (Anderson and Coates (2005), Gabszewicz, Laussel and Sonnac (2001a, b), Ferrando et al (2003)), video games (Hagiu (2006)), [203] B2B E-commerce platform(Zhu and Lv,2005 [204]), Magazine industry(Kaiser and Wright (2006)), Television broadcasting(Shishikura and Kasuga (2010)[205]) and Fixed-Mobile convergence service(Ida and Kuroda (2010)[206]).

The paper (Rysman, 2004) estimated the importance of network effects in the market for Yellow Pages. Three simultaneous equations were estimated: consumer demand for usage of a directory, advertiser demand for advertising and a publisher's first-order condition (derived from profit maximizing behavior). Estimation showed that advertisers value consumer usage and that consumers value advertising, implying a network effect.

[200] Game developers pay royalty to video game console manufactures when players pay for video games to them.
[201] David S. Evans & Richard Schmalensee,(2008) 'Markets with Two-Sided Platforms', 1 ISSUES IN COMPETITION LAW AND POLICY 667 (ABA Section of Antitrust Law 2008)
[202] Some payment cardholders do not pay fees for their cards and/or get usage based rewards.
[203] Bruno Jullien, Price skewness and competition in Multi-sided markets,2008
[204] Zhu Zhengzhong and Lv Tingjie,Pricing strategies of electronic B2B marketplaces with two-sided networkexternalities,2005
[205] Shishikura Manabu and Kasuga Norihiro,An examination of variety issues in the Television broadcasting platform,2010
[206] Ida Takanori and Kuroda Toshifumi, Considering Fixed-Mobile convergence service as a two-sided market,2010

4.1.4 Regulation and social welfare

Regulation includes pricing regulation, market barrier regulation, antitrust regulation and so on. Boudreau and Hagiu (2009); Carbó-valverde, Chakravorti, and Fernández Rodríguez (2009); Evans (2003); Evans and Noel (2005); Holland (2007); Kojima (2008). Evans worked mainly on antitrust. Others focus on the general regulation rules in two-sided markets. Pricing regulation is a key feature for my study.

Kind et al. (2008[207]) worked on taxation in two-sided markets.

With respect to social welfare, Bergman (2006) derived a partial ranking of market structures according to their welfare effects; Bolt and Tieman (2006) proposed that in the social optimum, platform pricing leads to an inherent cost recovery problem. This result is driven by the positive externality of participation that users on either side of the market exert on the opposite side. The contribution of this positive externality to social welfare leads the social planner to increase users' participation by setting prices at both sides of the market such that the total price is below marginal cost. This causes operational losses for the platform. The regulators should find a balance between the social welfare optimum and platform profits.

4.1.5 Limitation of application of platform pricing theory in two-sided markets in mobile app market

Literature above can guide the pricing in mobile app market, especially credit card systems and computer operating system studies. Key factors (or determinants) of pricing in two-sided markets can be taken as references in App-store platform pricing in mobile app market.

There are also two mobile app market direct related studies which can be taken as references to mobile app market pricing.

One is from Gans (2012[208]), it was demonstrated that platform profits all come from revenues sharing from developers and platform cannot charge platform access price (membership fee) at a positive price, when platform access (likes purchasing a mobile device) takes place before app pricing. The Platform imposes restrictions such as the favored customer clause, and can allow the platform to gain more profits and charge a positive access price (membership fee).This study took Apple App store and Amazon app store's most favored customer clause imposed on developer as examples to explain the way to charge positive membership fee in mobile app market. Platform's exclusivity was demonstrated in mobile app market from this study. However, this study was based on one platform and one application and didn't consider app variety and competing platforms into pricing model. The real platform pricing in the mobile app market cannot be fully explained.

[207] Kind et al.,Efficiency enhancing taxation in two-sided markets, 2008
[208] Gans. J.S. ,'Mobile application pricing', Information Economics and Policy ,24(2012):52-59,2012

The other one is from Boudreau (2012[209]).It was demonstrated that for crowding similar apps, the average effect of adding producers on innovation incentives was negative. Overall, adding large number of producers led innovation to become more dependent on population-level diversity, variation and experimentation while drawing less on heroic efforts of any individual innovator. This can leave useful suggestions for mobile app developers.

Mobile app market burgeoned just in few years. Up to now, there is no systematic literature focusing on pricing strategies in mobile app market. Study of market structure, App-store platform's pricing structure, pricing determinants and strategies in mobile app market is urgently needed.

4.2 Determinants of platform pricing in two-sided markets

Pricing structure and price levels in two-sided markets are determined by a series of considerations, including price elasticity of demand; network externality; single homing or multihoming; products differentiation or customer demand for variety; producer's market power; interconnection of platforms; commitment; type of platform; difficulty of monitoring transactions; difficulty of charging and operating cost of platform. Besides the common key factors above, mobile device purchasing cost is a special pricing determinant in mobile app market.

Most studies are illustrated by taking a monopolistic and profit-maximizing platform as a reference to get the basic principles of pricing strategies in two-sided markets. Pricing under platforms' competition was expanded based on monopoly platform study.

4.2.1 Price elasticity of demand

Price elasticity of demand (PED or Ed) is a measure devised by Alfred Marshall [210]used in economics to show the responsiveness or elasticity, of the quantity demanded of a good or service to a change in its price. More precisely, it gives the percentage change in quantity demanded in response to a one percent change in price (holding constant all the other determinants of demand, such as income).

$$E_d = \frac{\%\text{ change in quantity demanded}}{\%\text{ change in price}} = \frac{\Delta Q_d / Q_d}{\Delta P / P} \quad (1)$$

(Reference: Wikipedia[211])

Price elasticity of demand is almost negative except for the Giffen goods that do not conform to the

209 Boudreau. K.J. (2012), 'Let thousand flower blomm?An early look at large number of software app developers and pattern of Innovation', Organization Science,Vol.23,No.5,September-October 2012.pp:1409-1427

210 Alfred Marshall (born 26 July 1842 in Bermondsey, London, England, died 13 July 1924 in Cambridge, England) was one of the most influential economists of his time. His book, Principles of Economics (1890), was the dominant economic textbook in England for many years.

211 http://en.wikipedia.org/wiki/Price_elasticity_of_demand ,retrieved 05/04/2012

law of demand (demand decreases with the increase of price). Revenue is maximized when the price is set so that the ED is exact one.

When changes in price have a relatively small effect on the quantity of the good demanded that also means ED is less than one(in absolute value), the demand for the good is inelastic(or relative inelastic); when ED is greater than one (in absolute value),the demand of the good is elastic(relative elastic).

Table 4- 2 Explanation of the value of price elasticity of demand

Value	Descriptive terms
$E_{d=0}$	Perfectly inelastic demand
$-1<E_d<1$	Inelastic or relatively inelastic demand
$E_d=-1$	Unit elastic, unit elasticity, unitary elasticity or unitary elastic demand
$-\infty<E_d<-1$	Elastic or relatively elastic demand
$E_d=-\infty$	Perfectly elastic demand

(Reference: Wikipedia)

As in one-sided market, platform in two-sided markets normally charges higher mark-up for less elastic side and lower for more elastic side. Platform can charges price below marginal cost or free even negative (platform offers subsidy) to more elastic side[212] [213].

4.2.1.1 Price elasticity of demand in Rochet and Tirole's study

Rochet and Tirole (2003[214]) indicated price elasticity of demand as a main factor into the pricing formula in two-sided markets. They obtained the pure-usage externality pricing model for a monopoly platform. They indicated that platform's prices to two sides were not inversely related with their own-price elasticity of demand. This was not consistent with the standard result which says that the price cost margin equals the inverse of the own-price elasticity of demand (like in one-sided markets).

Rochet and Tirole (2004[215]) encompassed the formulas obtained in the pure-usage-externality model of Rochet-Tirole (2003) and the pure-membership-externality model of Armstrong (2004) and rewrote the pricing formulas (see (4) and (5) below). The models are studied under two situations: with or without payment between two sides.

They presented that price elasticity of demand in two-sided markets is the transaction volume with respect to the total price. **η** is the price elasticity of demand. P is the price. Dots represent

[212] David S. Evans & Richard Schmalensee,(2008) 'Markets with Two-Sided Platforms', in 1 ISSUES IN COMPETITION LAW AND POLICY 667 (ABA Section of Antitrust Law 2008)
[213] JI Hanlin, (2006) ' Research of pricing strategy of two-sided market'
[214] Rochet and Tirole,(2003), 'Platform competition in Two-sided markets',European Economic Association
[215] Rochet and Tirole,Two-sided markets: An overview,2004

derivatives.

$$\eta \equiv -p\dot{V}(p)/V(p)$$

There are two sides of the market: $i \in \{B, S\}$, and a monopoly platform. Platform incurs fixed cost C_i per member on side i and marginal cost c per interaction between two members of opposite sides. On each side i, members are heterogenous over both their average benefit b_i per transaction and their fixed benefit B_i (often a fixed cost, and therefore negative) of joining the platform. End-users on side i pay to the platform A_i for membership and usage fee a_i per transaction. $N_B N_S$ is the number of transactions.

(1) There is no payment between two sides.

The platform's profit is equal to:

$$\pi = (AB - CB)\ N_B + (AS - CS)\ N_S + (a_b + a_s - c)\ N_B\ N_S \quad (1)$$

Let $P^i \equiv a^i + \dfrac{A^i - C^i}{N^j}$

(1) Can be transformed into:

$$\pi = (p^B + p^S - c)\ n^B\ (p^B, p^S)\, n^S\ (p^B, p^S) \quad (2)$$

Given a total price p ($p^B + p^S = p$) the optimal price structure is obtained by maximizing volume of usage:

$$\frac{p-c}{p} = \frac{1}{\eta} \qquad (3)$$

Pure-usage pricing is the following:

$$\frac{p^i - (c - p^j)}{p^i} = \frac{1}{\eta^i} \quad (4)$$

Pure-membership pricing is the following:

$$\frac{p^i - (-b^j)}{p^i} = \frac{1}{\eta^i} \quad (5)$$

Condition (3) may well turn out to be negative, if the externality effect is sufficiently strong. If negative prices cannot be applied in a market, only one side will be charged. This is an outcome often observed in many two-sided markets. As pointed out by Armstrong and Wright (Armstrong &Wright, 2004), the impossibility of imposing negative fees on one side induces lower fees for the other side. This is an example of a general effect termed by Rochet and Tirole (Rochet & Tirole, 2004) “topsy-turvy principle”: “a factor that is conducive to a high price on one side, to the extent that it raises the platform’s margin on that side, tends also to call for a low price on the other side as attracting members on that other side becomes more profitable”.

(2) Payment exists between two sides.

This model supposes that trade between end-users is the outcome of bargaining (where bargaining includes, as a polar case, price setting); and that on each side i, the ex post transaction benefits (or costs) b_i are drawn from distribution $F_i(b_i)$ independently of the end-user’s fixed membership benefit B_i. X presents trade probability and is an endogenous fraction $X \leq 1$.Let $b \equiv (b_b, b_s)$ and $a = a_b + a_s$ .The usage price structure is neutral under bargaining and only the a matters.

Expected net surplus per transaction for member on side i is

$$\beta_i \equiv E[(b_i - a_i)x(b,a) + t_i(b,a)] \quad (6)$$

$\sum_{i=B,S} t_i(b,a) = 0$, t_i is the balanced transfers because of bargaining.

Platform’s profit is :

$$\pi = \sum_{i=B,S} (A_i - C_i)N_i + (a-c)XN_B N_s \quad (7)$$

With $X \equiv E[x(b,a)]$,

Platform’s profit can be written in (8) after substituting and simplifying:

$$\pi \equiv [p_B + p_S + v_{(a)}]n_B n_s \quad (8)$$

Where $p_i = \frac{A_i - C_i}{N_j} + a_i X - E[b_i x(b,a) + t_i(b,a)]$

The platform's optimization problem decomposes:

i. The transaction charge a is set so as to maximize the average social surplus from potential interactions:

$$V(a) = E[(b_b + b_s - c).x(b,a)] \quad (9)$$

Under symmetric information bargaining between end-users, the platform passes through the per-transaction cost:

$$a^* = c \quad (10)$$

Under asymmetric information bargaining, in a wide range of cases (including price setting), the platform optimally subsidizes transactions:

$$a^* < c \quad (11)$$

ii. The platform sets the price level and structure as in the pure membership version of the canonical model when there is no payment between two sides，like function（5）,so as to maximize

$$\pi = [p_b + p_s + V(a^*)]N_b N_s \quad (12)$$

Utility of end user is

$$U^i = \beta^i(a^*)N^j + B^i - A^i \quad (13)$$

4.2.1.2 Price elasticity of demand in Mark Armstrong's study

Armstrong Mark (2006) [216] discussed three models in two-sided markets: a monopoly platform; two competing platforms where end users join a single platform (singlehoming); and a model of competitive bottlenecks where one group joins all platform (multihoming).

(1) Monopoly platform

There are two groups of agents, denoted 1 and 2. A member of one group cares about the number of the other group who use the platform (indirect network externality). Suppose the utility of an agent is determined in the following way: if the platform attracts n_1 and n_2 members of the two groups, the utilities of a group 1 agent and a group 2 agent are respectively:

[216] Armstrong Mark, Competition in two-sided markets,2006

$$u_{1}=\alpha_1 n_2 - p_1 ; u_{2}=\alpha_2 n_1 - p_2 \quad (1)$$

p_1 and p_2 are the platform's prices to the two groups. The parameter α_1 measures the benefit a group 1 agent enjoys from interacting with each group-2 agent, and α_2 measures the benefit a group 2 agent obtains from each group 1 agent.

If the utilities offered to the two groups are u_1 and u_2, suppose the numbers of each group who join the platform are:

$$n_1 = \Phi_1(u_1); n_2 = \Phi_2(u_2) \quad (\Phi_1(.) and \Phi_2(.) \text{ are increasing functions})$$

The platform incurs a per-agent cost f_1 for serving group 1 and per-agent cost f_2 for group 2.The aggregate consumer surplus of group i = 1, 2 be $v_i(u_i)$, where $v_i(\cdot)$ satisfies the envelope condition $v'_i(u_i) \equiv \Phi_i(u_i)$.

Platform's profit is

$$\pi = n_1(p_1 - f_1) + n_2(p_2 - f_2)$$

This can be transformed into:

$$\pi(u_1, u_2) = \Phi_1(u_1)[\alpha_1\Phi_2(u_2) - u_1 - f_1] + \Phi_2(u_2)[\alpha_2\Phi_1(u_1) - u_2 - f_2] \quad (2)$$

The welfare is composed by platform profit and consumer surplus:

$$w = \pi(u_1, u_2) + v_1(u_1) + v_1(u_2)$$

The utilities satisfying the following condition when we maximize the welfare outcome:

$$u_1 = (\alpha_1 + \alpha_2)n_2 - f_1; u_2 = (\alpha_1 + \alpha_2)n_1 - f_2$$

From expression (1), the social optimal prices satisfy:

$$p_1 = f_1 - \alpha_2 n_2; \; p_2 = f_2 - \alpha_1 n_1$$

From expression (2), the platform profit-maximizing prices satisfy:

$$p_1 = f_1 - \alpha_2 n_2 + \frac{\Phi_1(u_1)}{\Phi'_1(u_1)}; \; p_2 = f_2 - \alpha_1 n_1 + \frac{\Phi_2(u_2)}{\Phi'_2(u_2)} \quad (3)$$

$\frac{\Phi_1(u_1)}{\Phi'_1(u_1)}$ relates to the elasticity of group's participation.

A group's price elasticity of demand for a given level of participation by the other group satisfies:

$$\eta_1(p_{1/}n_2)=\frac{p_1\Phi'_1(\alpha_1 n_2-p_1)}{\Phi_1(\alpha_1 n_2-p_1)};\eta_2(p_{2/}n_1)=\frac{p_2\Phi'_2(\alpha_2 n_1-p_2)}{\Phi_2(\alpha_2 n_1-p_2)}$$

The platform profit-maximizing prices can be rewritten into the form of Lerner indices:

$$\frac{p_1-(f_1-\alpha_2 n_2)}{p_1}=\frac{1}{\eta_1(p_{1/}n_2)};\frac{p_2-(f_2-\alpha_1 n_1)}{p_2}=\frac{1}{\eta_2(p_{2/}n_1)} \quad (4)$$

We can find that the profit maximizing outcome involves group 1 can be offered a subsidized service (i.e. $p_1<f_1$) when group 1's price elasticity of demand is high and/or the external benefit enjoyed by group 2 is large.

(2) Two-sided single homing

- **Two platforms charges symmetric membership fees to two sides**

This model involves two competing platforms where end users join a single platform (singlehoming) [217].

There are two groups of agents 1 and 2, and there are two platforms A and B which enable the two groups to interact. Group 1 and 2 obtain the utilities { u_1^i, u_2^i } if they join platform i. { p_1^i, p_2^i } are the respective prices charged by platform i to the two groups. When Platform i attracts n_1^i and n_2^i members of the two groups, its utilities are:

$$u_1^i=\alpha_1 n_2^i-p_1^i;u_2^i=\alpha_2 n_1^i-p_2^i \, (1)$$

Agents in a group are assumed to be uniformly located along a unit interval with the two platforms located at the two endpoints; $t_1, t_{2>0}$ are the product differentiation or transport cost parameters for the two groups that describe the competitiveness of the two sides of the market.

When group 1 is offered a choice of utilities u_1^A and u_1^B from the two platforms and group 2 is offered the choice u_2^A and u_2^B from the two platforms, suppose the number of each group who join platform i is given by the hotelling specification

$$n_1^i=\frac{1}{2}+\frac{u_1^i-u_1^j}{2t_1};n_2^i=\frac{1}{2}+\frac{u_2^i-u_2^j}{2t_2} \quad (2)$$

[217] Armstrong Mark, Competition in two-sided markets,2006

Putting (2) together with (1), and using that, $n_1^j = 1 - n_1^i$ gives the following implicit expressions for market shares:

$$n_1^i = \frac{1}{2} + \frac{\alpha_1(2n_2^i - 1) - (p_1^i - p_1^j)}{2t_1}; n_2^i = \frac{1}{2} + \frac{\alpha_2(2n_1^i - 1) - (p_2^i - p_2^j)}{2t_2} \quad (3)$$

To focus on market-sharing equilibria, suppose the network externality parameters {α_1, α_2} are small compared to the differentiation parameters {t_1, t_2}. (If network effects were large compared to brand preferences, then there could be equilibria only where one platform corners both sides of the market.) The necessary and sufficient condition for a market-sharing equilibrium to exist is

$$4t_1t_2 > (\alpha_1 + \alpha_2)^2 \quad (4)$$

Putting (4) together with (3), suppose platforms A and B offer the respective price pairs (p_1^A, p_2^A) and (p_1^B, p_2^B). Given these prices, solving the simultaneous the equations (3) implies the market shares are:

$$n_1^i = \frac{1}{2} + \frac{1}{2}\frac{\alpha_1(p_2^j - p_2^i) + t_2(p_1^j - p_1^i)}{t_1t_2 - \alpha_1\alpha_2}; n_2^i = \frac{1}{2} + \frac{1}{2}\frac{\alpha_2(p_1^j - p_1^i) + t_1(p_2^j - p_2^i)}{t_1t_2 - \alpha_1\alpha_2} \quad (5)$$

For the monopoly model, suppose each platform has a per-agent cost f_1 for serving group 1 and f_2 for serving group 2. Therefore, platform i's profit is

$$(p_1^i - f_1)[\frac{1}{2} + \frac{1}{2}\frac{\alpha_1(p_2^j - p_2^i) + t_2(p_1^j - p_1^i)}{t_1t_2 - \alpha_1\alpha_2}] + (p_2^i - f_2)[\frac{1}{2} + \frac{1}{2}\frac{\alpha_2(p_1^j - p_1^i) + t_1(p_2^j - p_2^i)}{t_1t_2 - \alpha_1\alpha_2}]$$

(6)

For the case of a symmetric equilibrium where each platform offers the same price pair (p_1, p_2), the first-order conditions for equilibrium prices are

$$p_1 = f_1 + t_1 - \frac{\alpha_2}{t_2}(\alpha_1 + p_2 - f_2); p_2 = f_2 + t_2 - \frac{\alpha_1}{t_1}(\alpha_2 + p_1 - f_1) \quad (7)$$

Proposition 2. Suppose (4) holds. Then the model with two-sided single-homing has a unique equilibrium that is symmetric. Solving the simultaneous equations in (7) implies that equilibrium prices for group 1and group 2 are given respectively by

$$p_1 = f_1 + t_1 - \alpha_2; p_2 = f_2 + t_2 - \alpha_1 \quad (8)$$

From (3) a platform's own-price elasticity of demand given fixed and equal market share for the other group is $\eta_1 = p_1/t_1$ and $\eta_2 = p_2/t_2$ for group 1and group 2 respectively. Thus, expression (8) may be rewritten as

$$\frac{p_1 - (f_1 - 2\alpha_2 n_2)}{p_1} = \frac{1}{\eta_1}; \frac{p_2 - (f_2 - 2\alpha_1 n_1)}{p_2} = \frac{1}{\eta_2} \quad (9)$$

From (7), in equilibrium each platform makes profit

$$\pi = \frac{t_1 + t_2 - \alpha_1 - \alpha_2}{2} \quad (10)$$

Useful conclusions:

- From (5), if $\alpha_1, \alpha_2 > 0$,demand by the two groups is complementary, meaning that a platform's markets share for one group is decreasing in its price for the other group.

- Comparing (9) with the monopoly formula (expression (4) in the monopoly formula) as following:

$$\frac{p_1-(f_1-\alpha_2 n_2)}{p_1}=\frac{1}{\eta_1(p_1/n_2)};\frac{p_2-(f_2-\alpha_1 n_1)}{p_2}=\frac{1}{\eta_2(p_2/n_1)} \quad (4)$$

It shows that a platform in a duopoly two-sided single homing markets puts twice as much emphasis on the external benefit from one group when it sets its price to the other group. Because the duopoly platform's former user will become the member of its rival platform when it sets high price.

- From (10), we can see that positive cross-group externalities act to reduce profit compared to the case where $\alpha_1 = \alpha_2 = 0$,since platforms have an additional incentive to compete hard for market share.

- **Two platforms charge symmetric two-part tariffs to two sides**

For two two-sided single homing platforms, Armstrong also considered the platforms charges symmetric two-part tariffs (both membership fees and usage fees) to two sides. T_1^i , T_2^i are platform i 's prices (or tariffs) to side 1 and side 2. The equilibrium prices where the two platforms offer the same pair of two-part tariffs to group 1 and group 2of the form:

$$T_1 = p_1 + \Upsilon_1 n_2;\ T_2 = P_2 + \Upsilon_2 n_1 \qquad (11)$$

Υ_1 and Υ_2 are the usage fees (marginal prices), p_1 and p_2 are membership fees (fixed fees) to two sides.

Membership fees are the following:

$$p_1 = f_1 + t_1 - \alpha_2 + (\Upsilon_2 - \Upsilon_1)/2;\ p_2 = f_2 + t_2 - \alpha_1 + (\Upsilon_1 - \Upsilon_2)/2 \quad (12)$$

t_1 and t_2 are the product differentiation (or transport cost) for the two groups that describe the competiveness of the two sides of the market.

Platform's profit of each platform in equilibrium is:

$$\pi = (t_1 + t_2 - \alpha_1 - \alpha_2)/2 + (\Upsilon_1 + \Upsilon_2)/4 \quad (13)$$

Conclusions:

Platform's profit increases in the usage fees Υ_1 and Υ_2. Indirect network externality makes market so competitive.

(3) Competitive bottlenecks

Members from group 1 are singlehoming. Members from group 2 are multihoming. The difference between competitive bottlenecks and two-sided singlehoming is that the group 2 does not make an "either–or"decision to join a platform. Keeping the market shares of group 1 constant, a group 2 member makes a decision to join one platform independently from its decision to join the other. There is no competition between platforms to attract group 2 members.

There are two types of models. One is informative advertising on media platforms such as newspapers or yellow pages where advertisers wish to make contact with potential customers by placing ads through these media platforms. The other one is supermarket. App-store platform is like the supermarket where there is a shop in middle that has to attract both the customers and the content suppliers. Thus, supermarket pricing could be a primary discussion for App-store pricing. Media platform pricing could be applied for Ad-store pricing.

There are two supermarkets competing to attract consumers. Consumers from group 1 care both about the prices they pay and the range of products on offer. They visit either one supermarket or the other (but not both) over the relevant time period. Suppose there is a continuum of monopoly products ("group 2"), each of which could be supplied to either or both supermarkets. Suppose each consumer wishes to buy one unit of each product so long as the price of the product is less than their reservation value α_1.The cost of selling each unit of any product for supermarkets is *c*. Supermarket sets its retail price p_1 to consumers and makes take-it-or-leave-it offers to buy from the suppliers. Suppose that the unit cost of supply for each product α_2 is unknown to supermarkets and is independently and identically drawn from a distribution function $F(\alpha_2)$. The supermarkets make a per-unit price p_2 to all suppliers. (P_2 is the platform pays for group 2 and this payment bases on each transaction).

The utility of a consumer from visiting the supermarket is the number of products multiplied by the net surplus per product:

$$u_1 = F(p_2)(\alpha_1 - p_1) \quad (1)$$

The supermarket's profit per consumer is

$$\pi = F(p_2)(p_1 - c - p_2) \quad (2)$$

Regardless of its market share of consumers, a supermarket will choose p_1 and p_2 to maximize its profit per consumer, π, subject to delivering a required utility u_1. Expressions (1) and (2) then imply that

$$p_2 \text{ maximizes } \quad F(p_2)(\alpha_1 - c - p_2) \quad (3)$$

The competition in group 1 decides how well the consumers are treated. If consumers choose their supermarket according to the Hotelling specification $n_1^i = \frac{1}{2} + \frac{u_1^i - u_1^j}{2t_1}$ (t represents the market power), the equilibrium utility u_1 is

$$u_1 = F(p_2)(\alpha_1 - c - p_2) - t \quad (4)$$

We can also get the equilibrium per-unit price to consumer is

$$p_1 = c + p_2 + t / F(p_2) \quad (5)$$

Conclusions:

- As with all the competitive bottleneck models, in equilibrium the joint surplus of the platforms and the single-homing group is maximized (supermarkets and consumers in this case, as given in expression (5)), and the interests of the multi-homing side (the suppliers) are ignored.

- The treatment of suppliers is not affected by the strength of competition between supermarkets for consumers.

- When the suppliers sell directly to consumers without passing the transactions through supermarkets, this makes consumers worse off (Because there is a continuum of suppliers, each supplier sets its monopoly price $p_1 = \alpha_1$ without regard for the effect its high price has on the number of consumers who visit the local shopping area). But it does improve efficiency because the competitive bottleneck is overcome and the range of products supplied is efficient. Lack of coordination between independent suppliers acts as kind of commitment to price high in a shopping area and this boosts profit.

4.2.1.3 Price elasticity of demand in Bolt Wilko and Tieman Alexander's study

Bolt and Tieman (2008)[218] studied that under constant elasticity of demand for a monopoly platform, the more elastic side of the market is used to generate maximum demand by providing it with platform services at the lowest possible price. In their paper, they assumed the buyer's side is

[218] Bolt Wilko and Tieman Alexander, (2008) 'Heavily skewed pricing in two-sided markets', International Journal of Industrial Organization,26 (2008): 1250–1255

more elastic and the maximal skewed pricing is profit maximizing under constant elasticity of demand.

This paper works on the model in which monopoly platform just charges pure usage fees from two sides. As in the following picture, t_b, t_s are the usage fees from buyer side and seller side charged by the platform.

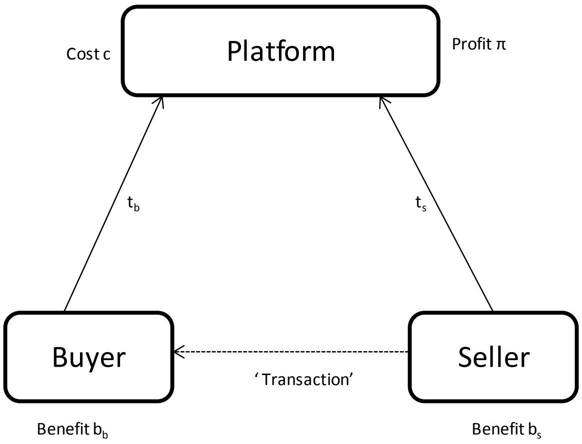

Figure 4- 1 The monopoly platform

And by maximizing the profit of platform, they get the equilibrium usage prices for the two sides:

$\varepsilon_b, \varepsilon_s$ are the price elasticity of demand for buyer and seller sides. C is the joint marginal cost of platform.

$$t^*_b = \frac{c\varepsilon_b}{\varepsilon_b + \varepsilon_s - 1}, t^*_s = \frac{c\varepsilon_s}{\varepsilon_b + \varepsilon_s - 1}$$

There is also a table of monopoly platform profits under a constant-elasticity distribution.

Table 4- 3 Monopoly platform profits under a constant-elasticity distribution

		Interior	Corner solutions	
		(t^*_b, t^*_s)	Buyer	Seller
			$(\underline{b}_b, m_s)$	$(m_b, \underline{b}_s)$
Price:				
Buyer fee	t_b	0.046	0.020	0.069
Seller fee	t_s	0.034	0.081	0.018
Total fee	tr	0.080	0.101	0.087
Demand(in%):				
Buyer demand	$D_b(t_b,t_s)$	8.4	100.0	2.4
Seller demand	$D_s(t_b,t_s)$	25.5	3.7	100.0
Total demand	$D(t_b,t_s)$	2.1	3.7	2.4
Profit:				
Total	$\pi(t_b,t_s,C)$	0.32	1.35	0.56

(Parameters: $\varepsilon_b = 3, \varepsilon_s = 2.2, \underline{b}_b = 0.02, \underline{b}_s = 0.018, c = 0.064 (c_b = c_s = 0.032), N = 1000.$)

From the table, total demand is highest in the buyers' corner solution even though it has the highest total price. Complete buyers' participation boosts total demand, which at the same time allows a higher price to be extracted from the relatively inelastic sellers.

4.2.1.4 Revelations of price elasticity of demand's influence in platform pricing in two-sided markets

Rochet &Tirole (2003) studied the pure-usage externality pricing model for a monopoly platform. Rochet &Tirole (2004)'s study integrated usage and membership externalities for a monopoly platform. Both of the two studies indicated that platform's price to two sides were not inverse of the own-price elasticity of demand.

Bolt and Tieman (2004[219]) found that Rochet and Tirole's conclusions just hold true when concavity assumptions for the profit function should be met. Conclusions of Rochet and Tirole may actually be violated in many circumstances where a corner solution would emerge.

Armstrong (2006) focused on indirect network externality, membership fee or usage fee and single or multihoming three determinants' influences to pricing in two-sided market. Monopoly platform, two-sided single-homing and competitive bottlenecks were all considered into this study. Armstrong (2006)'s study presented price elasticity and indirect network externality's effects to pricing in two-sided markets when platform charges membership fees to two sides. Pricing models in competitive bottlenecks and two-part tariffs in two two-sided single-homing platforms will be taken as references to pricing in mobile app market. Hotelling specification to describe number of each side members who join the correspondent platform is reasonable.

4.2.2 Network externalities

Katz and Shapiro (1985, 1994); Farrell and Saloner(1986), Arthur (1989);David and Greenstein(1990);Gilbert(1992);Bensaid and Lsene (1996);Parker and Van Alstyne(2000,2002);Ambus and Argenziano(2003);Armstrong(2006);Caillaud and Jullien(2003);Rochet and Tirole(2003);Reisinger Markus(2004) and Gokce Kurucu(2008)[220] are the main studies which focus on the network externality in two-sided market.

4.2.2.1 Definition of network externalities

There are two basic definitions for network externalities:

- The effects of one product to one user increases with the increase of number of other users who use the same products or compatible products are the positive network externalities. (Jean

[219] Bolt.W and Tieman.A.F.(2004) 'Skewed pricing in two-sided markets: An IO approach',DNB working paper 13,October
[220] Gokce Kurucu, Negative network externalities in Two-Sided Markets :A competition approach,2008

Tirole, 1988[221])

- The value of membership to one user is positively affected when another user joins and enlarges the network. This could be called "network effects" or "network externalities". (Katz and Shapiro, 1994, p94[222])

Both of the definitions above describe the characteristics of network externalities. Network externalities are also called network effects or demand-side economies of scale. We can find network externalities in financial exchanges, software industry, telecommunications industry, internet and other information industries.Twitter, Facebook and Google+ are the good social networks in our daily life with the positive network externalities.

Other overviews of the literature on network externalities are also given in katz and Shapiro (1985[223]), Farrell and Saloner (1985[224]), Arthur (1989), David and Greenstein (1990[225]) and Gilbert (1992).

4.2.2.2 Current studies of network externalities

Bensaid and Lsene's study (1996) tried to find optimal dynamic pricing for a monopoly platform through Discrete-time model. They found that when network externalities are strong, the positive network externalities can help the monopoly platform increase the product price by commitment of the platform's reliability.

Parker and Van Alstyne (2000[226], 2002[227]) are the first who propose the network externalities in two-sided markets.They proposed that cross-market externalities and inter-network externalities exist in two-sided market through the pricing case study in Microsoft, Netscape and Adobe. They classified cross-market externalities and inter-network externalities into indirect externality. They found that platform will subsidy for the product sales even without competition because the exits of network externalities; Platform charges lower price for the side which has large indirect network externalities to the other side.

Ambus and Argenziano (2003) solved the pricing through game theory in rational consumer market with network externalities and alliance for a monopoly platform.Under the assumption that consumers are heterogeneous; a monopoly firm will offer different product prices through different distribution channels.

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[221] Jean Tirole, The theory of industrial organization,1988
[222] Katz and Shapiro, Systems competition and network effects,1994
[223] Katz, M. and C. Shapiro (1985), Network externalities, competition, and compatibility, American Economic Review, 75, 424-440.
[224] Farrell, J. and G. Saloner (1985), Standardization, compatibility, and innovation, RAND Journal of Economics, 16, 70-83
[225] David, P. and S Greenstein S. (1990), The economics of compatibility standards: An introduction to recent research, Economics of Innovation and New Technology, 1, 3-41.
[226] Parker and Van Alstyne, Information Complements, Substitutes and Strategic Product Design,2000, Available at SSRN: http://ssrn.com/abstract=249585
[227] Parker Geoffrey and Marshall Van Alstyne, Two-Sided Network Effects: A Theory of Information Product Design, 2005, Management Science, 51(10): 1494–1501.

Caillaud and Jullien (2003 [228]) analyzed a model of imperfect price competition between intermediation service providers. And they insist on the presence of indirect network externalities and other factors that are relevant for informational intermediation via the Internet.Intermediaries have incentives to propose non-exclusive services, as this moderates competition and allow them to exert market power.

Rochet and Tirole (2004) classified the network externalities into membership externality and usage externality.An end user on side 1 derives a strictly positive net surplus from interacting with additional end-users on side 2, membership decisions generate membership externalities. If a user strictly benefits from using the products or services of platform, the end-user from the other side exerts usage externalities by supplying the products or services. Usage externalities arise from usage decisions. Rochet and Tirole have established the models to solve the pricing problem in two-sided markets by charging pure membership fees, pure usage fees or the two at the same time based on membership externality and usage externality.

Reisinger Markus (2004[229]) analyzed a two-sided market where there are two competing platforms. One side, the advertisers, exerts a negative externality on the other side, the users. It is shown that if platforms can charge advertisers only, a higher degree of competition for users can lead to higher profits because competition on the advertisers' side is reduced. If platforms can charge users as well, profits might increase or decreases the latter because of increased competition through the additional instrument of the user fee. Nevertheless the equilibrium with user fee is more efficient.

Armstrong (2006[230]) proposed that if a member of group 1 exerts a large positive network externalities on each member of group 2, then group 1 will be targeted aggressively by platforms. Positive indirect network externalities act to intensify competition and reduce a platform profit (except for the monopoly platform). The following is the equilibrium platform profits when the two sides are both singlehoming for two competitive platforms.

$$\pi = \frac{t_1 + t_2 - \alpha_1 - \alpha_2}{2}$$

Positive indirect network externalities act to reduce profit compared to the case where $\alpha 1 = \alpha 2 = 0$, since platforms have an additional incentive to compete hard for market share. This assumption was based on two two-sided single homing competed platforms who charges membership fees to two sides.

In Gokce Kurucu's study (2008[231]), a firm advertised in a job matching agency with the aim of employing the most qualified workers. Assume that there is a monopolist platform in a two-sided market setup in which the agents on each side prefer the platform to be less competitive on their side;

[228] Caillaud, Bernard and Bruno Jullien (2003), Chicken & Egg: Competition among Intermediation Service Providers, RAND Journal of Economics, 34: 309-328.
[229] Reisinger Markus, Two-Sided Markets with Negative Externalities,2004
[230] Armstrong Mark,2006,Competition in Two-Sided Markets, The RAND Journal of Economics, 37(3): 668–91.
[231] Gokce Kurucu, Negative network externalities in Two-Sided Markets :A competition approach,2008

that is a market with negative indirect network externalities. If the market's negative network externalities are substantial, that is, if an agent's disutility given the size of the agent pool on his side is high (enough), then the profit-maximizing strategy for the matchmaker will be to match the highest types of one side with all of the agents on the other side, by charging a relatively high price from the former side and allowing free entrance for the agents of the latter side. If the network externalities on one side are not substantial, then the matchmaker will maximize profits by matching an equal number of agents from each side.

4.2.2.3 Revelations of network externalities' influence in platform pricing in two-sided markets

The conclusion of the above studies is as follows, when one member of side 1 exerts large positive network externalities to each member of side 2, then side 1 will be targeted aggressively and be charged lower price (free or even subsidy) by platforms in two-sided markets.

Network externalities to pricing in Parker and Van Alstyne (2000, 2002) and Armstrong (2006) studies will be taken to guide pricing in mobile app market.

4.2.3 Singlehoming or multihoming

4.2.3.1 Current studies of singlehoming or multihoming

We can find the relevant studies about singlehoming or Multihoming in Caillaud and Jullien (2001); Wright (2002); Gabszewicz and Wauthy (2004); Armstrong and Wright (2004); Armstrong (2006); Belleflamme and Toulemonde (2007[232])) in two-sided markets.

Caillaud and Jullien (2001[233]) examined a Bertrand competition game between two intermediaries offering matching services between two sides of a market. They formalized some specificities of intermediation on the Internet by allowing registration and transaction prices, and multiple registrations. When only registration fees (membership fees) are used and agents register to at most one cybermediary (singlehoming), there exists an equilibrium where one firm corners the market with positive profits, as well as zero profit equilibria where the firms share the market. Introducing either fees that are contingent on successful matching or the possibility of registration with two intermediaries drastically reduces the profits of a dominant firm. Moreover, with multiple registrations, new types of positive-profit equilibria emerge where both matchmakers are active and one side of the market registers with both cybermediaries (multihoming).

Wright Julian (2002[234]) assumed that cellular side is singlehoming and fixed telephone side is

[232] Belleflamme Paul and Toulemonde Eric, Negative Intra-group Externalities in two-sided markets, 2007
[233] Caillaud and Jullien, Chicken & Egg: Competing Matchmakers,2001
[234] Wright Julian, Access Pricing under Competition: An Application to Cellular Networks, mimeo, University of Auckland,2002

multihoming. Telecommunication operator charges lower membership fee and called-out fee for cellular side and higher called-in fee. The multihoming side's benefits were ignored. It is concurrent with conclusions in Armstrong (2006).

Gabszewicz and Wauthy (2004[235] and 2007[236]) modeled duopoly competition between two platforms. They operated in a two-sided market where agents are heterogeneous on both sides of the market and are allowed to multihome. Network externalities are captured within a vertical differentiation framework.Under single-homing there exists an interior equilibrium where networks exhibit asymmetric sizes and both firms enjoy positive profits. When all agents are allowed to multihome the two platforms, we show that in equilibrium multi-homing takes place on one side of the market only. Moreover, the only equilibrium exhibiting positive profits for both platforms replicates the collusive outcome.

In Gabszewicz and Wauthy's study (2007), two platforms competed in quantities in a two-sided market where agents' valuation of the indirect network externalities are heterogeneous. Indirect network externalities are shown to generate an endogenous vertical differentiation structure. When agents are only allowed to single-home, there exists a unique equilibrium outcome where two asymmetric platforms co-exist with positive profits. In the case where one side of the market is allowed to multi-home, platforms exhibit asymmetric sizes in equilibrium but they also exhibit inversed hierarchy from one side to the other, i.e. each platform dominates one side of the market.

Armstrong Mark and Wright Julian (2004[237]) studied two competed platforms which were viewed as homogenous by sellers but heterogeneous by buyers. Sellers are multihoming. Buyers are singlehoming. The competitive bottleneck arises in the equilibrium where sellers have their network benefits exploited while buyers face a below cost price. The benefits of the multihoming side are ignored. Exclusive contracts are offered to prevent multihoming.

Armstrong Mark (2006) showed as with all the competitive bottleneck models, in equilibrium the joint surplus of the platforms and the single-homing group is maximized, and the interests of the multi-homing side (the suppliers) are ignored.

Belleflamme Paul and Toulemonde Eric (2007[238]) argued the sensible way to endogenize the choice between singlehoming and multihoming is to offer the exclusive contracts by the platform. The exclusive contracts can compel agents accept such contracts to singlehome. In the absence of exclusive contracts, multihoming makes entry harder for the new platform. But exclusive contracts might facilitate divide-and-conquer strategies. This is correspondent with the conclusions in Armstrong and Wright's study (2004).

[235] Gabszewicz and Wauthy, Two-sided markets and price competition with multihoming ,2004
[236] Gabszewicz and wauthy, Network Competition in a Market where Cross Externalities induce vertical differentiation ,2007
[237] Armstrong Mark and Wright Julian, Two-sided markets, competitive bottlenecks and exclusive contracts,2004
[238] Belleflamme Paul and Toulemonde Eric, Negative Intra-group Externalities in two-sided markets, 2007

4.2.3.2 Revelations of singlehoming or multihoming's influence in platform pricing in two-sided markets

From the above studies, we can deduce that singlehoming side is treated more favorably and charged lower price by platforms.Multihoming side's benefits were usually ignored (Wright (2002), Armstrong and Wright (2004), Armstrong (2006)).

Multi-homing takes place on one side of the market in equilibrium when both two sides are allowed to multi home for a market with duoploy platforms (Caillaud and Jullien (2001), Gabszewicz and Wauthy (2004)).

Exclusive contracts are offered to prevent multihoming.

4.2.4 Products Differentiation and customer demand for variety

4.2.4.1 Current studies of products differentiation/variety

Products Differentiation/Variety studies in two-sided markets are mainly in Armstrong Mark and Wright Julian (2004) and Hagiu Andrei (2009).

Armstrong Mark and Wright Julian (2004) studied products differentiation's influence to pricing with membership fee between two competing platforms.(1) If the products differentiation for both two sides of the two platforms is larger, platforms will get more mark-up from the two sides; if this differentiation is smaller, the two platforms' competition focused one side will aggravate and the two platforms will decrease the price on this side until zero; when the differentiation continues decreasing, the two platforms can't charge negative fee from one side, they will also decrease the fee from the other side.(2) If the product differentiations just exist in one side for the two platforms, this side with differentiation will choose single homing. This singlehoming side will get subsidies from the two platforms.

Hagiu Andrei (2009[239]) considered two-sided platforms are bottlenecks between consumers and producers in the sense that a consumer can purchase and use a seller's product if and only if both join the same platform. Platform charges only membership fees for two sides; there are no vertical differences for the preference of products for both two sides. When consumer's demand for variety is higher, platform will get its profits mainly from the producer side, since producers become less substitutable and there is less competition between producers.

[239] Hagiu Andrei , Two Sided Platforms: Product variety and Pricing structures,2009

4.2.4.2 Revelations of products differentiation's influence in platform pricing in two-sided markets

Large products differentiation for both two sides will make more profits for platform. Platform will focus the side with lower products differentiation and charges lower price on this side.

The only products differentiation side will choose singlehoming.Singlehoming side will be treated better than multi homing side. This is coincident with the single or multi homing's influence to pricing in two-sided markets.

Customers will be charged less when customers' demand for products variety is higher under optimal pricing structure for a monopoly platform[240].

4.2.5 Producer's market power

Hagiu Andrei (2009), argued that when the stronger producer market power, the less effective a given platform's price cutting strategies on the consumer side are in driving producers away from the competing platform, and therefore the higher the equilibrium price charged to consumers.

Customer side will be charged higher price when producer or seller has stronger market power.

4.2.6 Interconnection of platforms

4.2.6.1 Current studies of interconnection of platforms

Interconnection of platforms studies in two-sided markets are mainly in Armstrong (2001[241]), Doganoglu and Wright (2006[242]); Jullien (2008) and Soltani (2008)[243]). Interconnection of platforms exists broadly in Payment card systems and telecommunication industry.

Armstrong (2001) studied the interaction between competition and regulation in telecommunications markets and focus on the access charges and network interconnection. All firms in the market need to purchase access to rival firms' subscribers from each other. In this situation the danger is collusion between networks. Whether the free negotiations between networks over their mutual access charges induce high prices for subscribers depends in part on the kinds of tariffs that networks offer.

Doganoglu and Wright (2006) showed that when competing firms make their services compatible,

[240] Setting a lower price on the consumer side is accounting for indirect benefits created by additional consumers on the producer side.
[241] Armstrong Mark, The Theory of Access Pricing and Interconnection ,2001
[242] Doganoglu Toker and Wright Julian, Multihoming and compatibility,2005
[243] Soltani Houda, Vertical compatibility in two sided-markets,2008

consumers enjoy greater network benefits. These benefits can also be realized if firms remain incompatible and consumers multihome by purchasing from each of the firms.They found that such multihoming may be a poor substitute for compatibility. Multihoming weakens competition and introduces costs that firms do not internalize. As a result, multihoming can increase the social desirability of compatibility, while making compatibility less attractive for firms.

Jullien Bruno (2008) supposed that users of interconnected platforms benefit from externalities with all users. While externalities raise the incentive to reach a large population, platform A is not able to appropriate the efficiency gains associated with these externalities. Moreover, it may have to sell to some sides. There is an opportunity cost of letting them joining the competitor. Choosing to interconnect may then be one way to avoid these problems. Positive network effects between members of the same side may refrain platform A from interconnecting with platform B, as it can obtain an extra profit on each side served, that vanishes under interconnection. The profit that platform A can obtain by cornering the market is now augmented by the total value of inter-side or direct network effects. Thus platform A's profit may be above the interconnected profit.

Soltani Houda (2008) determined different business models according to the choice of the compatibility strategy (between platforms and sellers side). This choice depends on the structure of the costs of the market. The model shows that: (i) the strategy of asymmetric compatibility charged to sellers side is dominated by the strategy of total and perfect compatibility, (ii) the strategy of total and imperfect compatibility is strictly dominated by the strategy of asymmetrical compatibility charged to the platforms, (iii)the asymmetric compatibility charged to sellers side is socially preferable to the asymmetric compatibility charged to the platforms if, and only if, the total profit associated to the rise of prices, caused by the choice of an asymmetric strategy of compatibility, is higher than the total cost of such a strategy.

4.2.6.2 Revelations of Interconnection of platforms' influence in platform pricing in two-sided markets

Compatibility, switching cost and access charges are the three important factors for the interconnection of platforms.

Interconnection of platforms is normally dependent on the network external benefits. Positive direct (or inter-side) network effects between members of the same side may refrain platform's interconnection.

Consumers enjoy greater network benefits through interconnection of competing platforms.

4.2.7 Commitment

Hagiu Andrei (2006[244]) assumes that i) Platforms are essential bottleneck inputs for buyers and

[244] Hagiu Andriei, Pricing and commitment by two-sided platforms,2006

sellers transacting with each other; ii) sellers arrive before buyers; iii) platforms can charge both fixed fees and variable fees (royalties). A monopoly platform may prefer not to commit to the price it will charge buyers at the same time it announces its seller price if it faces unfavorable seller expectations.

With competing platforms commitment makes the existence of an exclusive equilibrium (in which sellers register only with one platform) less likely, but has no impact on multihoming equilibrium (in which sellers support both platforms) whenever these exist.

Commitment is not welcomed by monopoly platform. Commitments from two competing platforms will make less possible for seller side's singlehoming.

4.2.8 Platform price allocation to two sides

4.2.8.1 Current studies of price allocation

There are also other papers which focus on price allocation (distribution): Weisman Dennis (2010[245]), Kaiser and Wright (2005[246]), Hagiu Andrei (2009[247]).

Weisman Dennis derived an optimal allocation rule (α^*) that (1) assigns a share of the transaction price to the buyer-side of the two-sided markets;(2) is equivalent to Rochet-Tirole price structure rule;(3) is a function of the own/cross-price elasticity. For linear demands, demand symmetry is sufficient for α^*=1/2 and α^* is decreasing (increasing) in the own-price (cross-price) sensitivity parameter of buyer side demand.

Kaiser and Wright (2010) presented and estimated a model of competition in a two-sided market: the market for magazine readership and advertising. Using data on magazines in Germany, they find evidence that magazines have properties of two-sided markets. The results are consistent with the perception that prices for readers are subsidized and that magazines make all their money from advertisers. Consistent with advertisers valuing readers more than readers value advertisements, the results imply that higher demand on the reader side increases ad rates, but that higher demand on the advertising side decreases cover prices.

Hagiu (2009) found that with platform competition, consumer preferences for variety, producer market power and producer economies of scale in multihoming also make platforms' price-cutting strategies on the consumer side less effective.

[245] Weisman Dennis, Optimal Price Allocations in Two-Sided markets ,2010
[246] kaiser Ulrich and Wright Julian ,Price structure in two-sided markets Evidence from the magazine industry ,2005
[247] Hagiu Andrei, Two Sided Platforms: product variety and pricing structures, 2009

4.2.8.2 Revelations of price allocation' influence in platform pricing in two-sided markets

Price to buyer will decrease when buyer's price elasticity of demand is higher or more sensitive.

Consumer preferences for variety[248], producer market power and producer economies of scale in multihoming makes it difficult to charge lower price from user side.

4.2.9 Other factors

There are other factors like difficulty of monitoring transactions; difficulty of charging for two sides; type of platform (Hagiu Andrei (2006)) and operating cost of platform which also influence the pricing strategies. And they have been mentioned in the formulas of two-sided market pricing strategies.

Membership fees are more often charged when it is difficult to monitor transactions or charge for two sides.

Hagiu (2006[249]) compared proprietary (closed) and open platform.

Proprietary platforms create two-sided deadweight losses through monopoly pricing but at the same time, precisely because they set prices in order to maximize profits, they partially internalize two-sided positive indirect network effects and direct competitive effects on the producer side. In this way sometimes make proprietary platforms more socially desirable than open platforms.

Operating cost of platform's influence to price is often considered by Ramsey Pricing to achieve a balanced budget.

4.2.10 Effects of price determinants to platform pricing

In conclusion, form the determinants of pricing in two-sided markets, we can obtain the main determinants' effects to platform pricing in two-sided markets (Table 4- 4). Generally multihoming side will be charged more from platform. The Smaller product differentiation side is usually singlehoming so to be charged less by platform. The rest four determinants are inverse related to platform pricing.

[248] Hagiu supposed that there exists an additional motivation for lowering prices to consumers: undercutting the rival platform and thereby stealing some of its consumers drives some producers away from it, resulting in even more consumers stolen, etc. In this situation, consumer's demand of variety is not positive for cutting consumer's price.

[249] Hagiu. A (2006),' Proprietary vs. Open Two-Sided Platforms and Social Efficiency', PhD dissertation

Table 4- 4 Price determinants to platform pricing in two-sided markets

Determinants	**Effects on platform pricing level**[250]
Price elasticity of demand	-
Indirect network externalities	-
Single or multihoming	+
Products differentiation	+
Customer's product variety need	-
Producer's market power	-

4.3 Determinants of App-store platform pricing in mobile app market

Price elasticity of demand, network externalities, single or multihoming,products differentiation, customer demand for variety, difficulty of monitoring of transcation,mobile device purchasing cost are the determinants for App-store pricing.

[250] + means positively related to platform pricing level, - means inverse related to platform pricing level.

4.3.1 Price elasticity of demand's influence to App-store platform pricing

Like other two-sided markets, both users and developers have their correspondent price elasticity of demand in mobile app market. Usually, buyer's price elasticity of demand is higher than seller in two-sided markets[251]. For example, card holders are quite sensitive to price changes of payment services in payment card system through empirical analysis[252].

Users are sensitive to mobile app prices.65% of users from our mobile app use investigation (see chapter 5) downloads just free apps. 25% of them download less than 2 Euros each month. 14% of 600 respondents indicated that they will download more apps when the price declines. The predecessor of modern mobile app - DoCoMo's imode went out of service mainly because of higher app store access (membership) fee and usage fee. Like iMode users, mobile app users are also sensitive to platform's charges. Price elasticity of demand for user side is higher in mobile app market.

Developers get low membership fee to access app store platform services (normally under marginal cost) and they obtain SDK,API and other app developing supports that facilitate writing mobile app at relatively low prices. Besides membership fee, app store platform also charges a revenue share as usage fee from app sales from developers. About 18% of 3,460 respondents in Vision Mobile's Developer Economics 2013 survey are not interested in making money from mobile apps.

App store platform reduces the duplicative costs in mobile app market. App store platform incorporates the app function codes into platform and supplies an easy access to the codes through an application program interface to developers. This can reduce the total number of codes required for app developing and learning cost for users. This reduction in cost can increase the supply of apps for platform, increase the platform value for users and make positive feedback effects to application developers.

Because of the supports for developing, merchandising and hosting supplied by platform and the huge app sales revenue surplus, developers care app store platform's user reach and revenue potential. Developers' price elasticity of demand is lower than users.

4.3.2 Network externalities' influence to App-store platform pricing

Network externalities are widespread and interactive among different sides, platforms and also

[251] Bolt Wilko and Tieman Alexander, (2008) 'Heavily skewed pricing in two-sided markets', International Journal of Industrial Organization, 26 (2008): 1250–1255.
[252] Humphrey,D., Kim, M.,Vale, B., (2001) 'Realizing the gains fromelectronic payments. Journal of Money, Credit, and Banking' 33, 216–234.

within the same side. It is difficult to study pricing strategies for platform through network externalities analyses[253].

Network externalities between developer side and user side are analyzed below. Users' network externalities to developers can be considered stronger than developers to users. If just considering this indirect network externalities strength, App–store should charge less from users. However, we cannot ignore other intertwined network externalities to study platform's pricing strategies.

Users benefit more from more apps supplied from more developers through app store platform and developers benefit more from more users downloading more apps. Both user sides' indirect network externalities to developer and developer side to user are positive in mobile app market.

There are more than 800,000 apps in Apple App store as of March 2013 and nearly same amounts of apps in Google Play. Apps are high substitutable and competitive in app stores. Most of developers submit the same app to more than one app store platform. Users can get the app needed easily without constraint of mobile devices and mobile operating systems. So benefits of increase one more developer is not so significant to users.

Developers value more users than users value developers in mobile app market. Developers are willing to develop apps for app store which can reach more users and more app downloads. When there are more apps supplied by more developers, users' number and app use will increase. Overall, users' network externalities to developers are larger than vise versa in mobile app market.

Network externalities above are the indirect or intra-side network externality. Direct or inter-side network externality exists also in user side and developer side. 41% of 600 respondents in our mobile app use survey indicated that recommendations of other users give them confidence for appropriate app choosing. Direct network externalities are huge in user side. More developers will also drive platform improve the developing, merchandising, hosting and other supports. This can be said positive direct network externalities. There exists also negative direct network externalities inter developer side when more developers accelerate the competition among developers. Difficulty of app discovery and marketing cost for developers will increase. But competition is positive for social welfare and users can get more apps of good quality.

4.3.3 Singlehoming or multihoming's influence to App-store platform pricing

78% of developers of 1693 respondents in Vision Mobile's Developer Economics 2013 use two or more app store platforms for app developing and each developers use 2.6 app store platforms on average. Developers get more revenues when they develop for more platforms. Extending an already successful app to more platforms generates more revenues for developers according to Vision Mobile's survey. Developers are multihoming in mobile app market.

[253] Detailed network externalities in mobile app market see chapter 3.

73% of 600 respondents hold just one mobile device (smartphone or tablet) in our mobile app consuming. Most of users are considered singlehoming for mobile devices.

According to pricing theory in two-sided markets, singlehoming side is often treated favorably. Users normally in mobile app market are charged less or free by platform. Developers are the main revenue resources for platform.

4.3.4 Customer demand for variety's influence to App-store platform pricing

App users' demands for variety are strong (Figure 4- 2). User's app category preferences distribute almost uniformly in Games, Books, Social Networking, Entertainment and Navigation. Health, Sports, Education and Finance are also welcomed by special groups of users.

High demands of app variety from users tend to indicate that platform charges lower price to user side in mobile app market.

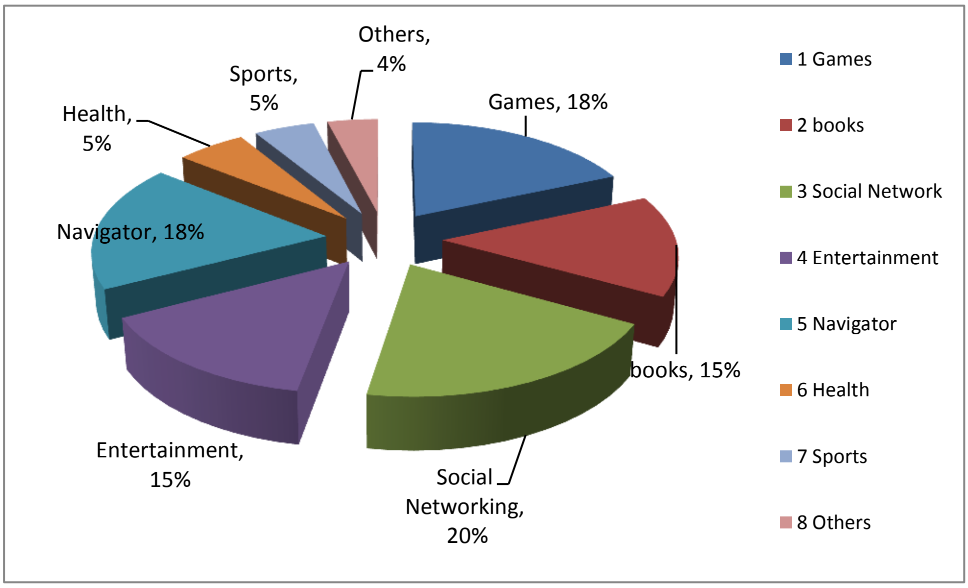


Figure 4- 2 Favorite app type for users

4.3.5 Difficulty of monitoring of transaction

Users in mobile app market are asked to register to affiliate with App-store platform. Registration often includes personal information, contact, mobile device information or credit card information (not obligated). This registration behavior aims to make app use transaction be monitored by App-store platform. And this also makes customized advertising or service from platform to users to be possible.

App store can also monitor transaction through its own payment system.

Although there are hundreds of millions active mobile devices used and numerous users go to app store search, download, view the advertisements or pay for the apps needed. It is still possible to monitor the transaction between the two sides for App-store platform. This works same to Ad-store.

So usage fee can be considered used in mobile app market. Membership fee can be charged for free to encourage end users 'on board'.

4.3.6 Mobile device purchasing cost

In mobile app market, App-store platform access is often provided through mobile device. The users have to purchase mobile devices to access the applications through App-store platform. Mobile device cost influences App-store platform's pricing decision from two sides.

Gans (2012[254]) worked under the simple assumption that one app supplied through one platform and developers can supply app directly or through app store platform in mobile app market. It was demonstrated that when platform access (like user's purchasing of mobile device) takes place in advance of application pricing, a non-trivial unravelling problem emerges that makes infeasible to charge access at a positive price from user. In this situation app store platform profits all come from revenue sharing with developers. To solve the unraveling problem, most favoured customer clauses imposed on developers. Such clauses to allow app store platforms to gain more profits and charge a positive access price (membership fee) from users.

Explanation of non-trivial equilibrium in Gans (2012) in mobile app market:

A non-trivial equilibrium existence issue emerges as a result of this: if the cost to the user of platform access is positive, the developer will set application prices "too high" in the sense that not all users who purchase platform access will purchase the app on it. This is not sustainable as equilibrium as those (marginal) users receive negative surplus. As a result, the only equilibrium that exists involves the platform owner setting access prices at zero and demanding a share of application revenues.

Gans (2012) study revealed the basic pricing principles for App-store platform: users will be charged free membership fee from platform when considering device cost. Platform will generate profits from revenues shares with developers.

Thus, we can consider taking part of mobile device cost as membership fee from users in the future study.

[254] Gans. J.S. (2012) 'Mobile application pricing', Information Economics and Policy 24 (2012): 52–59

4.4 Business model of mobile app market

There are four main revenue models from mobile app: In-app advertising, paid apps, freemium and in-app purchase (Table 4- 5). All of these four business models could also bring revenues from mobile device sales for device supplier and other participants in mobile app market ecosystem.

Cost for app comes from developing input of developers, payment fee to bank, app processing and distribution, and platform operating costs for app stores.

Revenue share split between app developers and App-store for paid apps sales and in-app purchase are 70:30. Revenue share split between app developers and Ad-store is often 60:40.

Table 4- 5 Business models in mobile app market

Revenue model	How it works	Works best for these app types	Revenue source for platform
In-app advertising (app ad revenue)	Ads run on space sold within an app, revenue depends on number of user impressions ,clicks or installs	Games, News, Social Networking, Entertainment	Ad-store receives ad-funded app advertisement revenues share with developer
	<u>Sponsorship</u> Individual or business underwrites an app and often puts ads or logo within the app in exchange for recognition benefits	Locally or Event focus, Narrow audience focus	
Paid apps	User pays one-off to download an app	Utility, Productivity, Music and Video	App-store shares paid app sales revenues with developer
Freemium **(premium / freemium upsell)**	Free'lite' or 'HD' version and purchasable 'Full' version or Free trial app which needs to be purchased to continue use	Games , Books, Finance	

In-app purchase[255]	User directly purchases virtual goods (contents) like additional privileges, badges, photo…	Games, Lifestyle, News	App-store shares in-app purchase revenues with developers
In-app purchase[255]	Subscriptions**:** User pays small subscription fee for using app or user subscribes to content service and is charged for receiving information	Books, Games, Lifestyle, News	App-store shares in-app purchase revenues with developers

4.4.1 In-App advertising

In-app advertising indicates showing ads to app user within the downloaded app. It works mainly for free apps. Free app users are used to accept in-app advertising as an appropriate price for free app. However, paid app users expect and prefer ad-free apps. Paid app with ads will degrade user's app use utility.

Sponsorship is one form of in-app advertising and it is a one-time payment. Advertiser pays ad spending to Ad-store first. Ad platform keeps a commission per transaction[256] and delivers the rest to developer. Ad-store shares ads revenue with developer based on ad revenue share split. App-store generates no direct profits from in-app advertising.

In-App advertising needs apps to bring back users regularly with heavy use at the same time.

4.4.1.1 In-App advertising ways

House Ads, Ads exchange and mediation networks are the three popular ways for In-App advertising through app advertising platforms (Figure 4- 4). House Ads can achieve app promotion among developer's own apps. Ads exchange means exchange of promotion amounts for apps among different developers. Mediation networks complies radioactive promotion in the Ads platform's network.

[255] It is called in-app billing in Google Play.
[256] Transaction here means that user reads, clicks or installs the ads.

Figure 4- 3 Popular app advertising platforms

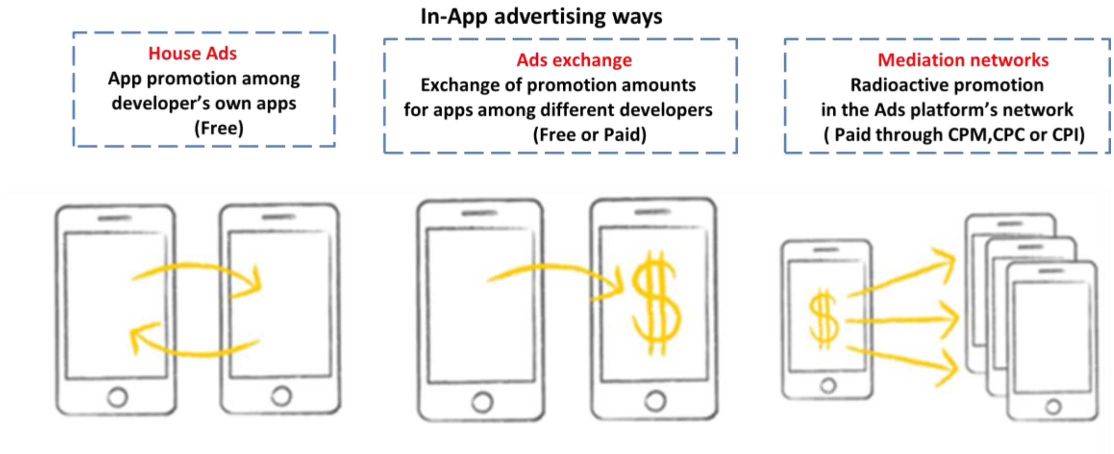


Figure 4- 4 In-App advertising ways

(Source: venture beat[257])

House Ads among developer's own apps is a self promotion and it is free. Like one developer promotes his new app B through his existed app A.

Ads exchange of equal promotion amounts for apps are free. Developer 1 has to pay for developer 2 for the excess promotion amounts for apps.

For mediation network, advertisers have to pay for publishers through CPM, CPC or CPI. Admob, iAd, Inmobi, Jumptap, Millennial media, MobFox and Mojiva are the main mediation networks that support Ads developing SDKs.

For example, advertiser needs to pay a small fee to Chart boost and Play heaven and also a small fee to developers when they use mediation network promotion in the Ad-store's network. Fees to Chart boost or Play heaven normally range from $ 0.8 to $3 per app through CPM, CPC or CPI. Developer can get $1 per install normally when a user installs an app by the ad In Play heaven, a developer who wants to promote his app will pay $3 in total to have a new user install it on user's mobile device.[258]

[257] http://www.36kr.com/p/165866.html,02/11/2012, Retrieved o2/03/2013
[258] 5 ways free apps make money, http://www.bluecloudsolutions.com/blog/5-ways-free-apps-money/, Retrieved o2/03/2013

4.4.1.2 Sponsorship

An enterprise agrees to sponsor (fund) an app that has some degree of affiliation and direct (or indirect) benefit to the enterprise.

The app or content service is freely available and the developer is paid by the sponsor for development of the app.

Through sponsorship, app developer can guarantee revenue for some time and potentially app R&D supports. This is one way to publish an initial app.

However, sponsorship is not on-going revenue and there might be the limitations for apps developing because of by the sponsors requirements, agenda, and budget.[259]

The RATP Group (French: Groupe RATP), also known as the Régie Autonome des Transports Parisiens (English: Autonomous Operator of Parisian Transports) produces and sponsors the development of the RATP app which shows the maps and calculates the optimal trips for users by bus, tram, subway,RER (Regional Express Network , Réseau Express Régional in French) in Paris (Figure 4- 5).

Figure 4- 5 France RATP app

(Source :Google Play)

4.4.2 Paid apps

Paid apps bring in revenues directly from app sales. Developer shares paid app sales revenues with App-store. Revenue from paid app sales accounts for a small proportion of total gains for both App-store and developer due to the majority free apps.

[259] Mobile Monetisation A revenue stream Framework,19/07/2011,Retrieved 02/03/2013

Apps can be sold through the MOS, MNO or TP app stores. The app store cuts about 30% of per sell of a paid app.As of March, 2013 there were about 44% paid apps in Apple App store while 22% paid apps in Google Play. At the same time, 807,013 and 665,603 total apps can be found in Apple App store and Google Play (Figure 4- 6).

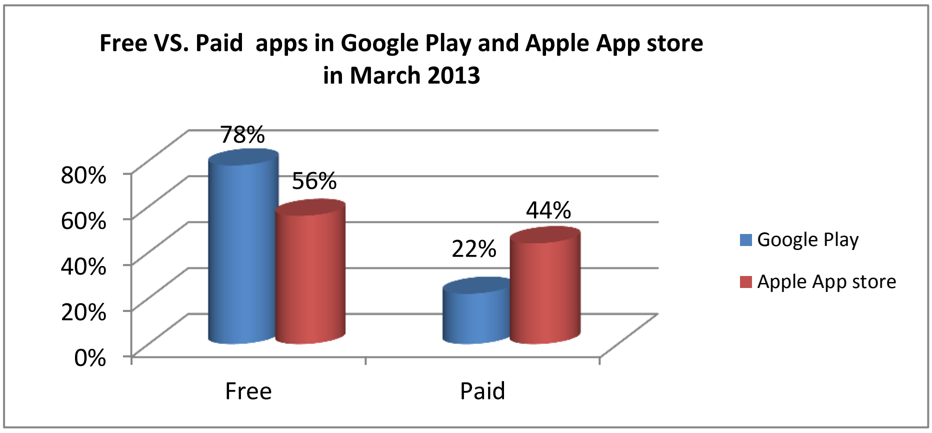


Figure 4- 6 Free VS. Paid in Google Play and Apple App store in March 2013
(Source:148Apps.biz , App brain)

4.4.3 Freemium

Freemium, also called freemium upsell or premium, is a way to sell paid app through the promotion from its free app in basic version. App-store takes the commission each paid app download.

For freemium, developers supply free 'Lite' version with simplified features first and purchasable 'Full' version with all features later. Or users can use a free trial app for a limited time period which needs to be purchased for continued use.

Typically this likes the "Lite" and "Regular" or "HD" versions of an app paired together with the paid version. The free app will have a link that a user can click that drives them to the app store on their Smart phones.

It is a feeder system in which users can download a free app and get a sense of what is being offered, and then they can easily purchase the full version which will have much more functionality.

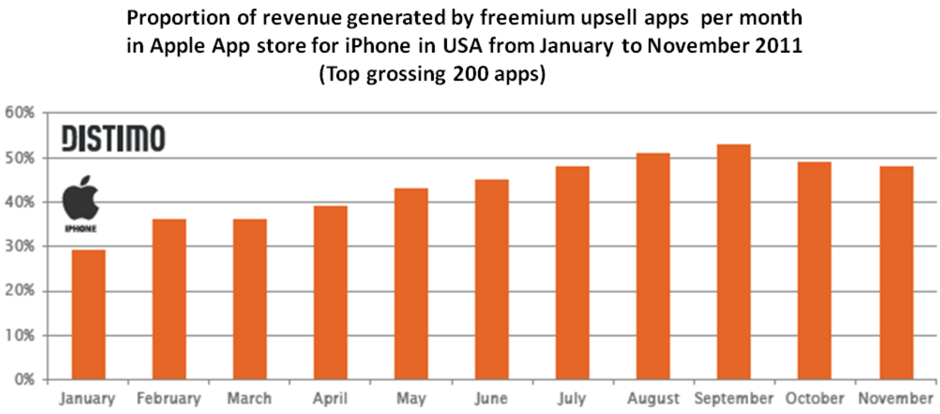


Figure 4- 7 Proportion of revenue generated by freemium upsell apps per month in Apple App store for iPhone in USA from January to November 2011

(Source: Distimo[260])

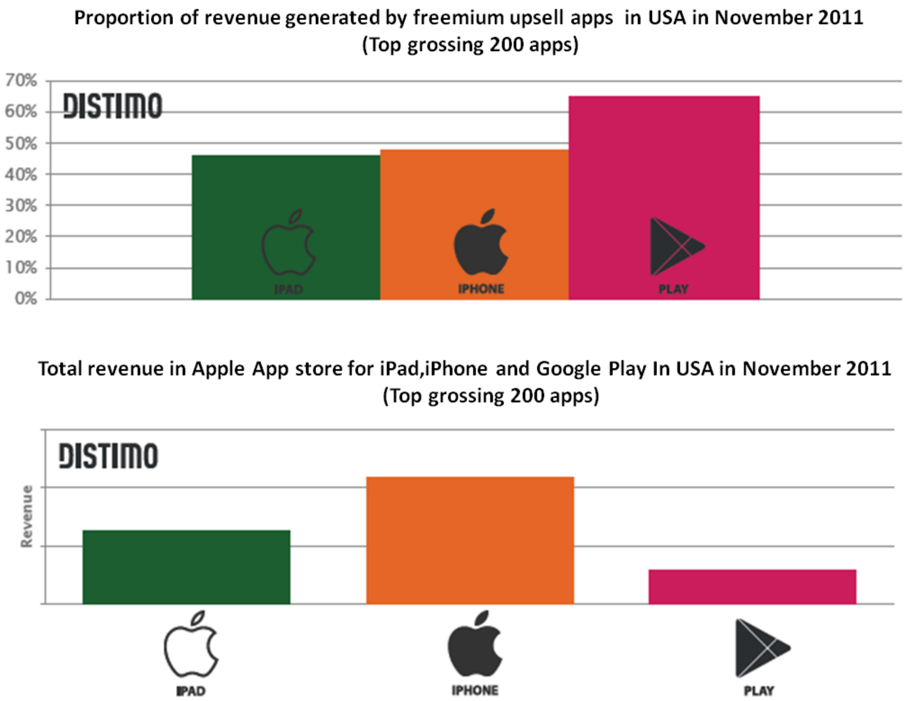


Figure 4- 8 Proportion of revenue by freemium upsell apps and total revenue in Apple App store for iPad, iPhone and Google Play in USA in November 2011

(Source: Distimo)

As we can see in Figure 4- 7and Figure 4- 8, 40% of the revenue came from freemium upsell till November 2011. The freemium upsell model is more successful in Google Play than in Apple App store. It had reached 60% in November 2011. However the total revenue from Apple App store was nearly four times that of Google Play. That is because of the difficulty for Android developers

[260] Distimo publication Full year 2011,Retrieved 03/02/2012

experience using the paid apps (on-off fees) monetization model.

4.4.4 In-app purchase

In-app purchase aims mainly to sell digital goods or subscriptions through apps. In-app purchase can be found in both free and paid apps. Most of apps implanted in-app purchase functionality are free for users. The aim is to charge users when they are used to this app. App-store also shares revenues from digital goods or subscriptions with developers. The revenue share split is usually the same as paid apps. In-app purchase had reached 69% of the revenue with a 16% increase in Apple App store in November 2012 compared to January 2012. 35% of the revenue generated from paid app sales among the top 10 most generating iOS developers[261].

When building apps, developers can set IAP (in-app purchases) to be a onetime purchase (users want to unlock the feature) or an ongoing option (ex. Users want to purchase 20 coins for $0.99), meaning user can purchase that over and over again. This can easily start racking up enormous amounts of revenue with the second, but that requires the app has strong features and be qualified and competitive.

Figure 4- 9 shows the procedure of In-app purchase without or with a developer's server in Apple App store. It needs app, App-store, a server and iTunes to work together to achieve an In-app purchase. The server is for saving the transaction code and product information. The server is not obligated when the app is very simple. Product information is embedded into the app without a server.

[261] Distimo publication 2012 year in Review, Retrieved o2/03/2013

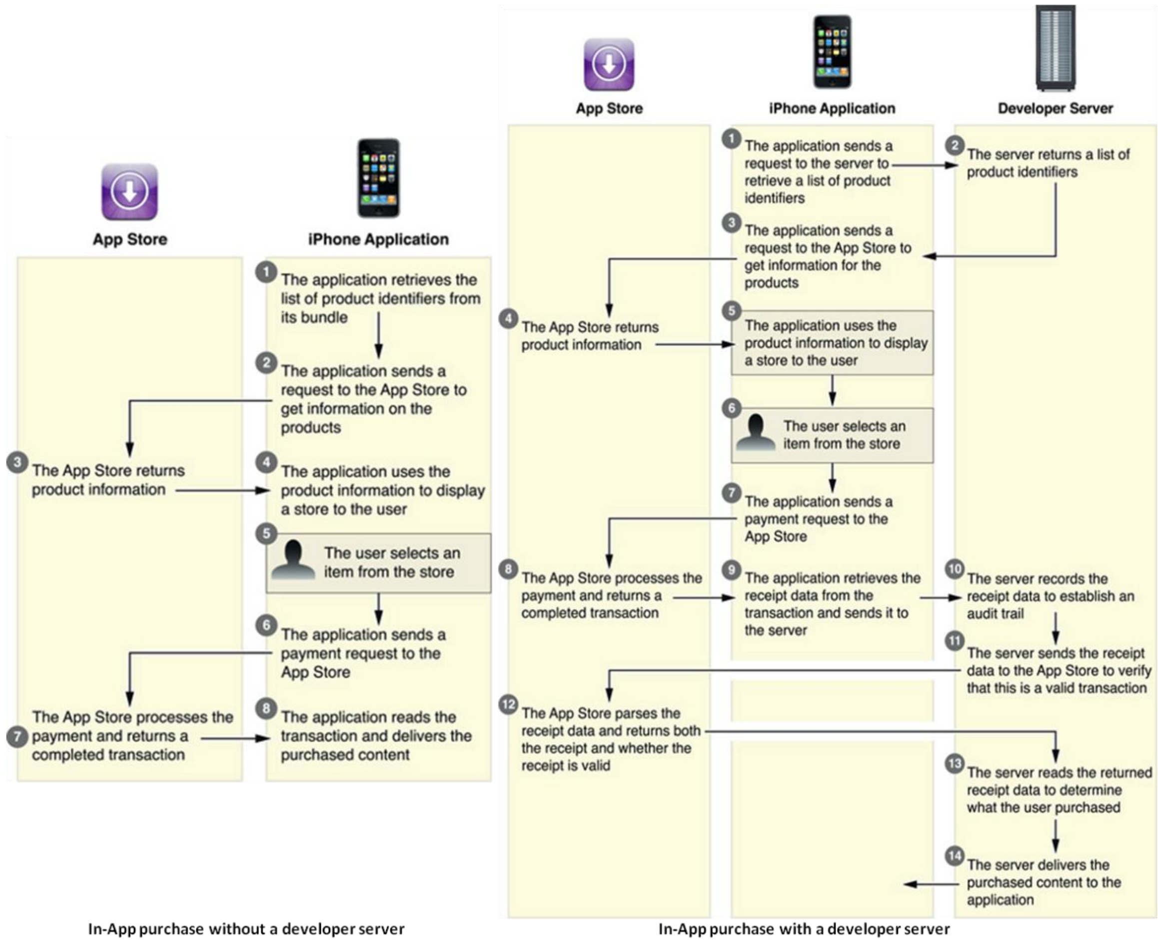


Figure 4- 9 In-app purchase procedure
(Notes: For in-app purchase with or withou a developer server[262])

In-App purchase had taken more than 59% in App store for iPad,iPhone and Google Play in March 2012 and was the business model heavily used in mobile app market (Figure 4- 10).

Figure 4- 10 In-App purchase apps distribution in March, 2012

(Source: Distimo[263])

[262] http://www1.huachu.com.cn/group/ShowPost.asp?ThreadID=1000001826,Retrieved 02/02/2011
[263] App store opportunity, http://www.slideshare.net/phonegap/the-appstore-opportunity-by-gert-jan-spriensma-phonegap-day-eu-sept-14-2011, Retrieved 02/03/2013

4.4.4.1 Direct in-app purchase

Users purchase additional contents or services directly. The app is mainly used to purchase virtual goods. Include items such as additional privileges and badges, movie and concert tickets, virtual gifts, virtual currency (mobile money), m-banking and airtime top-ups. Airtime, also called top-up or recharge, are prepaid mobile credits that can be purchased either at point of sales in the form of scratch cards or printed vouchers featuring a PIN number or via direct real time reload to the prepaid phone. Prepaid mobile credits can also be purchased at ATM, or online.[264]

Revenue generated from the direct (in-app) sale of virtual goods.

In-app purchases allow users to unlock features or purchase more of functionalities. In fact, 6 of the top 10 grossing apps in 2011 were free. They were able to use in-app purchases so well that they drove millions of dollars in sales.

4.4.4.2 Subscriptions

Users are charged a small monthly or yearly subscription fee in order to use the app or they can subscribe to an app and are charged for receiving information.

This requires developers provide fresh content for app regularly.

Subscriptions work best for news apps.The Newsstand functionality within the Apple framework allows developers to set up an in-app purchase that will automatically charge every month. News app developer can set a small membership fee per month through an app to supply for members access to exclusive posts and information.

4.4.5 Mobile app revenue resources

According to Vision Mobile's Developer Economics 2013 (Figure 4- 11), in-App advertising, in-App purchase, Freemium upsell had been used by more developers from June 2012 to January 2013. Pay per download (Premium) was the only revenue model which had declined from 34% to 32%. Subscriptions remained the same used proportion but it isthe better way to generate revenue with $2.649 per app per month. In-App advertising is the most used revenue model with revenue $1,014 per app per month which is much lower than the revenue generated by Subscriptions.

[264] http://www.transfer-to.com/what-is-airtime, Retrieved 02/03/2013

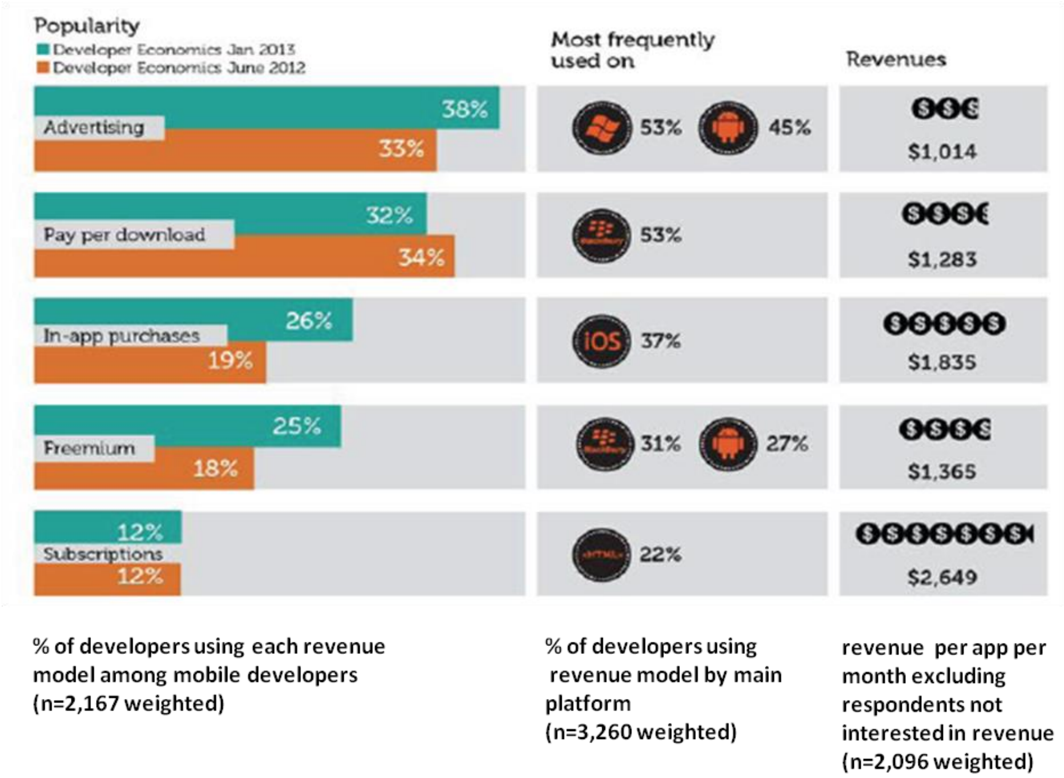


Figure 4- 11 App developer revenue model survey

(Source: Vision mobile, Developer Economics 2013)

Flurry's report in July 2012 estimated in-app advertising would take 23% increased from 18% of app revenue for iOS and Android apps in 2011. Premium (freemium) and In-app purchase would reach to 77% of app revenue. In-app purchase revenue in Flurry's report included freemium upsell revenue (Figure 4- 12).

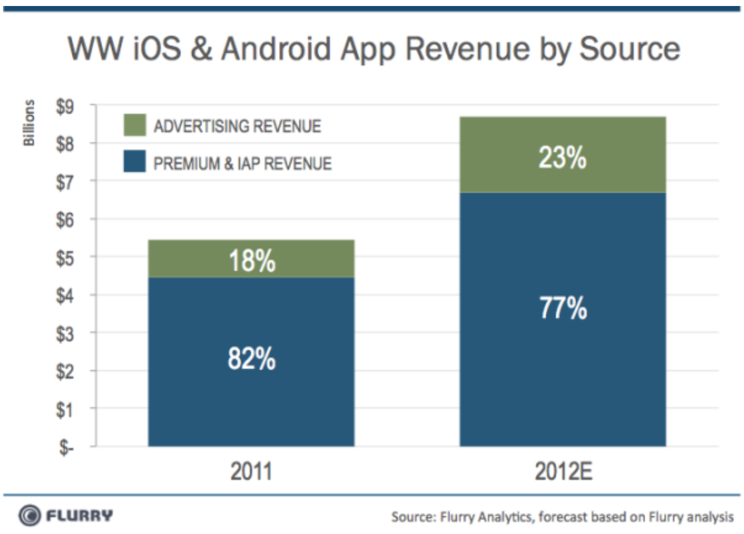


Figure 4- 12 App revenue by source

(Source: Flurry[265])

[265] http://blog.flurry.com/default.aspx?Tag=App%20Store, Retrieved 02/03/2013

According to Distimo's Full year 2012 report, the proportion of revenue that derived from in-apps purchase including freemium upsell increased from 53% to 69% in 2012. Average proportion was about 60% in 2012 for in-app purchase and freemium upsell revenue. Gartner Research estimated that paid apps and freemium accouting for 75.9% of mobile app store revenue in 2013, while in-app purchase took up 17.2%[266].

Summarizing the above analysis, we can conclude the mobile app revenue resource distribution figure (Figure 4- 13).

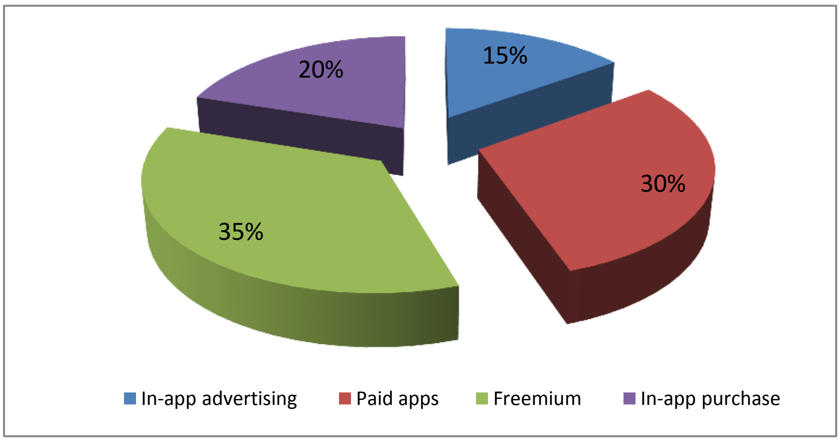


Figure 4- 13 Mobile app revenue resource

As of April 2013, Apple App store counts for more than 70% of mobile app market revenue and Google counts for about 20%[267]. Although Google Android app downloads had taken 51% and Apple App store took 40% in mobile app market. For the Apple App store, 69% of revenue came from in-app purchase which including freemium in 2012. In-app advertising contributed lot to the Google play revenue and then followed by in-app subscription as its in-app purchase revenue model.

Google extended the capabilities of its in-app purchasing model in Google Play to allow in-app subscriptions in May, 2012. The in-app subscription model fills an important monetization gap in Android that the Apple's iOS has offered in February, 2011. Google In-app subscription defines subscriptions broadly so that developers can use the subscription model to streamline monetization for any kind of product. Developers can also offer customers the ability to carry their subscriptions across multiple platforms, such as Android apps as well as Web properties.

In-app subscription had reduced the revenue gap between iOS and Google Play which was 4 times in 2012.Carrier billing and in-app billing was said to be the magic combination for Google Play. Google Play's in-app purchasing has a long way to catch up with Apple App store (Figure 4- 14).

[266] Mobile app store revenue,worldwide,2011-2017, http://techcrunch.com/2013/09/19/gartner-102b-app-store-downloads-globally-in-2013-26b-in-sales-17-from-in-app-purchases/,Retrieved 01/10/2013.

[267] http://techcrunch.com/2013/04/08/app-stores-in-q1-2013-hauled-in-2-2b-in-sales-on-13-4b-downloads-googleapple-duopoly-leading-the-way-canalys/, Retrieved 18/04/2013

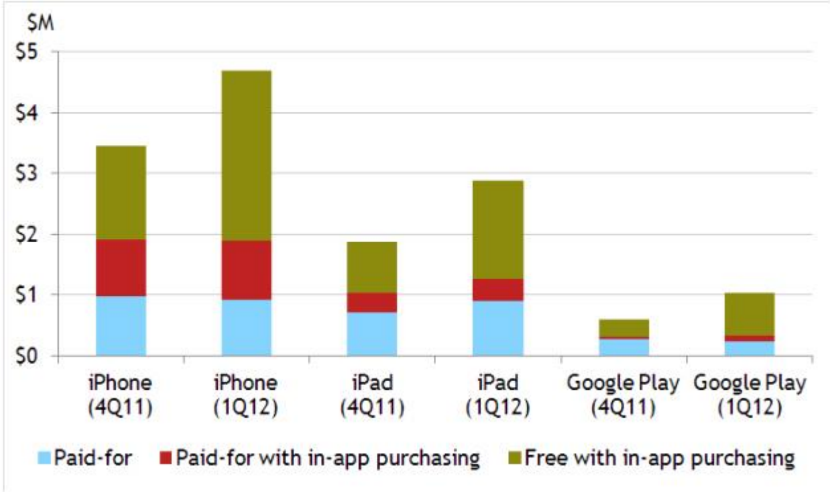


Figure 4- 14 Global daily revenue by store for top 200 apps in 4Q11 and1Q12

(Source: App VU Global, 1Q12[268])

4.4.6 App price deployment

Free or paid is a difficult pricing decision to make for app developers.

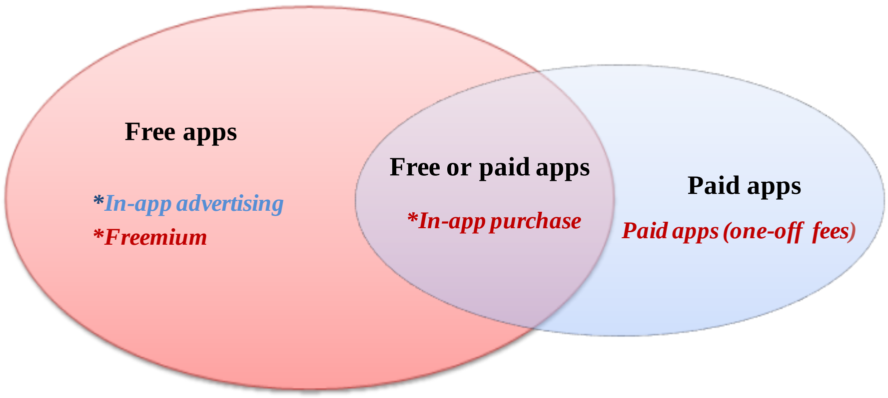
For free apps, reviews can bring value which means money or revenue in mobile app market. Deploying a free app will bring earning potential from the advertisements that will appear in a regular time interval on the app. It has been observed that a free application is likely to get downloaded more often and reach the masses easily, thus creating greater earning potential through advertisements than paid apps.[269]

Paid apps definitely give instant revenue and depend entirely on the number of downloads. For the top 10 most generating iOS developers in 2012, 35% of revenues come from paid apps sales.

Choosing a type of business model for apps is another key decision for developers.

We can find that in-app advertising is a good revenue model for free apps and it brings ads revenues to Ad-store (Figure 4- 15).

[268]http://www.fiercedeveloper.com/story/google-plays-app-subscriptions-hold-promise-fragmented-android-ecosystm/2012-05-29, Retrieved 02/03/2013
[269] http://www.openxcell.com/blog/2012/02/revenue-from-mobile-app-ads-or-income-from-paid-app-deployment/,Retrieved 02/03/2013



Notes: Words in blue indicate revenues generate for Ad-store platform; in red for App-store platform.

Figure 4- 15 Revenue source for free and paid apps

Free apps tend to use in-app advertising way. Games which are strategized to be initially free and later followed by download charges register less than 2% conversion rates in 2012, rest all comes through In-App advertising[270]. Paid app users are less tolerant of advertising. Advertising is not a good choice for paid app promotion.

Paid apps generate app sales revenues for App-store.

In-app purchase could be applied both free and paid apps. In-app purchase brings revenues for App-store.

4.4.7 Cost of applications

There are four basic parts which made of cost for applications: fee for developers; processing fee for app store platform; fee for payment processor and profit of app store or fee for mobile network operator. Other costs come from the operating, marketing, distribution inputs of the app store platform and currency exchange costs for developers.

The average selling price (ASP) in Apple App store in USA in March 2013 was $1.58. ASP for paid apps in Apple app store in 2011 is about $1.44.

Figure1-66 from Gene Munster who is the analyst of Piper Jaffray shows the proportion of the four parts of cost for developing an app.

Take a $1.55 app as an example, developer can get 70% about $1.09. App store takes 30% of the revenues and then pays $0.23 about 15% of app selling price to credit card system; cost of processing an app for app store is $0.02 about 1%; app store keeps $0.21 about 14% as profits. The developing cost of developer dominantly decides the price of a paid app (Figure 4- 16).

[270] http://www.openxcell.com/blog/2012/02/revenue-from-mobile-app-ads-or-income-from-paid-app-deployment/,Retrieved 02/03/2013

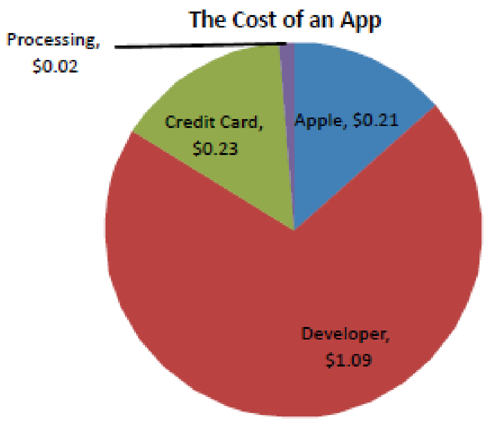


Figure 4- 16 Cost of an App

(Source: Piper Jaffray[271])

4.4.8 Payment system

Common payment methods for mobile app are credit card, PayPal, in-app billing, operator billing.

In-App billing allows developers monetize within their apps using a variety of payment methods. Developers and app stores can deliver users a simple and consistent app payment experience. Apple and Google had launched their own in-App billing systems which were tightly integrated with their app stores.

Payment system for Apple app store is mainly through credit card which can be effectively by-passes mobile operators to make monetization for developers a no-brainer. Payment system for Apple app store was based on the successful model of iTunes which had brought several millions users of iPhone into Apple app store.[272]

For Google, consumers are not so interested in signing up for the official payment mechanism supported by Google Play- Google Checkout. Problem of payment system of Google leads to the independent app store like Amazon and Getjar to launch their own storefronts and payment system to sell Google Android applications.

Google launched its in-app billing platform in March, 2011. Developers can publish applications to the Google Play that contain mechanisms to allow for in-app purchases of digital goods. In-App billing lets developers monetize apps using try-and-buy, virtual goods, upgrades and other billing models. The app accesses the in-app Billing service using an API that is exposed by the Google Play app that is installed on the device. The Google Play app then conveys billing requests and responses between the application and the Google Play server [273] (Figure 4- 17).

[271] http://www.zdnet.com/blog/btl/apples-app-store-economics-average-paid-app-sale-price-goes-for-144/52154 ,Retrieved 11/07/2011
[272] Netsize-Application store billing- white paper 2011
[273] http://developer.android.com/google/play/billing/billing_overview.html,Retrieved 02/03/2013

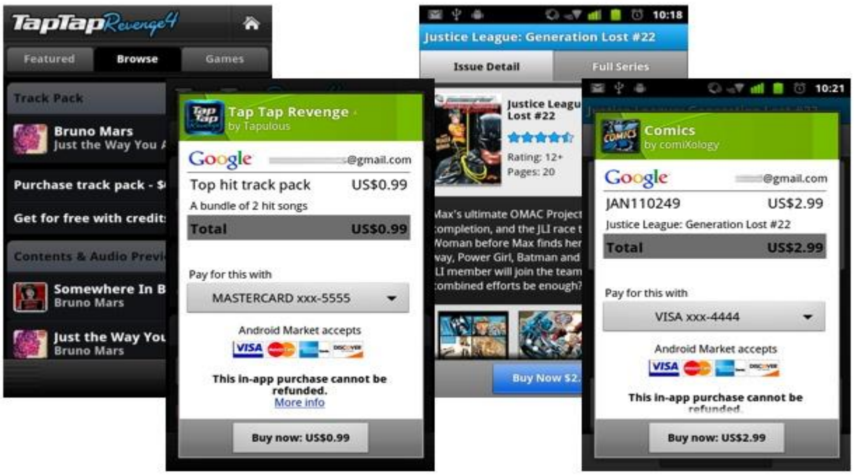


Figure 4- 17 Google's in-App billing sample

(Source: Technology tell)

For Nokia-Microsoft, Nokia announced it would drop the Ovi name from its application store and sell applications under the 'Nokia' brand In May 2011. Nokia has supported mobile network operator's payment system that has allowed it to maintain market share and power.

4.4.9 Revenue share split in mobile app market

4.4.9.1 Revenue share split between developers and App-store

Apple App store is the first one which applied 70-30 revenue split between developers and its app store. That was revolutionary and has exerted huge pressure on other app store vendors and payment processors, and has become the actual standard in the app store industry.

70-30 revenue split can not only generate considerable profits from apps sells, the power of control in ecosystem of mobile app and also this can greatly bring developer's initiative for developing the apps. And the important attraction for Apple is that the selling of apps greatly help device sales. Apple App store supplies app developing supports, marketing channels and payment system to developers. Although there is intense competition of attention, Apple app store has successfully put the developers into a situation that they are greatly needed.

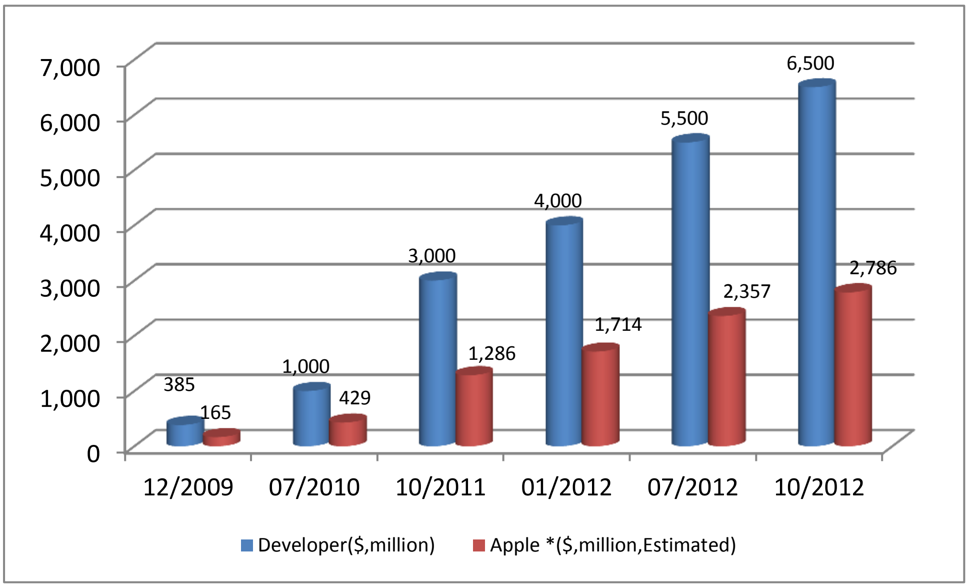


Figure 4- 18 Apple App store profit distribution for developers and Apple 2009-2012

(Source: GIGAOM, Cnet and Apple)

From December 2009 to July 2010, profits for developers of Apple App store were booming from $385millon to $1 billion with an increase of 160% in six months. For Apple Inc, there was an increase from $165millon to $428.4millon in the same period (Figure 4- 18).

70-30 revenue split is also quite different from the mobile network operator who picked 90% of revenue from the software and content sold through their networks. It effectively encourages developers' participation in the mobile app market.

4.4.9.2 Revenue share split between developers and Ad-store

Ad-store shares revenue from in-app advertising and sponsorship with developers. Its profit comes from ad-funded app downloads. 70-30 (Apple model) or 60-40 is taken as the revenue share split between developer and Ad-store.

4.5 Pricing strategies for App-store platform in mobile app market

It is a complex ecosystem with two two-sided platforms in mobile app market. We will focus on App-store platform pricing in this study.

4.5.1 Monetary relations for app store platform

Monetary relations in mobile app market have to be analyzed before the study of pricing strategies for app store platform. Benefits, costs, membership and usage charges for the participants are necessary to get clearly. The following diagram (Figure 4- 19) summarizes the monetary relationships and flows for App-store platform with uppercase letter membership fees (*A*) and lowercase letter (*a*) the charges. Along with these charges, we note B, b profits and use C, c costs. All these values can be positive, zero or negative.

4.5.1.1 Benefits and costs

App-store platform faces two sides – developer side and user side. Developers who sell apps at a price or in free ad-funded model are taken as seller side labeled in S . Users who download and consume apps are buyer side labeled in B .

User's app download benefit is b_b. Developer gets app sale revenues, ad revenue or in-app purchase revenue in b_s with each app download. User's membership benefits to connect with the app store platform is B_b. User's membership benefits can be app volume and diversity in App-store or related services. Developer's membership benefit is B_s.Membership benefits can be app developing environment like developing forum, app billing service and other app developing or distribution utilities from App-store.

App-store platform incurs fixed cost C_b and C_s per member on user side and developer side and marginal cost *c* per interaction between two members of opposite sides. Platform's fixed cost for user is like platform promotion, data storage and other input costs. For developer is the input of developing and maintaining software environment and other developing infrastructure costs. Marginal cost per transaction is like app auditing, processing, payment and data monitoring costs.

4.5.1.2 Membership or usage fees for App-store platform

In mobile app market, mobile device purchase which associated with a MOS is necessary to receive and download apps.The acquisition of the device (at a price A_d) can therefore be regarded as an act of affiliation to the app store platform for user. This device acquisition is much more expensive than platform usage charges when user downloads app. The device provider greatly benefits the number and the diversity of apps available on the app store platform, which is one of the main selling points of the devices.

Device supplier installs MOS for his devices with a cost A_c. A_c could be zero or positive. Apple[274] internalized its iOS cost into iPhone/iPad/iPod touch device purchase. And A_c is included into A_d

[274] It is the same for Windows and Blackbarry.

in this situation. It is same for Windows and Blackberry. Google Android MOS is free for device suppliers. Android is the widely used MOS by device suppliers for the mobile devices due to its free installment cost and open developing environment. So we can assume $A_c = 0$.

Developer has to pay for app developing SDK cost at a price A_s. A_s can be taken as the membership fee to app store platform from developers. A_s is often charged in the form of annual fee.

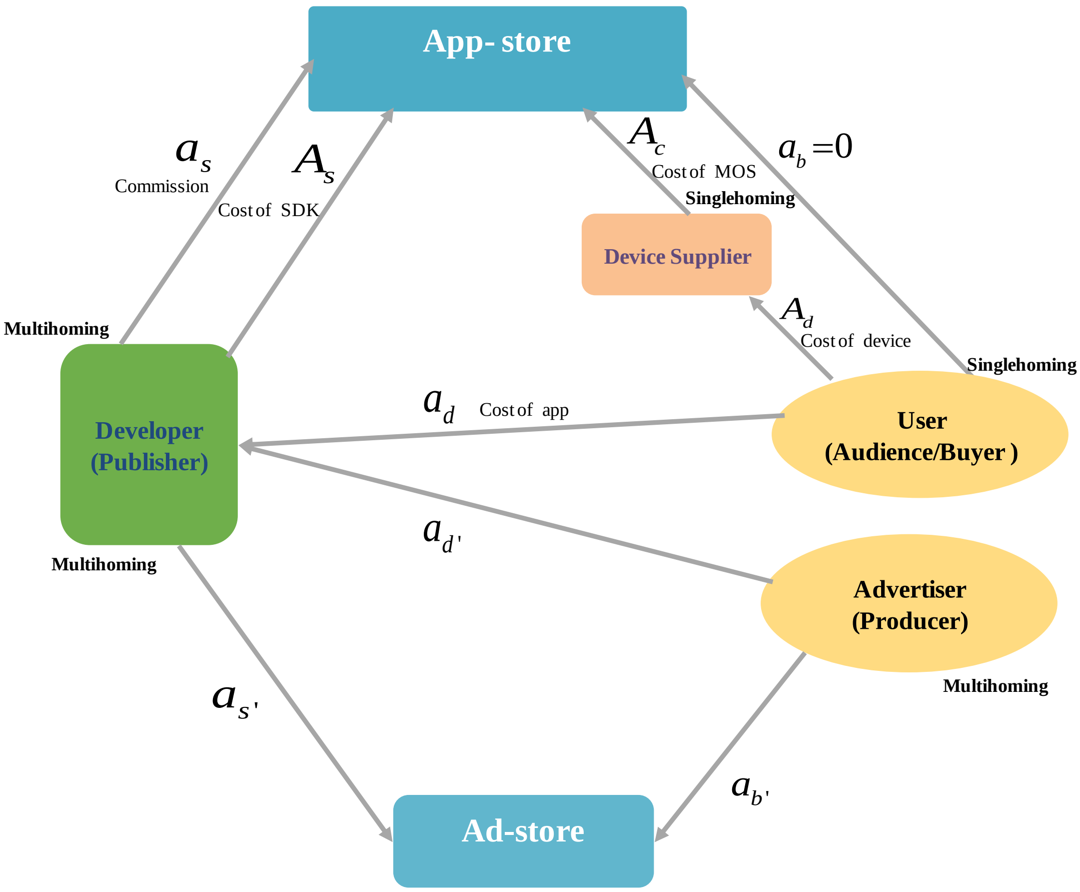


Figure 4- 19 Monetary relations for mobile app store platform

App acquisition (download) can be free or paid. When downloaded app is paid or it brings in-app purchase, App-store keeps a commission per transaction that is distributed between developer and user. Transaction commission (a_s) is considered as the usage fees too App-store platform from developers. Usage fee from users to App-store platform (a_b) is zero. That means users can download or buy apps from App-store without paying charges for App-store usage. This may be due to user's small-amount app consumption mode and higher price elasticity of demand. Getting users 'on board' to attract more developers and apps could be more profitable for App-store.

There is payment between developer and user for paid app download and in-app purchase activity.

We assume that a_d is the cost of an app delivered from user to developer each paid app download or each in-app purchase transaction.

When downloaded app is free, the main revenue source for developer is in-app advertising revenue shared with Ad-store. There is no payment between developer and user. App-store generates no profits from in-app advertising.

It is therefore in the presence of a duplication of seller and user that we will identify with s' and b' for developer and advertiser in the second cycle. Developer and advertiser are the two sides connected with Ad-store. Users who purchase products through in-app advertising are the advertising audiences. The advertiser pays for ad expenses to Ad-store. Ad-store takes a commission per transaction and delivers the rest to developer. a_d is the cost of advertisement. $a_{s'}$ is the commission per ad publishing from developer to Ad-store. $a_{b'}$ is the usage fee from advertiser to Ad-store and it is usually zero ($a_{b'}$ =0). Ad-store shares advertisement revenues with developers and it keeps the commission. Membership fee from developers ($A_{s'}$) and advertisers ($A_{b'}$) are considered as zero. Developers are encouraged to connect with Ad-store to provide advertising display places without membership charges even there is ad-SDK cost for Ad-store. Advertisers are charged no membership fees. But the advertising expense per transaction is charged as usage fee by Ad-store. Ad-SDK cost will be covered from advertiser's ad spending. In the case of free app download, even if the price paid is zero, we can consider that the usefulness deteriorates (which displays advertisement or may lead to switch to a paid version of the application). The difference $(b-a)$ degrades for user side.

Membership fee for app store platform is considered as negligible in mobile app market. For developer side, SDK cost is marginal compared to app gains[275]. So developer's membership fee is assumed as $A_s = 0$. For user side, mobile operating system license fee is hardly known. Google Android OS is free for device supplier. Apple iOS and others are internalized in their mobile devices. So we also assume $A_c = 0$.Therefore we assume that app store two-sided platform works on usage fee except the mobile device cost (A_d).

This mobile app market ecosystem is therefore analyzed as follows:

1 The attractiveness of mobile devices depends on the available offer of app volume and diversity.

2 This app offer is based on revenue prospective.

Revenue is generated from paid apps, freemium in-app purchase or in-app advertising. App sales

[275] App store platform demands a small number of membership fee. $99/year for individual developer in Apple App store and $25/year for Google play. Blackberry World and Palm/HP catalog is free for developers.

and in-app purchase bring revenues for both App-store and developers. In-app advertising generates not only direct profits for Ad-store and developers, but also indirect products sales revenues for advertisers (producers).

3. The benefits of these apps are based on their distribution and hence the number of mobile devices on which they can be run.

Membership fee and usage fee for App-store and Ad-store are concluded in Table 4- 6. App-store can be assumed to work on usage fees except when we consider part of mobile device purchase cost as membership fee from users. Developer side is the revenue source side for App-store.

Table 4- 6Membership fee and usage fee for App-store and Ad-store

	Side 1	**Side 2**	**Revenue source for platform**
	User	**Developer**	**App-store platform**
Membership fee	$A_c = 0$ (cost of MOS) λA_d (cost of device for receiving apps, $0 < \lambda \leq 1$)	$A_s = 0$ (cost of app SDK)	Side 2, Revenues share with developers from paid app sales and in-app purchases
Usage fee	$a_b = 0$	a_s (commission)	
	Advertiser	**Developer**	**Ad-store platform**
Membership fee	$A_{b'} = 0$	$A_{s'} = 0$ (cost of ad SDK)	Side 2, Ads revenues share with developers
Usage fee	$a_{b'}$ (cost of ad)	$a_{s'}$ (commission)	

Ad-store is considered to work also on usage fee. Its revenue source side is developer side.

In other words, both App-store and Ad-store implement asymmetric pricing strategies to their two sides. Developers are the revenue side for the two platforms. And developer side is also the subsidized side from the two platforms for app or ad developing /distribution at the same time. User side is the well treated side from App-store. Users are encouraged to access to App-store for bringing developers and apps due to the indirect network externalities.

Usage fee plays an important role in App-store's pricing strategies. Membership fee is negligible for App-store.

Mobile device is an important factor and profit-generating point in mobile app market. It is the carrier for app running. There are strong positive network externalities between mobile device sales and app offers. Mobile device sale is one of the key points of earnings in mobile app market ecosystem besides App-store and Ad-store.

4.5.2 Revenue source of App-store and Ad-store

App-store's profits generate from revenues share with developers. So developer's revenue determines App-store's profits directly.

We found that developers can be classified into two types:

- Developers who offer a standalone application form Entertainment (games for example) or provide self service or information (photo editing for example, weather information).
- Developers who offer an external product-supported application (Metro app provides train schedules to drive tickets sales and metro using.). This is belonged to their entire product strategy that provides an application to support their external products or activities. Developers have obvious interests in getting their apps used frequently and they often provide free apps to their customers.

There are clearly important indirect network externalities between the two sides for App-store platform. Developers will have interests in offering more apps when there are more users. There will be more users for the app store platform (first through purchasing mobile device associated with platform's MOS) when there are more interesting apps. So developers can get more app revenues from more users. We can say that, application distribution first improves the attraction of mobile device which associated with MOS. And second, app distribution also increases the product attraction which is delivered through apps.

So an app developer can receive three potential types of revenues:

a. Advertising revenues from publishing ads through his ad-funded apps

b. Paid apps,freemium upsell or in-app purchase revenues

   Paid apps generate revenues directly from sales. In-app purchase or subscriptions also bring in revenues. For freemium model, paid app users receive an app with developed functionalities. Free app users use the app with basic features or limited time of service. To some extent, we can say paid app users subsidy the free app users.

c. An external benefit of supported products/activity derived from the app distribution when developer is also the advertiser (or producer).

   Better brand awareness, customer loyalty and higher transactions conversion efficiency through product-supported apps can bring more profitable business relationships for developers. Developer uses his own apps to promote his external products or activities in this situation.

In the three above revenue sources for developers, advertising revenues are shared between developers and Ad-store. The ad revenue share between developer and Ad-store is well accepted as 60:40. App-store profits nothing from ad-funded app downloads and in-app advertising.

For paid apps, freemium and in-app purchase revenues, App-store shares revenues with developers by certain share split (70:30 is the general split.).

For external[276] product-supported apps, they generate direct products sales revenues to advertisers or producers. And they also bring in indirect positive effects to app downloads and mobile device sales. As mobile app is the marketing channel for external products, the increase of external products sales consequently promote app downloads and can finaly drive mobile device sales. Accordingly, mobile device sales increase could generate more attractiveness to mobile app market.

We can get the revenue source for App-store and Ad-store (Table 4- 7).

Table 4- 7 Revenue source for App-store and Ad-store

<table>
<tr><th></th><th>Developer</th><th>App-store</th><th>Ad-store</th></tr>
<tr><td>In-app advertising</td><td>Ads revenue</td><td>×</td><td>Ads revenues share with developers</td></tr>
<tr><td>Paid apps</td><td rowspan="3">Paid app sales or
In-app purchase revenues</td><td rowspan="3">Revenue share from paid app sales or in app purchase with developers</td><td rowspan="3">×</td></tr>
<tr><td>Freemium</td></tr>
<tr><td>In-app purchase</td></tr>
</table>

4.5.3 Discussion of pricing for App-store two-sided platform

We find that this mobile app market ecosystem is complex and does not fit easily into classical platform pricing patterns in two-sided markets.

4.5.3.1 Limitations for pricing for App-store platforms

① The mobile device is acquired for his own features (phone, tablet, photo ... and all the native features of the device) and its ability to receive external applications probably account for some, probably small, of its purchase price. A_d cannot be assimilated to the cost of the device, but at a fraction of the cost which will vary from one user to another and from one terminal to another .

② The platform works both (mainly) with free applications without monetary transaction (payment) between the two sides. It works also with paid apps where there is monetary transaction (payment) between the two sides.

Rochet and Tirole (2004) studied two-sided platform's membership fee and usage fee based on

[276] External here indicates out of mobile app market.

there is or not payment between the two sides. It is not easily to apply the platform pricing model from Rochet and Tirole's study.

③ Free apps work with or without interaction of the advertising platform. Indeed, some free product-supported apps generate positive externalities on their external core business through the app distribution[277].

We cannot say that revenue model for free apps is just in-app advertising. In-app advertising, in-app purchase and freemium are all the revenue sources for free apps.

④ There are widespread indirect network externalities between two sides for App-store platform, also significant direct network externalities (ex. Social networking apps) within the same side.

There are obvious direct network externalities inside of users especially for those who utilize the same app, such as Facebook. Similar to the traditional telecommunication service, Social networking app users profit the benefits from communicating with other more potential members in the same social network when there are more users.

Network externalities exist also between developers and advertisers, advertisers and users, free apps and paid apps, apps and mobile devices, apps and external products and even between App-store and Ad-store. It is an intricate network for network externalities in mobile app market. We cannot study just one of these network externalities without considering the influences from other sides or groups.

Most of the researchers focus either on direct network externalities or indirect network externalities for platform's pricing. Rochet and Tirole (2004) excluded the direct network externalities within the same side.

⑤ Many economic factors are unknown because of the industrial integration presented in this ecosystem. Indeed, the two major players, Apple and Google, focus not only essential to App-store platforms, but also the various activities Ad-Store and Device Supplier.

Traditional two-sided platform pricing principles are not suitable to evaluate pricing strategies and revenues for App-store.App-store, Ad-store and mobile device are the three basic profit-generating points. Based on majority free apps in mobile app market, App-store's revenue from paid app sales and in-app purchase just takes a small part of App store operator's profits. Ad-store which creates considerable advertising revenues for the majority free apps has effectively complemented the profit chain. Development of App-store and Ad-store brings large volume and various apps. Apps have to run on mobile devices associated with MOS. This drives an increase in mobile device sales in addition. Apple is a good example that generates revenues mainly from mobile device sales by its App store's animation.

4.5.3.2 App-store platform pricing suggestions

The reciprocal network externalities are highly developed and strengthened among different sides, different platforms and within side. In addition to the problems for pricing we have mentioned

[277] For example, scheduling information supplies for transport companies, location of stores for distributors, assistance applications using for goods or services, etc.

above, it is complex and difficult to simulate.

Thus, the canonical model developed in the literature cannot simply apply. However From the study, we can get some reasonable App-store platform pricing suggestions:

a. In the case of free apps, platforms operates mainly in two ways ,under the assumption with negligible costs of affiliation (membership fees) :

i . Mobile device sales flow (Apple model)

ii .In-App advertising Flow (Google model[278])

In 2012, Apple App store's revenue was about $2,000 million. Its Ad-store iAd's 2012 revenue was about $125million. iPhone sales 2012 was $80,477 million and Apple total net sales was $156,508 million. We can see that App store's revenue was only 2.5% of iPhone sales and 1.3% of Apple's total net sales. iAd's revenue just took 0.02% of iPhone sales (Table 4- 8). For Apple, its main revenue generates from device sales. App store is a digital app distribution platform which aims to get both developer side and user side into Apple app ecosystem. App store keeps Apple app market in vitality through supply various apps. iAd was set to 'improve users' experience and help developers fund the development of new apps' by Steve Jobs in 2010. Both App store and iAd drive Apple device sales at last.

Android apps sales revenue was about $540million[279] revenues in 2012. This could be roughly taken as Google Play revenue in 2012. It took 1.2% of Google's total revenues $46,039 million (excluded Motorola related revenue) in 2012. Revenues from Admob Ad-store were estimated about $300 million based on data from IDC[280]. It was more than half of Google Play's revenues. Google's core revenue source is advertising which includes web advertising and mobile ad advertising.

Table 4- 8 Revenues for Apple App store, iAd, iPhone and Apple in 2012

$,millions	**App store[281]** **(revenues)**	**iAd[282]** **(revenues)**	**iPhone** **(net sales)**	**iPhone & iPad** **(net sales)**	**Apple[283]** **(total net sales)**
Revenues/ net sales	2,000	125	80,477	112,901	156,508

(Source: Apple Annual report 2012)

b. In the case of paid apps, the classical scheme of a two-sided platform can be considered to apply. But its operation is largely impacted by the implementation of free apps.

[278] The price elasticity of demand for developers will be weaker when there is no revenue from App-store for his free apps. The in-app advertising revenues are vital for developers. Ads revenue share split is often 60:40 between developers and Ad-store. Apple iAd increased this split to 70:30 in April 2013.

[279] Apple Worldwide Developers Conference (WWDC) 2013, Android apps sales revenue was 20% of whole market $2.7 billion. Apple App store's developer revenue share $5billion which was 3 times of developers from other platforms. According to revenue share split between developer and app store platform 70:30, we can get whole app sales market revenue was $2.7 billion.

[280] IDC , http://www.businessinsider.com/apple-admits-steve-jobs-vision-for-iad-was-a-huge-flop-2013-6,retrieved 30/11/2013

[281] Apple Worldwide Developers Conference (WWDC)2013

[282] IDC , http://www.businessinsider.com/apple-admits-steve-jobs-vision-for-iad-was-a-huge-flop-2013-6,retrieved 30/11/2013

[283] Developer's app revenue shares (about $5 billion 2012) was not included into the total net sales for Apple.

It is clearly multihoming for developers /publishers (for both of the two platforms) and advertisers /producers. It is clearly singlehoming (except users with different MOS devices) on the users (buyers) side. Platform charges mainly from multihoming side to increase end user's platform conversion cost. Developers are multihoming in mobile app market and this side is the revenue source side for App-store. Users are charged free for App-store usage and they are the well treated side.

All these phenomena are inextricably linked. The study aims first to document these phenomenon, and secondly, to document the behavior of users in this ecosystem. App price elasticity of demand for users will be measured in Chapter 6.

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5 Chapter 5 App price preferences for mobile app users

Contents

5.1 Introduction

As for most of the developing markets, the flourishing of mobile app market has caught attention on the usage and price preferences of mobile app users. Mobile app users have high price elasticity of demand and they are sensitive to app price and to price changes. There is a 'magic $1 barrier' in mobile app market. $1 is the psychological threshold of app price for users. Apps with a price under one dollar[284] (or one euro) are the most downloaded paid apps. Downloads will plummet when app price steps over $1.

In this part, we want to study the influencing factors of price preferences for mobile app users. Based on the theoretical relationships between different factors which influence the price preferences of mobile app users, the following hypotheses are formed. Users' demographic characteristics, mobile device use and app use influence their app price preferences and app choosing decisions. These hypotheses are tested and measured through the mobile app use survey of French and Chinese app users. SEM (Structural Equation Modeling) has been applied to analyze the data from questionnaire. This allowed building the relation between app user's app price preference and its influencing factors.

5.2 Background literature

Customer or user preference can be defined as tending to indicate choices among neutral or more valued options with acceptance indicating a willingness to tolerate the status quo or some less desirable option (Fife-Schaw et al. 2007[285]). Many researchers have indicated price as customer preference (Kara et al. 1995[286]; Huber et al. 2001[287]; Palazon and Delgado 2009[288]). Price affects customer satisfaction. Price preference is an important part of customer performance.

Mobile app market is a new member in ICT[289] industry. There is no systematic user (or customer) preference study specially in price preferences. Customer preference studies which include price preferences in mobile service (Culter 2012[290]), bank (ZHANG Qun et al. 2010[291]), foodservice (Abdullah Firdaus et al. 2013[292]), E-commerce (Lightner et al. 2002[293]) and other retail systems will be taken as references.

Culter (2012) analyzed mobile service price sensitivity in U.S., Germany and Brazil. He found that

[284] This could be other currency like one Euro (€) in France or one Yuan (¥) in China.
[285] Fife-Schaw et al., Measuring customer preferences for drinking water services,2007
[286] Kara et al.. Marketing strategies for fast-food restaurants: a customer view, International Journal of Contemporary Hospitality Management 7(4): 16-22,1995
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price is critical in all markets and flexibility in pricing plans would improve mobile service provider’s competitive advantage.

Zhang Qun (2010) built customer preferences indicators including 'demographic features'; 'financial product quality', 'service quality' and 'financial behaviors' (mainly focused on bank marketing channels). It was found that bank marketing channels influence primarily customer preference. Demographic features affect less than bank marketing channels in commercial bank industry.

Abdullah Firdaus (2013) proposed a customer preference with five dimensions namely 'Halal', 'Price', 'Quality of Service', 'Branding' and 'Tangibles' in foodservice.

Lightner (2002) proposed that price negotiation would make a more satisfying shopping environment.

Overall, "demographic characteristics of users", "price", "product and service quality" and "consuming behaviors" can be taken as the four indicators of customer preferences. Relation among these indicators especially influences to price preferences by the other four indicators is valuable to study.

SEM was already used in several questionnaires results analysis. Hereafter are remarkable ones for this thesis.

SEM was applied to analyze the impacts of ICT usage on time use and travel behavior based on a survey in Hongkong (Wang and Law, 2007[294]).

Comparisons between Turkish and American university students' behaviors in E-commerce shopping (Lightner et al. 2002) were concluded through SEM. Carrillo et al. (2012[295]) constructed a SEM model to study influences of attitude towards health, natural content and novelty/fashion on functional food spending.

We can see that data for most of SEM studies are from survey (questionnaires). And SEM is widely used in different industries.

Mobile app price preference for users study has been implemented through survey from internet especially through social networking channels (like blog, Google group, Facebook, We chat).

5.3 Survey and application of SEM

5.3.1 Survey

This survey investigates factors which will possibly influence mobile app users’ app price preferences. Demographic characteristics of users, app price, app use behaviors and app store service are taken as potential influencing factors to users’ app price preferences. A questionnaire was developed and implemented in an attempt to enlighten these influencing factors focusing on

294 Wang and Law, Impacts of Information and Communication Technologies (ICT) on time use and travel behavior: a structural equations analysis, Transportation, 34:513–527,2007

295 Carrillo et al., Why buying functional foods? Understanding spending behavior through structural equation modeling, Food Research International 50 (2013) 361–368,2013

users mainly in France and China. A comparison of features between French and Chinese users will also be compiled.

This questionnaire was designed, produced and carried out through online survey and field survey (5%) over a period of 9 weeks between Early December 2012 and Mid February 2013. There were 24 questions (see Appendix 1). These questions were divided into two parts: demographic characteristics and app use features of the users. App price, app use behaviors and app store service were put into 'app use features' part. Seven questions were asked about demographic information: sex, profession, age, monthly income, access to questionnaire, mobile device type and country. Two questions about app price were 'monthly paid fee' and 'preferred app price'. Three questions were about app store service which included app store choosing principles, current using app store and advices for app store. The last ten questions focused on app use behaviors like mobile operating system usage, app use frequency, number of monthly paid downloads, monthly paid fee, app value and relation between app download and app price.

The questionnaire was tested beforehand to get information on participants' comprehension and design single or multiple responses for questions. 17 questions are single-response ones and 7 questions are multiple-responses.

Question 2.3 (favorite app type) was taken to represent app diversity. Question 2.10 is about price elasticity of demand (Rochet and Tirole (2004)) for mobile app. Question 2.11 and 2.13 reflect the network externalities (Armstrong (2002), Caillaud and Jullien (2003), Rochet and Tirole (2003), Katz and Shapiro (1985), Liebowitz and Margolis (1994)) in mobile app market. Question 2.13 also presents the producer's market power (Hagiu (2009)) in mobile app market. Question 2.3 and 2.8 are about product variety (Hagiu (2009)), which is presented by the type or category of mobile app in this market.

The questionnaire focused on 20 to 35 years old mobile app users. Most of them are students from university. We received 600 valid responses and the questionnaire was available in 3 languages (English, French and Chinese). Respondents came mainly from France and China. There were 222 Chinese users in China, 85 Chinese users in France and 269 French users in France. 24 responses were from USA, Canada and other countries.

5.3.2 Application of SEM

Statistics from the questionnaires' data were drawn up and analyzed through SPSS[296] V.21 before testing the influencing factors of app price preference for users by SEM modeling tool, AMOS V.21[297]. Correlation analyses were implemented to discover the relationships among the potential influencing factors on app price preferences for users. App price preferences for users will be called APPU for short in this study. The significant influencing factors on APPU were selected and put into SEM model.

SEM is widely used in empirical study to investigate relationships among observed variables (e.g. X_1 in Figure 5- 1) and latent variables (e.g. F_1 in Figure 5- 1). Observed variables can also be called

[296] SPSS (Statistical Product and Service Solutions) is one analytic software from IBM.
[297] AMOS (Analysis of Moment Structures) is one modeling program for create SEM model.

measured variables or manifest variables. Latent variables are also called unobserved variables or construct. Observed variables are usually represented by rectangles or squares and latent variables are represented by ellipses or circles. The residual associated with measurement of each observed variable or with the prediction of each factor is designed as e (e_1 to e_6 in Figure 5- 1). e can be considered as measurement error for using each observed variable to estimate latent variable. w is path parameter or factor loading. Single head arrows represent the impact of one variable over another and double-headed arrows represent covariance or correlations between a pair of variables.

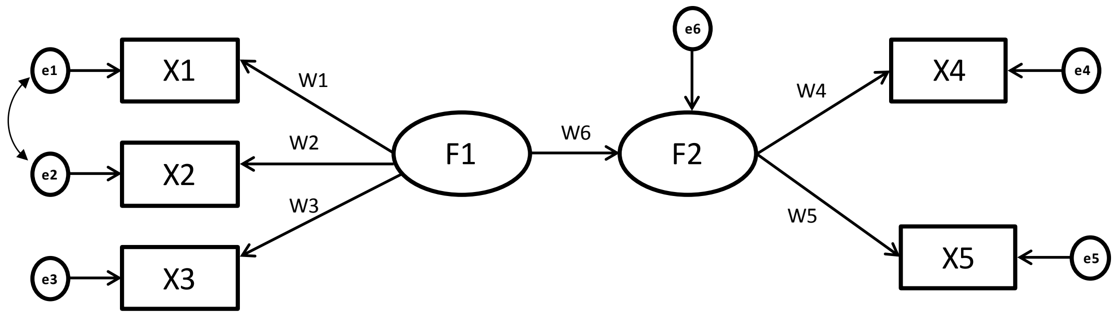

Figure 5- 1 A general structural equation model in AMOS

SEM is a member of multivariate models which focus on series of regression equations. These regression equations analyze covariance structures. In these covariance structures, covariance between two variables equals regression coefficient multiple the variance. One simple regression equation from Figure 5- 1 can be written as follows:

$$X_1 = W_1 F_1 + e_1 \text{ and } F_2 = W_6 F_1 + e_6$$

A specified statistic model has to be postulated based on theoretical relationship among the factors. And a test of plausibility based on sample data which concludes all the observed variables in the model (Byrne, 2006[298]).

Estimation which involves estimating the parameters in regression model and evaluation of the fitness of the model are the main objects in SEM. There are series of indicators to evaluate the fit goodness for hypothetical model and sample data. Chi-square to degrees of freedom ratio (CMINDF) means the chi-square fit index divided by the degrees of freedom. Ratio in 1-2 or 1-3 area means that goodness of fit for hypothetical model and sample data can be accepted. Root mean square error of approximation (RMSEA) value if less than or equal to 0.08 can be taken as a good fitness indicator. RMSEA less than 0.05 indicate a great fitness. Goodness of fit index (GFI) or adjusted goodness of fit index (AGFI) value is more close to 1 means better fitness of the model. SEM allows analyze with large number of groups and large sample sizes in each group and non-normality in observed variables.

AMOS[299] implements the general approach to SEM. It includes the general linear model and common factor analysis. Amos accepts a path diagram as a model specification and displays parameter estimates graphically on a path diagram.

[298] Byrne, B. M. Structural equation modeling with EQS: Basic concepts, applications, and programming (2nd edition). New Jersey: Lawrence Erlbaum Associates,2006
[299] Arbuckle,IBM SPSS Amos 21 User's Guide,2012

Amos performs state-of-the-art estimation by full information maximum likelihood for missing data instead of relying on ad-hoc methods like listwise or pairwise deletion, or mean imputation. It can also estimate means for exogenous variables and intercepts in regression equations. It makes bootstrapped standard errors and confidence intervals available for all parameter estimates, effect estimates, sample means, variance, covariance, and correlations. It also implements percentile intervals and bias-corrected percentile intervals (Stine, 1989), as well as Bollen and Stine's (1992) bootstrap approach to model testing.

5.4 Data analysis

There are 600 effective responses. The following are the basic statistics of data.

5.4.1 Demographic characteristics of mobile app users

Participants in this survey are mainly students from university (39%) or IT industry (29%) with an average age around 30 years old (Table 5- 1). There are more male users (55%) than female users (45%) for mobile app use and this is coherent with other digital goods consumptions.

In mobile app market, more than one third of users (36%) have 1,000 to 2,000 Euros monthly income and their average salary is a little below the middle class level (1675 Euros in 2010[300]). Social network is the main access to our survey. 55% of respondents came to this survey by social network of their friends or relatives. 28% of them participated directly by researcher's social network. The questionnaire was published through the main social networking tools such as Facebook, linked-in, we chat, QQ, Google group and email. There was a huge positive network effects in social network and also in mobile app market. App users' using commendation affects greatly other users' app downloading decisions (analysis of question 2.7 and 2.13 in Table 5- 3).

Because of Smartphone's portability and phone call features, Smartphone is the dominant mobile device to access to app store and apps (Table 5- 1). Downloading apps both on Smartphone and tablet is also popular (26.9% in Figure 5- 2). There are few tablet-only users.

59% of respondents are in France and 24%[301] of them are Chinese users. 37% of the respondents are Chinese users in China.

Table 5- 1 Demographic characteristics of respondents

Variable–description (possibilities)	N	Mean	Standard Deviation	Percentage
1.1 Sex	**600**	**1.45**	**0.50**	
Male =1				55%
Female=2				45%
1.2 Profession	**600**	**2.72**	**2.23**	
Student=1				39%
IT industry =2				29%

[300] 50% of French earned less than 1675 euros and the other 50% earned more than this number per month. http://www.inegalites.fr/spip.php?article190#nh1,29/01/2013
[301] 24%= 85/(85+269)

Civil servant/Official=3				5%
Professor or Researcher =4				10%
Self-employed=5				4%
Jobless=6				2%
Retired=7				0%
Others=8				11%
1.3 Age	**600**	**2.24**	**0.53**	
Under 20=1				3%
20—30=2				72%
30—45=3				23%
Over 45=4				2%
1.4 Income (in Euros per month)	**600**	**2.31**	**1.00**	
Under 1000=1				24%
1000—2000=2				36%
2000—4000=3				25%
Over 4000=4				15%
1.5Access to questionnaire	**600**	**1.73**	**0.99**	
Friends or relatives=1				55%
Social networking =2				28%
Field investigation=3				6%
Others=4				11%
1.6* Mobile device usage	**820**	**----**	**----**	
Yes,smartphone=1				63%
Yes, tablet=2				29%
Yes, other portable device				5%
No, none=4				3%
1.7 Country	**600**	**3.04**	**3.70**	
France=1				59%
China=2				37%
US=3				1%
Others=4				3%

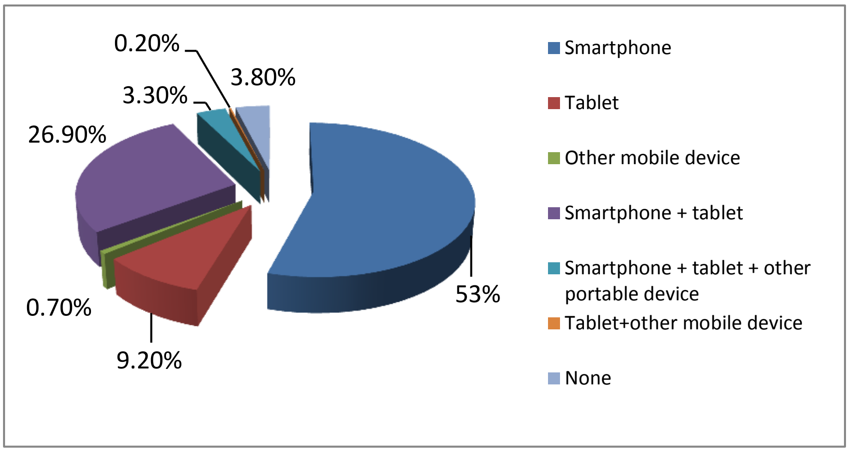

Figure 5- 2 mobile device using (Question 1.6 with multiple responses)

5.4.2 Mobile app price

Question 2.5 (paid fee) and 2.9 (preferred price) are taken as the app price preference related questions.

Free apps are more downloaded than paid ones. 78% of users download free apps monthly and 18% of users just download 1 paid app on average each month (Table 5- 3). For the free apps, more than 72% of users download two or more apps per month (Table 5- 3). Among the small amount of downloads of paid apps, paid fee for apps are usually less than one euro (16%) or between one and two Euros (9%) per month from users (Table 5- 2). 65% of users never paid for apps. We can find that percentage of users who never paid for apps is smaller than users who download free apps (65% vs.78%). That is because users who download free apps could pay for in-app purchase like buying privileges or badges. Free apps with in-app advertising and in–app purchase are good revenue models in mobile app market.

61% of users prefer just free apps. 19% of them can accept less than one euro apps. 12% of them can download apps with price from one to two Euros.

Table 5- 2 Mobile app price choice of respondents

Variable –description (possibilities)	N	Mean	Standard Deviation	Percentage
2.5 Paid fee (in Euros per month)	**600**	**1.72**	**1.23**	
0=1				65%
<1=2				16%
1—2=3				9%
2—5=4				4%
5—10=5				4%
>10=6				2%
2.9 Preferred price (Euros)	**600**	**1.72**	**1.12**	
0=1				61%
<1=2				19%
1—2=3				12%

2—5=4	4%
5—10=5	3%
>10=6	1%

*implies question with multiple responses.

5.4.3 Mobile app use behaviors

Table 5- 3 shows the statistics of mobile app use behaviors.

Apple and Google are the duopolies in mobile operating system market. 51% of respondents are Apple iOS users and 41% of users are Google Android users.

For app use frequency, 68% of users download and use mobile apps frequently. Social networking (20%), Games (19%) and Navigation (18%) apps are the top 3 favorite app categories for users.

Credit or debit card (49%) is the main app payment mode. 17% of users pay through telecom operator's mobile billing system. This happens more in China and Africa countries where credit card are not so universal as in Europe and America. 29% of participants just use free apps without paying and that is why the response 'others' in question 2.6 has taken a considerable proportion.

Rank, interest and recommendation of apps are the primary app choosing principles. Proportions of these three factors were 30%, 24% and 22% for users. Recommendation from other users affects app downloading. Users prefer apps which are well accepted by others and direct network externalities are significant in mobile app market.

Recommendation from other users (33%+8%[302]=41%) is the first important factor which gives confidences to download an appropriate app for users. App description (31%) is also the dominant factor. Developers in mobile app market don't trade directly with users and identity of app developers (just 3%) was taken as confidence factors. Only the big and professional app developers like Rovio Entertainment (developer of angry bird game) and Electronic Arts (developer of real racing games, EA for short) can be identified by users.

Functionality (77%) was taken as the most important app value determinant for users. Most of users did not consider price into app value. And users search app by functionality (33%) more than name (28%). Most of users (39%) use both functionality and name to look for apps. 71% of users update their apps when a new version is proposed.

Utilities (31%), Games (22%) and Social networking (20%) apps were the top three types of apps that had been recently downloaded by users. Under Utilities category, widget, travel & transport and shopping were the three most downloaded ones, which are followed by Finance, weather and education apps (Figure 5- 3). Comparing the three more recent downloaded apps to the users' favorite apps, Games and Social networking apps are both in the top 3 list. Utilities are also welcomed because of their practicality as tools.

[302] Recommendation from friends or relatives was in the family of recommendation of other users.

Question 2.10 about relation between app price and downloads was taken as the price elasticity of demand (PED) variable for apps. 'Totally free application has most downloads' response was assigned to the highest PED value and means users are too sensitive to app price and price changes. 'Downloads depend on the value of the application, not the price' is assigned to the lowest PED value and not sensitive to app price and price changes. 55% of users showed their highest PED to app price and 26% of users seemed to pay more attention to app value except price (Table 5- 3).

Table 5- 3 Mobile app use behaviors of respondents

Variable –description (possibilities)	N	Mean	Standard Deviation	Percentage
2.1 OS	**600**	**1.72**	**1.02**	
(Mobile operating system chosen)				
Apple iOS=1				51%
Google Android OS=2				41%
Windows Mobile OS=3				1%
Blackberry OS=4				1%
Others=5				6%
2.2 Frequency	**600**	**1.81**	**0.53**	
(app use frequency)				
Rarely used=1				25%
Frequently used=2				68%
Not used =3				7%
2.3* Diversity	**1727**	**----**	**----**	
(Favorite app type)				
Games=1				19%
Books=2				15%
Social Networking=3				20%
Entertainment=4				15%
Navigation=5				18%
Health=6				5%
Sports=7				4%
Others=8				4%
2.4.1 Free downloads	**600**	**3.43**	**1.30**	
(free app downloads number per month)				
0=1				8%
1=2				20%
2=3				22%
3—5=4				21%
>5=5				29%
2.4.2 Paid downloads	**600**	**1.28**	**0.61**	
(Paid app downloads number per month)				
0=1				78%
1=2				18%
2=3				2%

3—5=4				1%
>5=5				1%
2.6 Mode payment	**600**	**2.78**	**1.52**	
(how to pay for apps)				
Through telecom operator's mobile billing=1				17%
By credit card or debit card=2				49%
Through a special package of applications=3				3%
Through prepaid card for applications=4				2%
Others=5				29%
2.7* App chosen principles	**1020**	**----**	**----**	
Friends' recommendation=1				22%
Advertisement inside of apps=2				7%
Ranking of applications =3				30%
Think it is funny and want to try=4				24%
Number of downloads =5				13%
Others=6				4%
2.8*Three apps downloaded recently	**1586**	**----**	**----**	
(classified into 10 types)				
1Games				22%
2Books				5%
3Social networking				20%
4 Entertainment				3%
5Navigation				5%
6Health				0.4%
7Sports				1%
8Utilities				31%
9Music				5%
10Photo and video				7.6%
2.10 Price elasticity of demand	**600**	**1.81**	**0.99**	
(relation between app price and downloads)				
Totally free application has most downloads=1				55%
Much cheaper, more downloads=2				14%
Downloads depend on the value of the application, not the price=3				26%
Others=4				5%
2.11 Value determinants	**600**	**2.12**	**0.91**	
(app value determinants)				
Many people use it =1				13%
It provides me valuable functionalities =2				77%
The price of the application=3				2%
The advices of friends or relatives=4				4%
The reputation of the publisher =5				2%
Others=6				2%
2.12 App search way	**600**	**2.11**	**0.81**	

A name of one specific application=1				28%
For specific functionalities =2				33%
Both =3				39%
2.13Confidence	**600**	**3.94**	**1.53**	
(confidence of downloading an appropriate app)				
The reputation of the application store=1				10%
The identity of the application developer =2				3%
The description of the application=3				31%
The number of downloads=4				11%
The recommend of other users=5				33%
The recommend of friends or relatives=6				8%
Others=7				4%
2.14 Update	**600**	**1.29**	**0.45**	
(Update app version or not)				
Yes=1				71%
No=2				29%

*implies question with multiple responses.

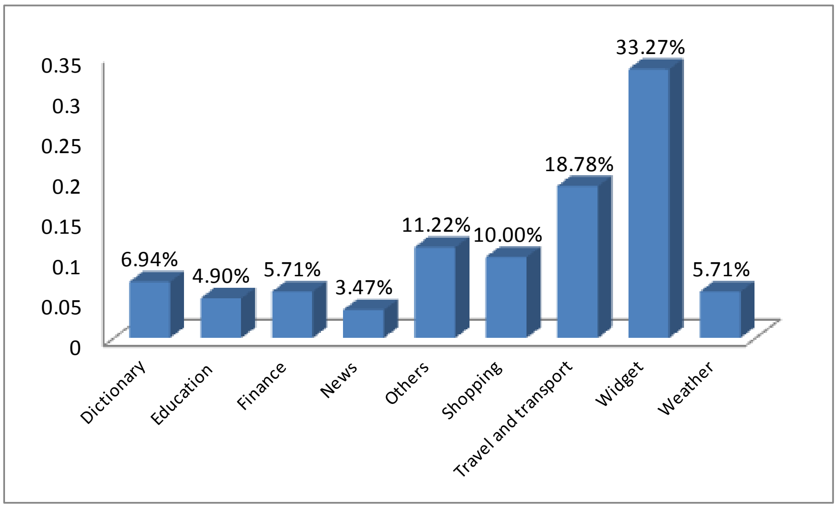

Figure 5- 3 9 sub-types apps in Utilities (n=490)

5.4.4 Mobile app store using advices

In Table 5- 4, we can find app store using features and advices from users.

App store preloaded in mobile device is the most used app store. 53% of users access to app store through platforms implanted ex ante in their mobile devices. This concur with Gans (2012)'s study. Platform access has always to be provided through a device. 24% of users choose app store platform by network externalities (most people's choice or friends' advices).

For the current app store usage, 46% of users downloaded apps from Apple App store and 27% of users downloaded from Google Play. Apple App store still has leading advantage compared to Google Play. 11% of users used their device manufacturer's app store (like Dell mobile app store, LG smart world and Huawei Hi cloud). 5% of them use their telecom operator's app store. Most of device manufacturer's app store and telecom operator's app store adopt Google Play store because of open source of Android.

For advices of app store, users like when there are more various apps (26%) in the app stores. 20% of them pay more attentions on app price. 16% of them hope to get better services. 14% of them would like interconnection with other app stores. 12% of users like targeted app advertising. Customized app advertisements will be needed. Users were satisfied with the convenience of mobile app payment mode.

Table 5- 4 App store usage advices of respondents

Variable –description (possibilities)	N	Mean	Standard Deviation	Percentage
2.15* How to choose app store	**827**	----	----	
The application store implanted in my smart phone or tablet=1				53%
The variety of applications in the store=2				12%
Many people use it=3				12%
The advices of friends or relatives=4				12%
The reputation of the application store=5				7%
Others=6				4%
2.16* App store current using	**699**	----	----	
Apple App Store=1				46%
Google Play=2				27%
Windows Phone store=3				1%
Blackberry App World=4				2%
Nokia Store=5				1%
Your telecom operator store=6				5%
Your device manufacturer store=7				11%
Others=8				7%
2.17* Advices of app store	**1136**	----	----	
Supplying more various applications=1				26%
Making proper price for application=2				20%
Making payments more convenient for the applications=3				7%
Interconnection with other application stores will be Welcomed=4				14%
Improvement of user experience and after-sales services=5				16%
Targeted advertising for applications=6				12%
Others=7				5%

*implies question with multiple responses.

5.5 Mobile app price preference influencing factors SEM modeling

Data from questionnaires was normalized before analysis. It was normalized based on quantity of level variable or options weights for latent variables. Questions with multiple responses (except for question 2.3 (favorite app type)) are not suited to identify the app use features for different type of users. Question 1.5 (access to questionnaire) and question 2.12 (app search way) are not directly related to app price. Thus they were not normalized and included in the following analysis. Data applied are from 16 questions (Table Appendix 5- 1,Table Appendix 5- 2,Table Appendix 5- 3). Sex, Age, Income and Country are demographic characteristics variables. Paid fee and Preferred fee are app price preference variables. OS, Frequency, Diversity, Free downloads, Paid downloads, Payment mode, Elasticity, Value determinants, Confidence and Update are the ten variables representing app use.

5.5.1 Correlation analysis among 16 variables

Correlation analysis among the 16 variables from 16 questions in the survey was implemented into SPSS 21 (Table 5- 5).

For demographic characteristics, Sex is significant with Frequency and Update. That reveals that female users download apps less than male users. Female users don't usually update apps as usually as male users. Elder users have higher income than younger ones but they update less than younger users. Users with higher income seem to download more paid apps, pay more fees for app use and prefer apps with higher prices. They like to pay for apps by credit card and they are used to take app description as the confidence to download an appropriate app. But the users with highest income, users with more than 4,000 euro show to pay least less and prefer lower price apps. Chinese users download more free apps than French users. However certain Chinese users accept to pay for more than ¥5 for app downloads per month and there are less French users who pay for more than €5 (9.5% of 222 Chinese users compared to 3.1% of 354 French users). Chinese users like to take app description as app choosing criterion and they like more types of apps than French ones.

For app price, users who pay more fees for apps tend to prefer higher app price and have lower price elasticity of demand. They prefer iOS app store, download more free and paid apps and also have higher app use frequency. They care more about app diversity. Users who prefer higher app price usually download more paid apps and have lower price elasticity of demand. They also like to pay apps through credit card.

For app use, iOS users download apps more frequently than Android users and demand higher app diversity. iOS users like to pay by credit card. This corresponds with the fact that Apple has a huge credit card customer base since iPod times.

Frequent users download more free and paid apps. They care about app diversity and usually update apps for the new versions. They care more about functionality as app value determinant and read more app descriptions to get confidence before downloading apps.

Frequent users download more paid apps. They care more about app diversity and update. They show interest to pay for apps by credit cards when needed. App functionality and app description are the main value determinants, and confidence source for apps.

Users with more paid app downloads have lower price elasticity of demand. They are less sensitive to app price. They update apps more often and like to pay for apps by credit card.

Credit card users have lower price elasticity of demand for apps and they usually update apps.

Table 5- 5 Correlation analyses among 16 variables from survey

Pearson correlation coefficient	Demographic characteristics				Mobile app price preferrences		Mobile app using behaviors									
	Sex	Age	Income	Country	Paid fee	Preferred price	OS	Frequency	Free downloads	Paid downloads	Payment mode	Elasticity	Value determinants	Confidence	Update	Diversity
Sex	1															
Age	-.004	1														
Income	-.068	.339**	1													
Country	-	.006	.043	1												
Paid fee	-.070	.042	.203**	.132**	1											
Preferred price	-.008	.043	.139**	-.028	.452**	1										
OS	.047	.033	.035	.020	.106*	.033	1									
Frequency	-.098*	-	.046	-.044	.104*	-.001	.158**	1								
Free downloads	-	-	.043	.102*	.124**	.020	.078	.431**	1							
Paid downloads	-.071	.006	.112**	.004	.597**	.303**	.047	.143**	.136**	1						
Payment mode	.047	.055	.117**	-.055	.332**	.150**	.197**	.062	.087*	.239**	1					
Elasticity	-.019	.059	.050	-.040	.254**	.247**	-.029	.076	.042	.245**	.149**	1				
Value determinants	-.008	.002	.005	-.014	-.086*	-.051	.025	.133**	.090*	-.077	.027	.080	1			
Confidence	-.021	.063	.107*	.138**	.029	.000	.058	.123**	.139**	-.001	-.001	.016	.164**	1		
Update	.088*	.112**	.077	.061	-.014	-.029	-.046	-.232**	-.192**	-.100*	-.084*	-.028	-.069	-.102*	1	
Diversity	-.045	-	-.032	.212**	.137**	-.070	.154**	.289**	.310**	.078	.108*	.047	.116**	.142**	-.164**	1

** means significant correlation at α=0.01 confidence level (two tailed significance) are marked in bold.

* means significant correlation at α=0.05 confidence level (two tailed significance) are marked in bold.

Users who care more about app functionality like to take app description as confidence criterion to download apps. They also pay attention to app diversity.

Users who take app description as confidence criterion to download apps have higher app diversity demand and often update apps.

Users who often update apps care more about app diversity.

Paid fee and Preferred price are taken as the two dependent variables to study app price preferences for mobile app user in this study. From the above correlation analyses, we can find 9 variables which include Income, Country, OS, Frequency, Free downloads, Paid downloads, Payment mode, Elasticity and Diversity that are closely related with Paid fee and Preferred price.

5.5.2 Multiple regression analyses

A path analysis can be conducted with a series of multiple regression analyses among variables according to Wuensch[303] (2013). We have entered the 9 variables presented above into SPSS 21 to try to find the paths coefficients to predict Paid fee and Preferred price from these 9 variables. After the series of multiple regressions, we have concluded the following significant outputs. Income, Country, Paid downloads, Elasticity and Diversity are the principle factors to Paid fee. Country, Paid downloads, Elasticity, Diversity and Paid fee are the significant factors to Preferred price. Amos path diagram for influencing factors to paid fee and preferred price will be built based on these implied relations.

Output for Income, Country, Paid downloads, Elasticity and Diversity to Paid fee is presented in the following tables *model summary 1* and *coefficient 1*. The Beta weights are the path coefficients leading to Paid fee: 0.433 from Income, 0.314 from country, 0.748 from Paid downloads, 0.314 from Elasticity and 0.107 from Diversity.

Model summary 1

Model	R	R Square[304]	Adjusted R Square	Std. Error of the Estimate
1	.738[a]	.545	.521	2.18256

Predictors: (Constant), Diversity, Income, Elasticity, Country, Paid downloads

Coefficient[b] 1

Model		Standardized estimates	T	Sig.
		Beta		
1	(Constant)		-2.689	.007
	Income	.433	4.042	.000
	Country	.314	3.410	.001
	Paid downloads	.748	16.123	.000
	Elasticity	.314	3.381	.001
	Diversity	.107	2.070	.039

b. Dependent variable: Paid fee

Model summary 2

Model	R	R Square[305]	Adjusted R Square	Std. Error of the Estimate
2	.685[a]	.469	.460	7.18859

[303] Karl L. Wuensch, Conducting a Path Analysis With SPSS/AMOS, East Carolina University,2013
[304] R Square >0.50 means individual item reliability is accepted.
[305] R Square >0.50 means individual item reliability is good and accepted.

a. Predictors: (Constant), Diversity, Elasticity, Country, Paid downloads, Paid fee

Coefficient [b] 2

Model		Standardized estimates Beta	t	Sig.
2	(Constant)		8.529	.000
	Country	-.075	-1.365	.173
	Paid downloads	.385	2.535	.000
	Elsticity	.337	3.548	.000
	Diversity	-.126	-3.303	.001
	Paid fee	.627	9.036	.000

b. Dependent variable: Preferred price

Output for Country, Paid downloads, Elasticity, Diversity and Paid fee to Preferred price is presented in the following tables *model summary 2* and *coefficient 2*. The Beta weights are the path coefficients leading to Paid fee: -0.075 from Country, 0.385 from Paid downloads, 0.337 from Elasticity, -0.126 from Diversity and 0.627 from Paid fee.

5.5.3 Hypothetical casual links of app price preferences for users in AMOS

Based on the correlation and multiple regression analyses, a path diagram has been built through Amos 21. Income and Country represent the demographic characteristics. Diversity, Elasticity and Paid downloads reflect the app use features. These five variables affect user's paid fee for apps usage.

Paid fee is highly related to Preferred price (Table 5- 5). Users who pay for higher fees tend to also prefer higher app price. Preferred price has paths to it from Paid fee, Country, Paid downloads, Elasticity and Diversity.

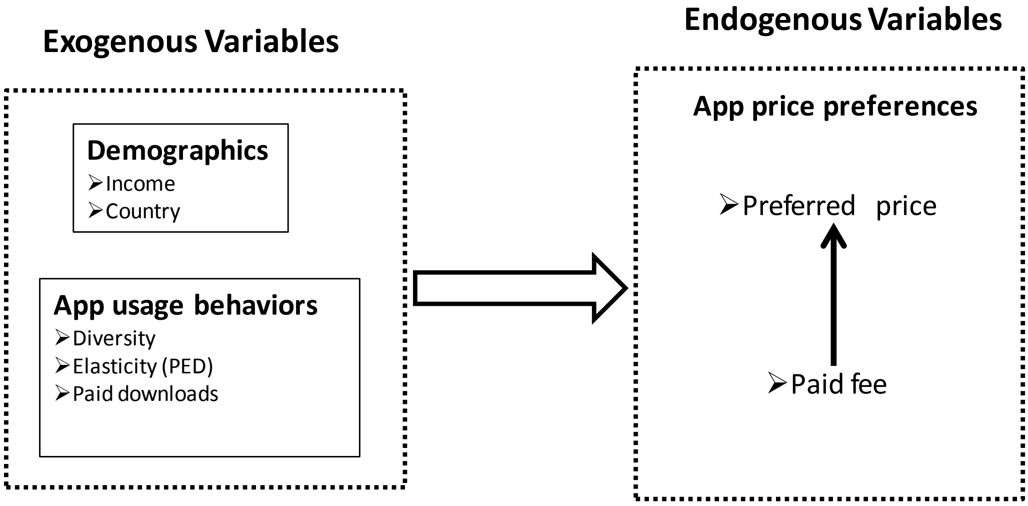

Figure 5- 4 Hypothetical casual links between demographics, app use behaviors and Paid fee, Preferred price

5.5.4 Mobile app price preference influencing factors path diagram in Amos

There are 39 users who did not download apps in the survey. In order to study the app price preferences for users, these 39 users were removed out of the data base in this part. So there were 561 respondents who download and use mobile apps considered for our analyses. 299 of them are iOS users. 262 of them are Android and other mobile operating system users. The path diagram can be seen in Figure 5- 5. Standardized Total Effects are presented in Table 5- 6.

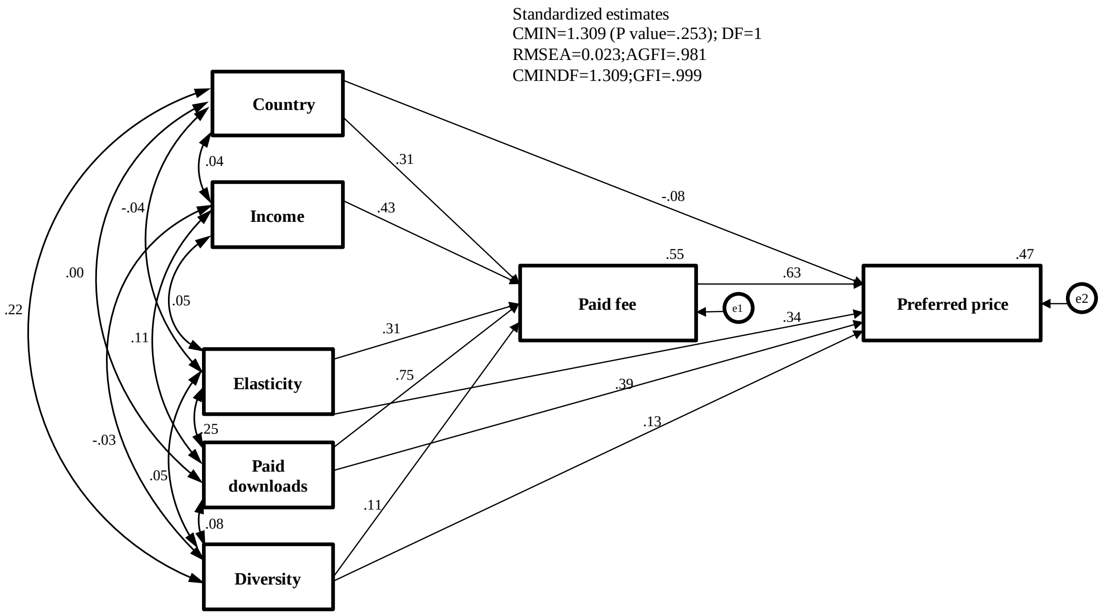

Figure 5- 5 Mobile app price preference influencing factors path diagram in Amos (n=561)

Table 5- 6 Standardized Total Effects (n=561)

	Paid downloads	Elasticity	Country	Diversity	Income	Paid fee
Paid fee	.748	.314	.314	.107	.433	.000
Preferred price	.385	.337	-.075	-.126	.057	.627

For goodness-of-fit statistics in AMOS, CMINDF (chi-square degrees of freedom ratio), GFI (goodness-of-fit index), AGFI (adjusted goodness-of-fit index) and RMSEA (root mean square error of approximation) are the general indices. CMINDF<2, GFI or AGFI=1 or RMSEA <0.05 represents good fitness between the built model and the default model.

In our model, CMINDF (chi-square degrees of freedom ratio) is 1.309 <2 and GFI (goodness-of-fit index) is 0.999. That means that this SEM model is a good fit (Figure 5- 5).

Paid downloads is highly related with Paid fee for users. Users pay more fees for apps when they download more paid apps. From the data normalization, we know that bigger Elasticity value means a lower price elasticity of demand (PED). For short, users with lower PED tend to pay more fees for apps. They are not so sensitive to app price and app spending. Users who care for Diversity usually pay more fees. Higher income usually leads to higher Paid fees except for the highest income (>4,000 euro in our survey) group. Users with more than 4,000 euro have highest price elasticity of demand and are very sensitive to app price.

To see the Paid fee differences in China and France, we found that 14.5% of Chinese users pay more than ¥2 for apps and the proportion is 4.2% for French users. But more French users pay between €1 and €2 than Chinese ones (27.5% compared to 23.4%). 68% of French users and 62% of Chinese users pay zero for apps. This was analyzed out of 269 French users and 222 Chinese users in our survey.

For Preferred price, Paid fee is the main influencing factor. Users who pay more fees for apps can accept higher app price. Users with lower PED seem to have higher Preferred price. French users Prefer higher app price than Chinese users. Users who prefer higher app price focus on certain app types and don’t have higher demand for app diversity.

5.5.5 Comparison of mobile app price preference influencing factors for Apple iOS users and other mobile OS users

In this part, we have divided the data from iOS and Android and other MOS users into two groups to study for the differences (Table 5- 7, Table 5- 8). Android and other MOS users is called Android group in this analysis. There were 299 iOS users and 262 Android group users. iOS mobile devices and Apple App store is still the leader in mobile app market.

iOS users have lower PED than Android group users. They are more willing to pay for apps. iOS Chinese users prefer higher app price. Android group's French users can accept higher app price.

iOS users who don't demand app diversity prefer higher app price. And Android group users with app diversity demand prefer higher app price. iOS users Paid fee affect greatly Preferred price. Influence of Paid fee on Preferred price for Android group users is lower.

Table 5- 7 Standardized Total Effects for iOS users (n=299)

	Paid downloads	Elasticity	Country	Diversity	Income	Paid fee
Paid fee	.724	.394	.301	.106	.441	.000
Preferred price	.308	.491	.129	-.273	.088	.683

Table 5- 8 Standardized Total Effects for Android and other MOS users (n=262)

	Paid downloads	Elasticity	Country	Diversity	Income	Paid fee
Paid fee	.765	.282	.326	.146	.417	.000
Preferred price	.427	.152	-.281	.001	.047	.434

So we can get some conclusions between iOS and Android group users. iOS users have lower price elasticity of demand and lower demand of app diversity. iOS app users have higher paying willingness. iOS and Apple App store is well accepted for Chinese users.

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6 Chapter 6 Mobile app user price elasticity of demand

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Apple is one is the dominant MOS app store. App price in Apple App Store represents the law and trends in mobile app market. This chapter focuses on app price distribution in Apple App store and price elasticity of demand for Apple App Store users in France, China and the US. All the data of the following analysis come from Apple App Store. In this study, iPhone, iPad and Mac book are taken as the main Apple branded mobile devices.

6.1 Data base introduction

We collected monthly data related to the top 300 free and top 300 paid downloaded mobile apps in Apple App store in France, China and the US from November 2011 to April 2013 (18 months in total). The data were collected from ipadown which is a professional Apple App Store app ranking and recommendation website[306].

The data include the name, rank, price and category of all iPhone and iPad apps in Apple App store. iPhone and iPad share the same Apple App store and the same app categories. All the prices in Yuan and Euro were converted to US Dollar according to the real-time currency exchange rates.

There are apps from three countries: France, China and the US; three platforms: iPhone App Store, iPad App Store and Mac App Store; two kinds of prices: Free and Paid; Apps ranging from 1 to 300; and 23 different app categories. The data cover the period between November 2011 and April 2013 (18 months in total).

Table 6- 1 Data sources and classification

Data sources and classifications	**Country**	**Platform**	**Price type**	**App rank range**	**Time period**	**App category**
	France	iPhone App Store	Free	1-300	11.2011—04.2013	23
	China	iPad App Store				
	US	Mac App Store	Paid			

There are 29,754 unduplicated mobile apps in this database. The following analysis of data will be done through the classification in Table 6- 1.

6.2 Mobile app characteristics

6.2.1 Mobile app price distribution

Mobile app price ranges from US$0, 0.99, 1.99, 2.99… till 999.99. About 56% of Apple App store apps are free apps till March 2013.

$0.99 mobile app is the dominant strength in mobile app market. $0.99 apps are consistent with the

306 http://www.ipadown.com/,ipadown supplies free app of the day for Apple branded mobile devices.

discrete uniform distribution in the top 300 paid app rank range. 62% of paid apps in Apple App store for iPhone and 37% of paid apps in Apple App store for iPad are $0.99 (Figure 6-1).

Mac store offers mainly desktop computer applications and software. Only 15% of $0.99 apps are in Mac store. $0.99 app is also the most popular app in Mac store. $4.99, $6.99, $9.99 and $ 19.99 apps are more popular in Mac store. In Mac store apps less than $3.99 take the smallest proportion compared to iPhone App store and iPad App store.

'$4.99, $6.99 and $9.99 Effects' are found in Mobile app market. Normally proportion of apps decreases with app price increasing according to the law of demand. Users download less expensive apps than cheap ones. However the $4.99, $6.99 and $9.99 mobile app price seem to be more acceptable by users. And most of these are Utilities mobile apps (Figure 6-1).

In the top 300 paid apps downloaded during 18 months in France, China and the US, there are nearly no apps which are worth more than $29.99.

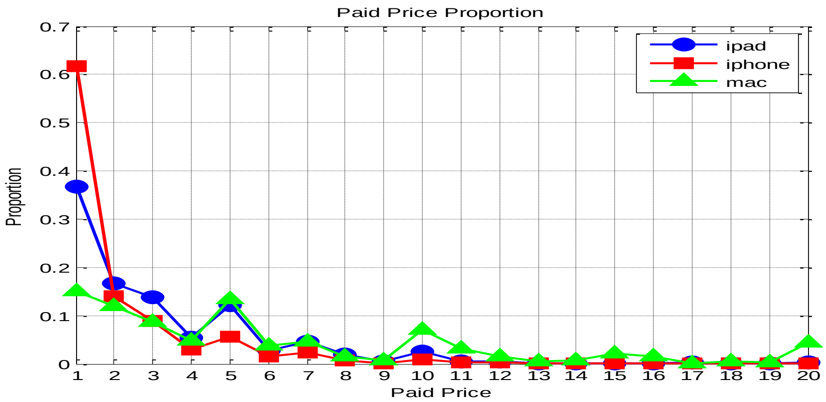

Figure 6-1 Average paid app price distribution in France, China and the US

The comparison of average paid app price distribution in France, China and the US, shows that average paid app price is highest in Mac app store. Then come App Store for iPad and App Store for iPhone (Figure 6- 2).

$0.99 apps in iPhone App Store in China and the US represent more than 60% and almost 60% in France. $0.99 apps in iPad App Store reach 46% in China, compared to 34% in the US and 30% in France. $0.99 apps in Mac App Store in China represent 21%, compared to 12% in the US and in France.

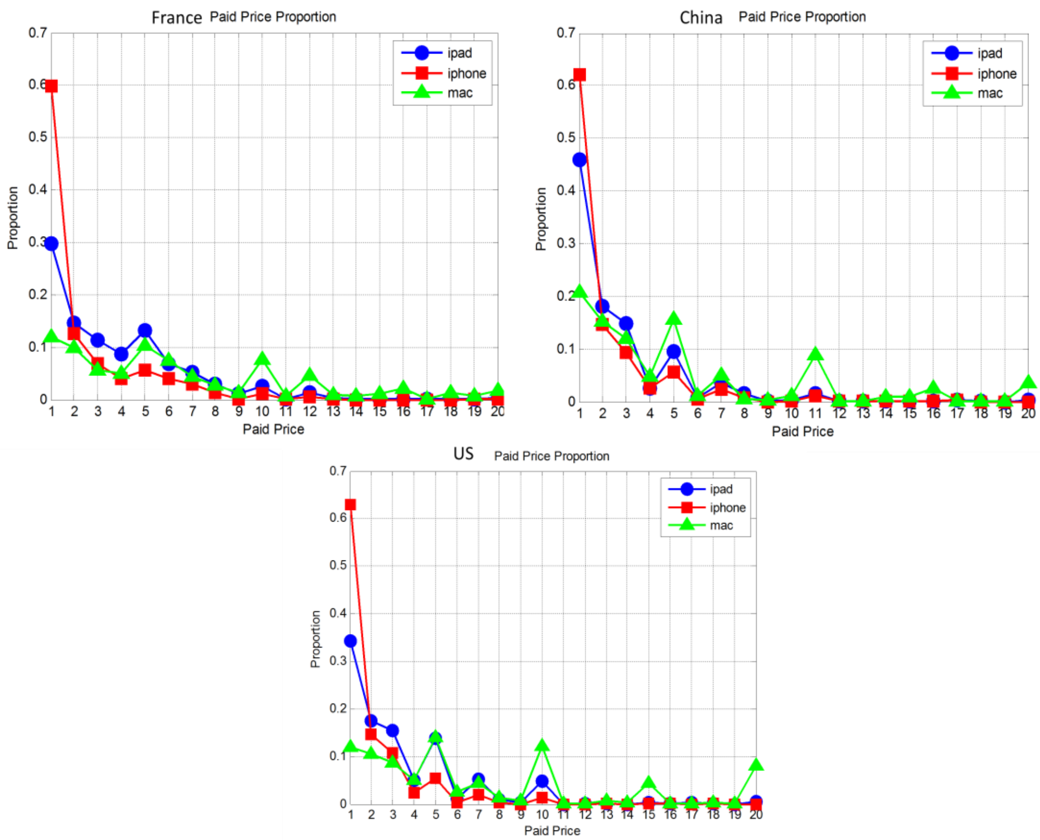

Figure 6- 2 Average paid app price distribution

6.2.2 Mobile app category distribution

Among the 23 categories of apps identified for iPhone and iPad in Apple App store in France, China and the US during the study (from November 2011 to April 2013) (Table 6- 2), the most popular for both free and paid apps in the three countries are: Games, Entertainment, Utilities, Education, Lifestyle, News, Travel, Weather and Food.

For free and paid apps, Games category is the most popular, representing more than 40% of the total. Free Games are more popular than paid ones.

The US is the country where iPhone free Games are the most heavily used. France is the country with the most iPad and Macfree Games downloads. There are more free Games on iPad and then is on iPhone.

The US is the most heavily paid games used country for iPhone and iPad. China is the most Mac paid Games used country.

Regarding free apps, Entertainment and Life style are the second and third most used categories. Lifestyle, Education and Utilities apps on iPhone and iPad are most popular among Chinese users than French and US ones. French users show more interest in Music, Photo, News, Travel, Weather and Food apps than Chinese and US users on iPhone, iPad and Mac (Figure 6- 3, Figure 6- 4). Utilities and Productivity apps are more popular on Mac.

Table 6- 2 Mobile app category in Apple App store

Category	**Country**		
	US	***China***	***France***
1	Games	游戏	Jeux
2	Books	图书	Livres
3	Social Networking	社交	Réseaux sociaux
4	Entertainment	娱乐	Divertissement
5	Navigation	导航	Navigation
6	Health	健康健美	Forme et santé
7	Sports	体育	Sport
8	Utilities	工具	Utilitaires
9	Music	音乐	Musique
10	Photo	摄影与录像	Photo et vidéo
11	Productivity	效率	Productivité
12	Education	教育	Enseignement
13	Finance	财务	Finances
14	Business	商业	Économie et entreprise
15	Catalogs	商品指南	Catalogues
16	Lifestyle	生活	Style de vie
17	Medical	医疗	Médecine
18	Newsstand	报刊杂志	Kiosque
19	News	新闻	Actualités
20	Travel	旅行	Voyages
21	Weather	天气	Météo
22	Food	美食佳饮	Alimentation et boissons
23	Reference	参考	Références

Regarding paid apps, Education ones are the most popular in China all devices taken into account.In China, Utilities apps are mostly used on iPhone, whereas apps in this category are mostly used on iPad and Mac in France. In France, Reference apps are the most downloaded on the three devices. Entertainment, Health and Social networking apps are the favourite ones of American users of iPhone, iPad and Mac. Same as free apps, Utilities and Productivity apps are also more popular on Mac.

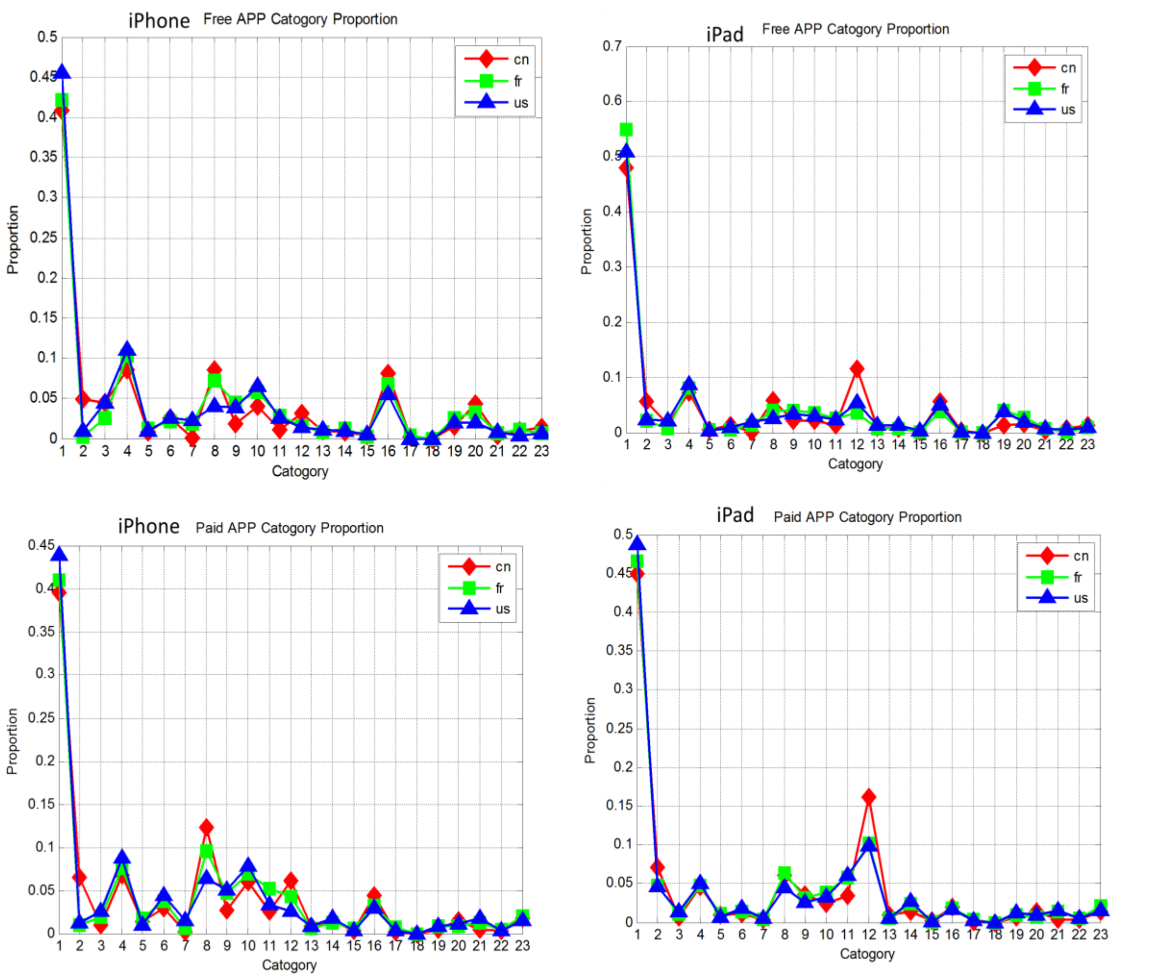

Figure 6- 3 Free and paid app category distribution in iPhone and iPad App Store

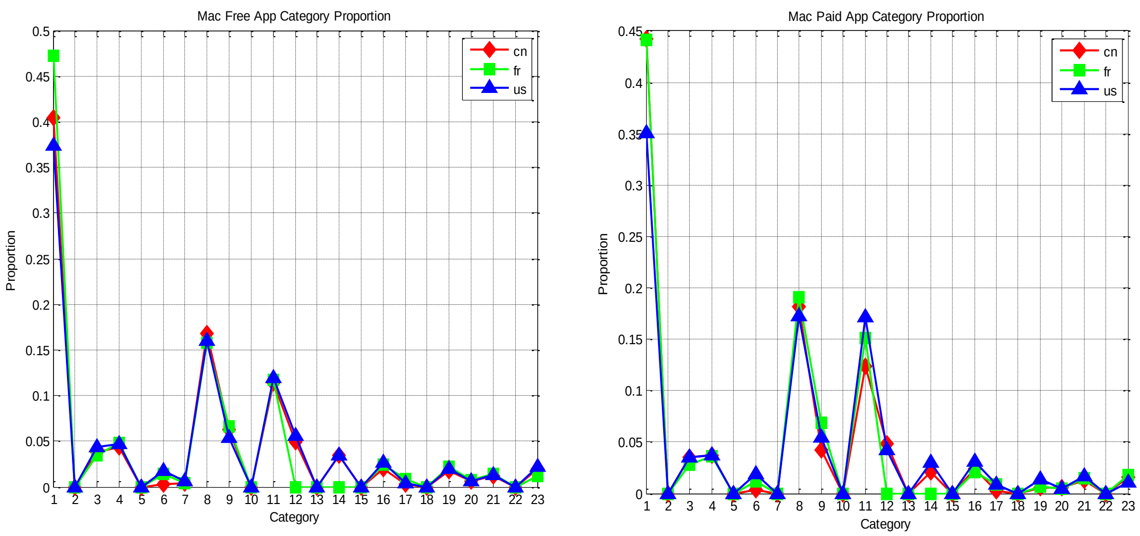

Figure 6- 4 Free and paid app category distribution in Mac App Store

6.2.3 Mobile app rank distribution classified by price

The data is classified according to the app rank, from 1 to 300. There are 30 different prices, from \$0.99 to \$29.99. We analyze rank distribution for each price in France, China and the US. Axis X is app rank and Axis Y is the number of apps downloaded for each app rank.

6.2.3.1 iPhone paid app rank distribution

iPhone paid apps with price from \$0.99 to \$9.99 are uniformly distributed from 1 to 300. There are more apps that concentrate on \$0.99. More than 3,000 apps can be found priced in \$0.99 on iPhone in France, China and the US (Figure 6- 5).

\$4.99 apps for iPhone in China are nearly consistent with the normal distribution.

French users accept to download paid apps more expensive (\$10.99, \$11.99, \$12.99). There are almost no apps priced \$10.99, \$11.99, \$12.99 in the US.

\$8.99 does not appear to be a welcomed price for users from the three countries.

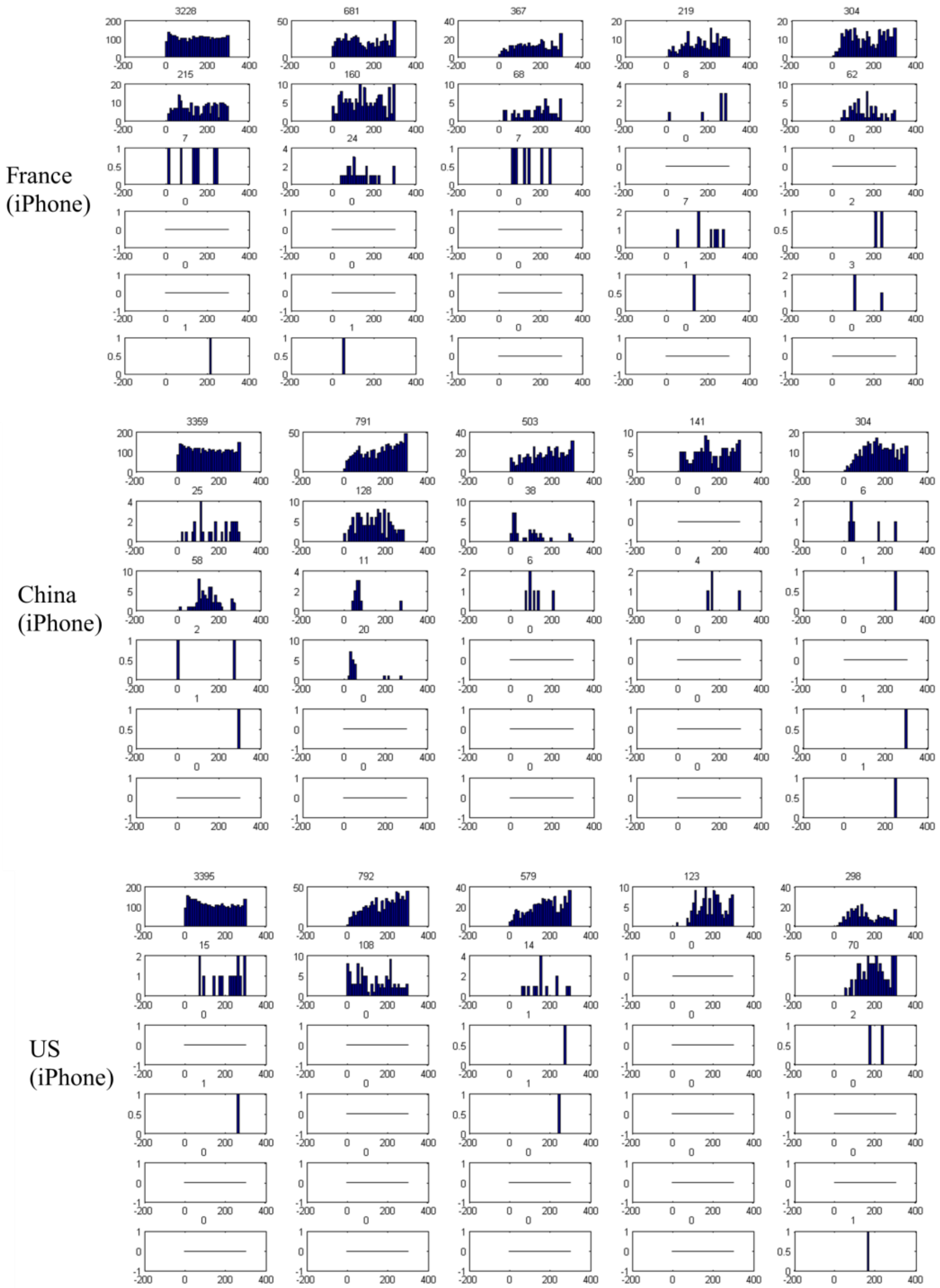

Figure 6- 5 Rank distribution by price in France, China and the US (iPhone)

6.2.3.2 iPad paid app rank distribution

Apps prices distribute mainly from $0.99 to $9.99. Compared to iPhone, there are less apps priced $0.99. But some apps priced higher like $15.99 and $19.99 can be found. French users download more apps priced between $5.99 and $9.99 than American and Chinese users (Figure 6- 6).

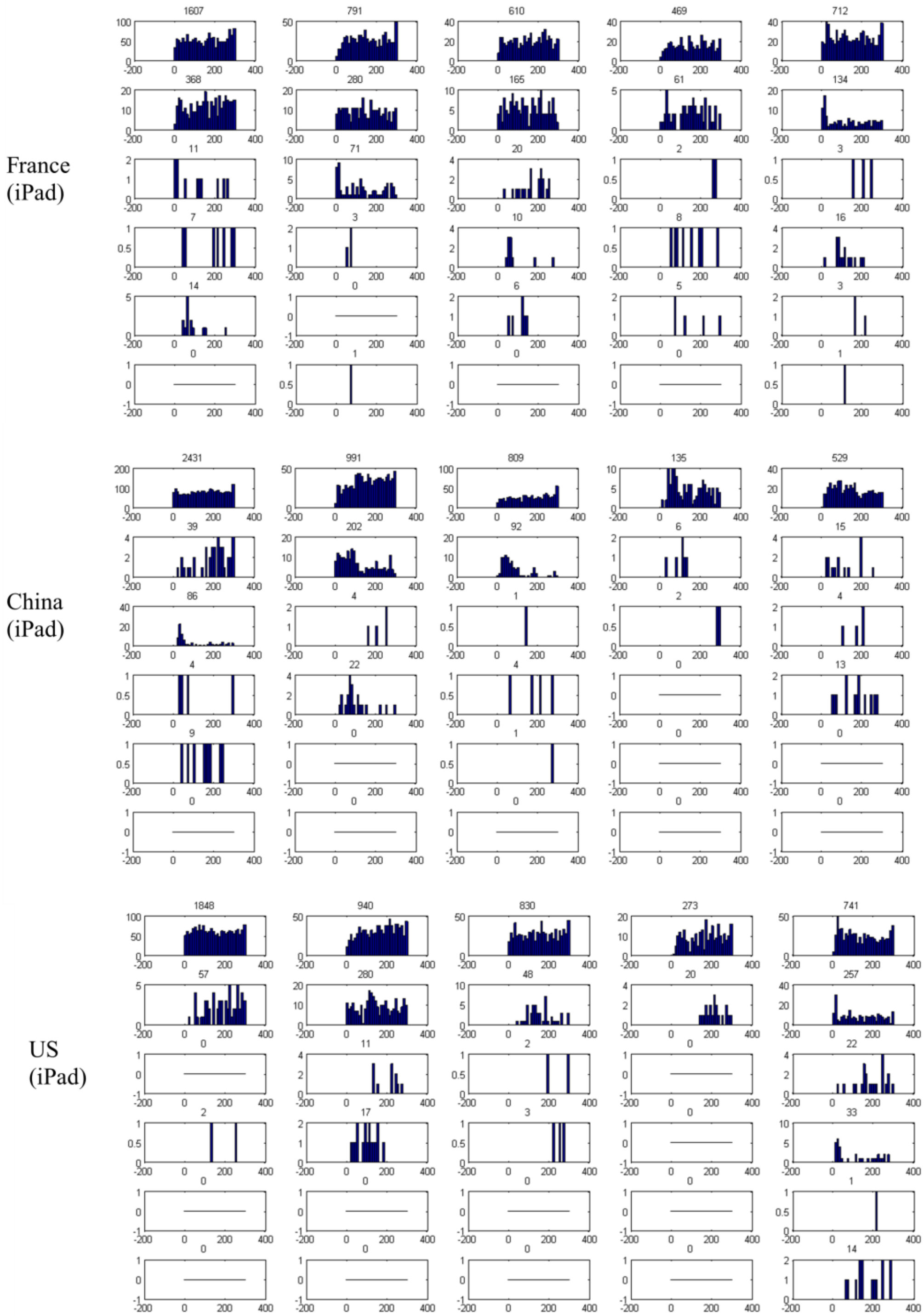

Figure 6- 6 Rank distribution by price in France, China and the US (iPad)

6.2.3.3 Mac paid app rank distribution

Compared to iPhone and iPad, there are more apps priced higher than $9.99 in Mac App Store.

Many apps priced $14.99, $19.99, $24.99 and $29.99 can be found. French users are the ones who download more apps priced more than $14.99 (Figure 6- 7).

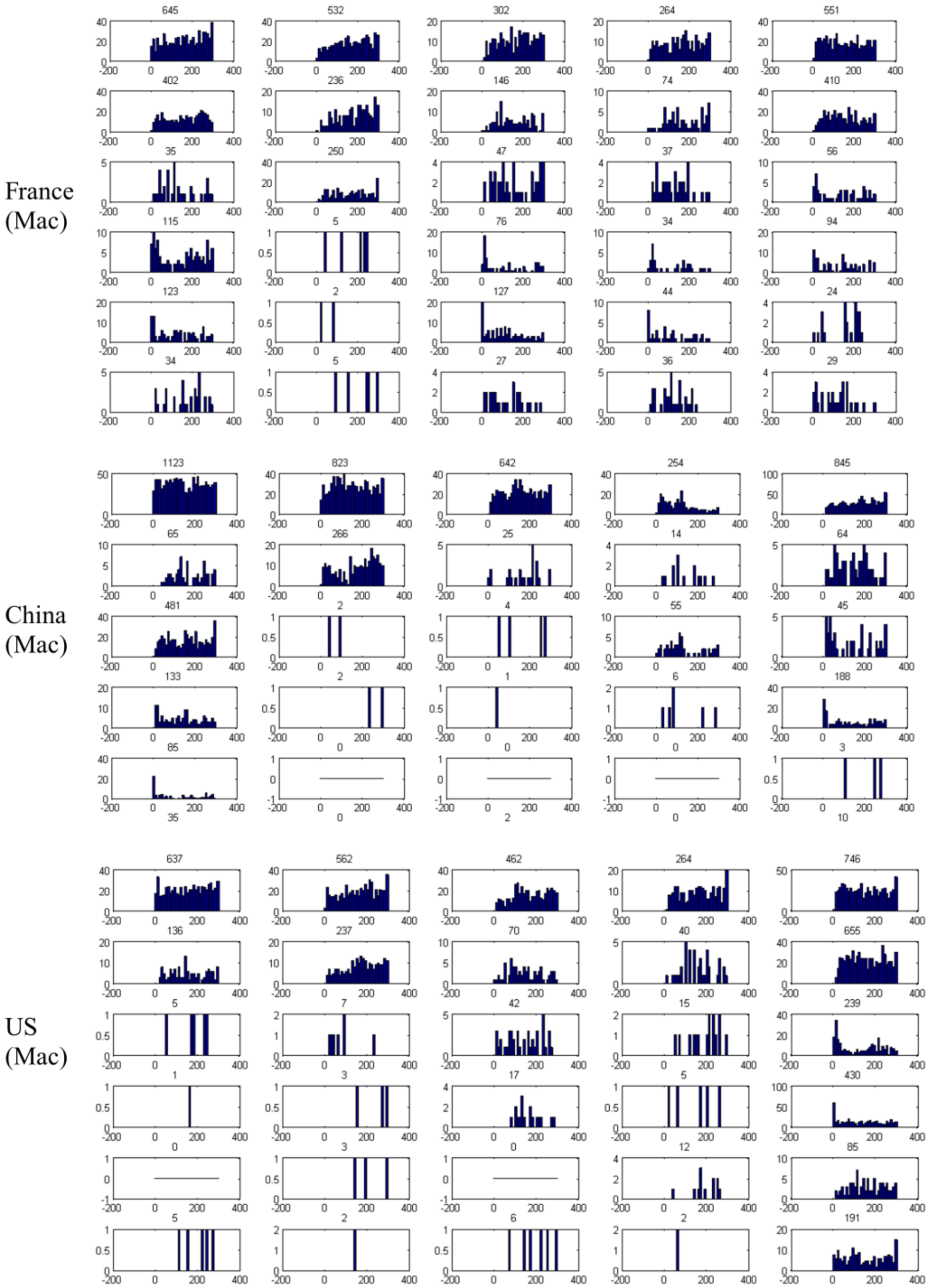

Figure 6- 7 Paid app rank distribution in France, China and the US (Mac)

6.3 Mobile app user price elasticity of demand

6.3.1 Fitting lines and regression equations for mobile app price elasticity of demand in France, China and the US

According to the ranking list from the main App Stores and mobile app analysis report, like Distimo, Flurry, 148apps, the mobile app ranks are classified into 6 ranges: 1-10; 11-20; 21-50; 51-100; 101-200 and 201-300. Rank represents the app downloads number and app popularity. A very downloaded app will get a top rank, meaning that a lot of users like it and download it. Rank is used to describe the app downloads in my data analysis.

In this study, 1, 2, 3, 4, 5 and 6 are taken creatively as the mobile app popularity index and they also correspond separately to the app rank range 1-10; 11-20; 21-50; 51-100; 101-200 and 201-300. Number 1 corresponds to the most popular apps (most downloaded), whereas number 6 corresponds to the least popular ones. App popularity index number has a reverse relation with the number of downloads. App popularity index represents app downloads volume in the following analyses of chapter 6 (Table 6- 3).

Table 6- 3 Mobile app popularity index and rank

Rank	***Popularity index***	***Downloads***
1-10	1	Most
11-20	2	More
21-50	3	More
51-100	4	More
101-200	5	Less
201-300	6	Less

We will analyze the mobile app price elasticity of demand for paid apps and all apps separately.

6.3.1.1 Fitting lines and regression equations for mobile app price elasticity of demand for paid apps

Mobile app price elasticity of demand for paid apps will focus on the tree platforms: iPhone App Stores, iPad App Stores and Mac Stores.

(1) Fitting lines and regression equations for mobile app price elasticity of demand for paid apps in iPhone App Stores

Data analysis gives the average app paid prices for each rank of popularity (iPhone apps) over 18 months in French, Chinese and US Apple App Stores (Table 6- 4).

Table 6- 4 Average paid app price in Apple App Stores (iPhone) from November 2011 to April 2013

Average paid price on iPhone (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	1.5798	1.5885	1.4622
	2	1.8255	1.7232	1.3789
	3	1.9828	2.0689	1.5067
	4	2.7038	2.0527	1.8567
	5	3.0705	2.1917	2.0639
	6	3.1405	1.9344	2.0544

(Source: iPadown)

According to the definition of price elasticity of demand (PED), app price elasticity of demand presents responsiveness of the app download volumes to changes in app prices. In this study, app PED is presented by responsiveness of the app popularity index to changes in app prices.

Though the unary linear regression analysis by Matlab, we can get three fitting lines for average paid app price and popularity index and their correspondent regression equations (Figure 6- 8). Least square method is used in the line fitting process.

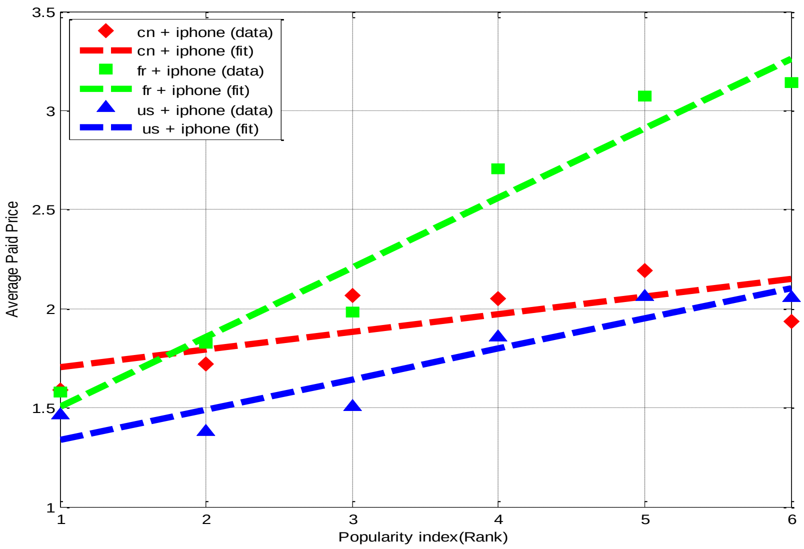

Figure 6- 8 Average paid price and popularity index (Rank) fitting lines in Apple App Stores (iPhone) in France, China and the US.

Assume the slope of the regression line is *a*, mobile app price is *Y*, app popularity index (app downloads) is *X*, price elasticity of demand in mobile app market is:

$$E_d = -1/\boldsymbol{a} \qquad (1)$$

The three regression equations are the following:

Fr + iPhone: Y1 = 0.3503X1+ 1.1579

Cn + iPhone: Y2= 0.0891X2 + 1.6147

Us + iPhone: Y3 = 0.1533X3 + 1.1839

And the three slopes are the following:

$\boldsymbol{a}$ 1=0.3503

$\boldsymbol{a}$ 2=0.0891

$\boldsymbol{a}$ 3=0.1533

From (1) and $\boldsymbol{a}$ 1, $\boldsymbol{a}$ 2, $\boldsymbol{a}$ 3, we can get the mobile app price elasticity of demand E_d in France, China and the US.

$$E_{d1} = -\ 1/0.3503= -2.85$$

$$E_{d2} = -1/0.0891= -11.22$$

$$E_{d3} = -1/0.1533= -6.52$$

According to the interpreting values of price elasticity of demands from Table 6- 5, we take the absolute value for E_{d1}, E_{d2} and E_{d3}.

Table 6- 5 Interpreting values of price elasticity of demands

Value	***Descriptive Terms***
$E_d = 0$	Perfectly inelastic demand
$-1 < E_d < 0$	Inelastic or relatively inelastic demand
$E_d = -1$	Unit elastic, unit elasticity, unitary elasticity, or unitarily elastic demand
$-\infty < E_d < -1$	Elastic or relatively elastic demand
$E_d = -\infty$	Perfectly elastic demand

(Source: wikipedia)

$|E_{d2}| > |E_{d3}| > |E_{d1}|$, That means price elasticity of demand for iPhone paid apps in China is the greatest. Then come the US. Price elasticity of demand for paid apps is the smallest in France.

In order to give a more intuitive and clearest look of mobile app price elasticity of demand, we reversed the horizontal axis and vertical axis of Figure 6- 8. Average paid price was taken as the independent variable and popularity index as the dependent variable, which give a new figure (Figure 6- 9).

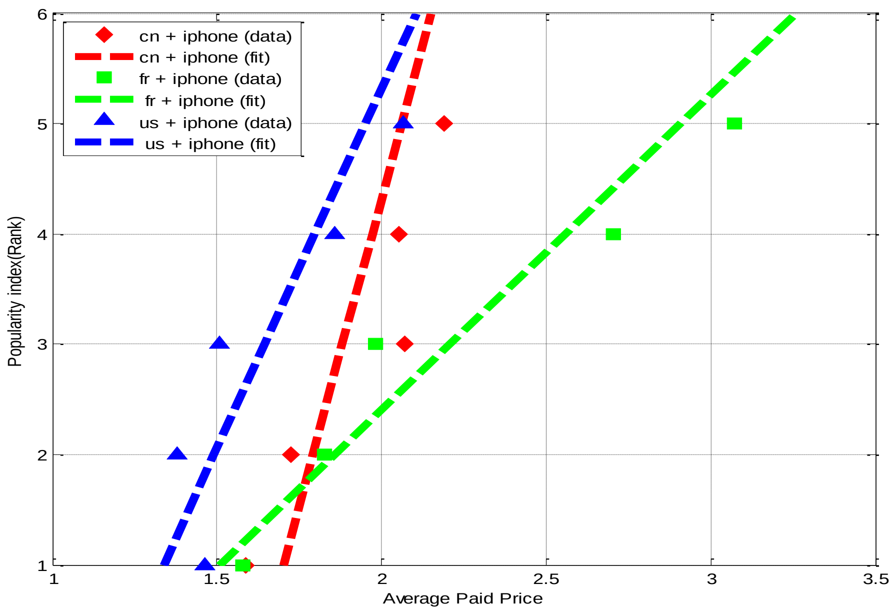

Figure 6- 9 Popularity index (Rank) and average paid price fitting line in Apple App Stores (iPhone) in France, China and the US

(2) Fitting lines and regression equations for mobile app price elasticity of demand for paid apps in iPad App Stores

Data analysis gives the average app paid prices for each rank of popularity (iPad) over 18 months in French, Chinese and US Apple App Stores (Table 6- 6).

Table 6- 6 Average paid app prices in Apple App store (iPad) from November 2011 to April 2013

Average paid price on iPad (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	4.6374	1.9859	3.2233
	2	4.3308	2.1865	4.5844
	3	3.8411	3.6639	3.4233
	4	4.1834	3.0491	3.1800
	5	4.0825	2.4437	3.4567
	6	3.9348	2.3696	3.3706

(Source: iPadown)

The three regression equations for iPad paid apps are the following：

Fr+ iPad: Y1= - 0.1119X1 + 4.5599

Cn + iPad: Y2 = 0.0593X2+ 2.4089

Us + iPad: Y3 = - 0.0826X3 + 3.8288

Mobile app price elasticity of demand E_d for iPad paid apps in France, China and the US are the following:

E_{d1} = -1/- 0.1119= 8.94

E_{d2} = - 1/0.0593= -16.86

$$E_{d3} = -1/-0.0826 = 12.11$$

$|E_{d2}| > |E_{d3}| > |E_{d1}|$, That means price elasticity of demand for iPad paid apps is the greatest in China, then in the US. Price elasticity of demand for iPad paid apps is the smallest in France. These results coincide the ones obtained with iPhone apps (Figure 6- 10, Figure 6- 11).

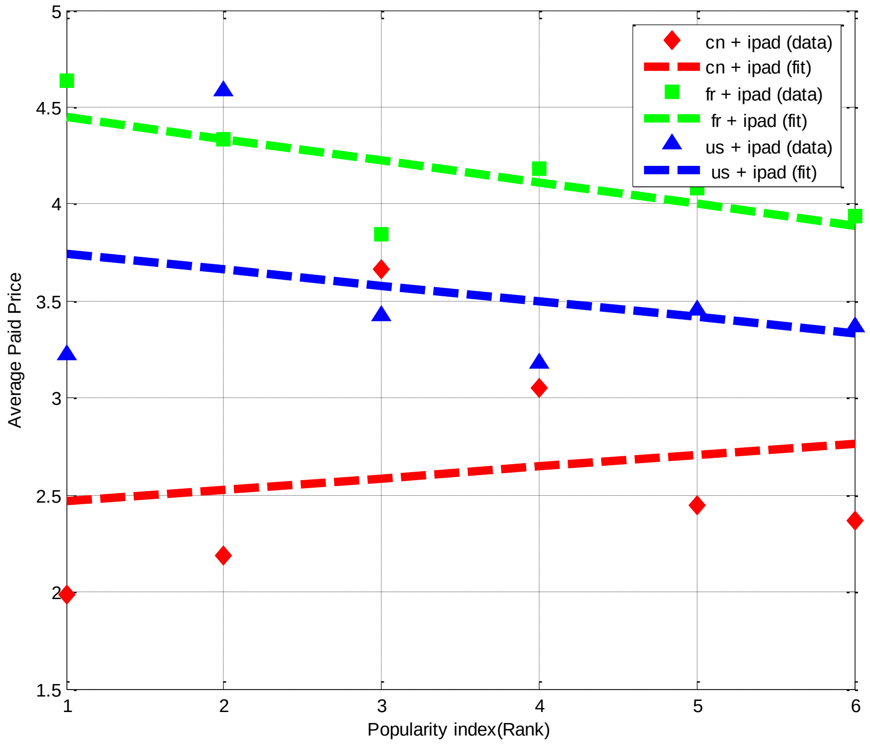

Figure 6- 10 Average paid price and popularity index (Rank) fitting lines in Apple App store (iPad) in France, China and the US

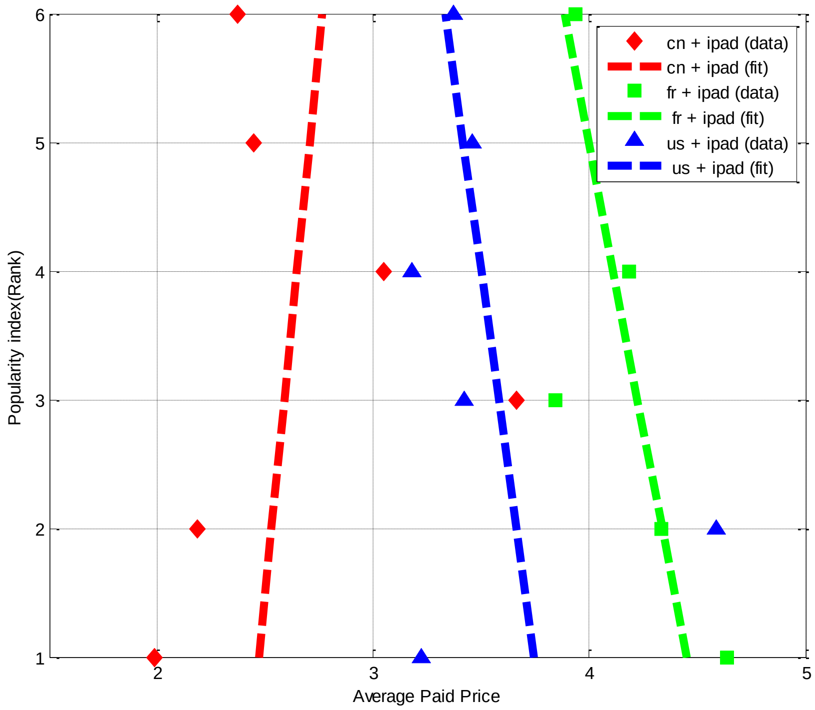

Figure 6- 11 App popularity index (Rank) and average paid price fitting lines in Apple App store (iPad) in France, China and the US

(3) Fitting lines and regression equations for mobile app price elasticity of demand for paid apps in Mac app Stores

Data analysis gives the average app paid prices for each rank of popularity (Mac) over 18 months in French, Chinese and us Apple App Stores (Table 6- 7).

Table 6- 7 Average paid app price in Mac App Stores from November 2011 to April 2013

Average paid price on Mac (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	15.5186	10.0024	13.1956
	2	34.6534	10.3683	39.4567
	3	24.7979	7.9835	22.3252
	4	14.0014	6.2872	15.5678
	5	12.3537	6.5704	11.5566
	6			

Average paid price on Mac (US $)	Country		
	France (fr)	***China (cn)***	***US (us)***
	11.8756	8.4914	12.3489

(Source: iPadown)

The three regression equations for Mac paid apps are the following：

$$\text{Fr+ Mac : } Y1= - 2.7403X1 + 28.4579$$

$$\text{Cn + Mac: } Y2 =- 0.5899X2+ 10.3484$$

$$\text{Us +Mac: } Y3 = -2.7060X3 + 28.5450$$

Mobile app price elasticity of demand E_d for Mac paid apps in France, China and the US are the following:

$$E_{d1} = -1/- 2.7403= 0.36$$

$$E_{d2} = - 1/- 0.5899= 1.70$$

$$E_{d3} = -1/- 2.7060= 0.37$$

$|E_{d2}| > |E_{d3}| > |E_{d1}|$, That means price elasticity of demand for Mac paid apps is the greatest in China, and then in the US. Price elasticity of demand for Mac paid apps is the smallest in France. These results also coincide with the ones obtained with iPhone apps (Figure 6- 12, Figure 6- 13).

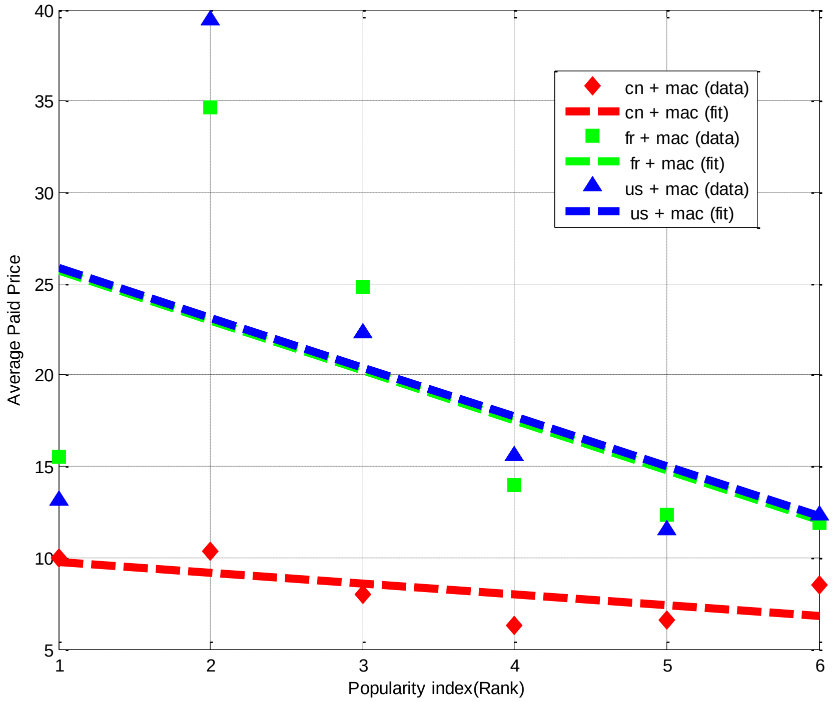

Figure 6- 12 Average paid price and popularity index (Rank) fitting lines in Apple App Stores (Mac) in France, China and the US

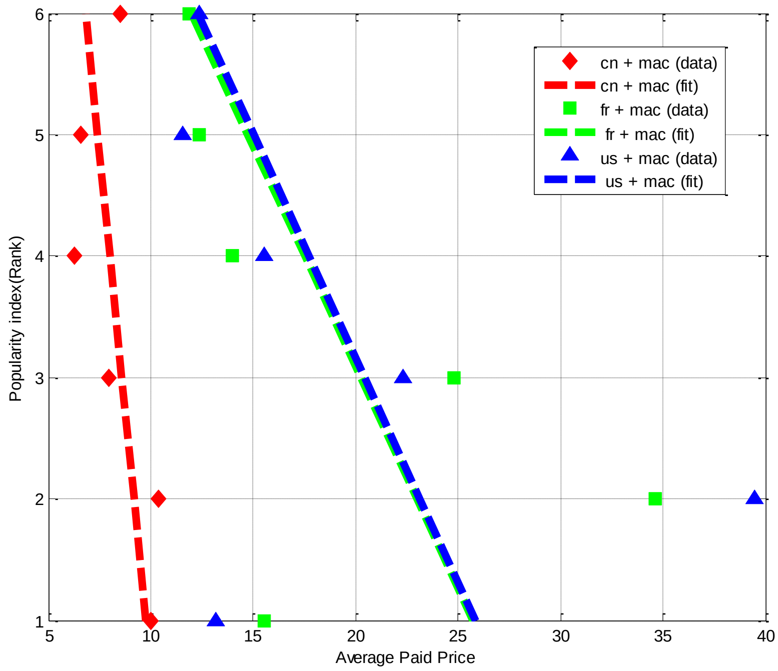

Figure 6- 13 App popularity index (Rank) and average paid price fitting lines in Apple App Stores (Mac) in France, China and the US

6.3.1.2 Fitting lines and regression equations for mobile app price elasticity of demand for all apps

Mobile app price elasticity of demand for all apps will focus on iPhone App Stores, iPad App Stores and Mac Stores. Average app prices include both the free and paid apps.

(1) Fitting lines and regression equations for mobile app price elasticity of demand for all iPhone apps in App Stores

Data analysis gives average app prices for each rank of popularity (all iPhone apps) over 18 months in French, Chinese and US Apple App Stores (Table 6- 8).

Table 6- 8 Average app prices in Apple App Stores (all iPhone apps) from November 2011 to April 2013

Average price for all iPhone apps (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	0.7899	0.7942	0.7311
	2	0.9128	0.8616	0.6894
	3	0.9914	1.0344	0.7533
	4	1.3519	1.0263	0.9283
	5	1.5352	1.0959	1.0319
	6	1.5702	0.9672	1.0272

(Source: iPadown)

The three regression equations for all iPhone apps are the following：

Fr+ iPhone: Y1= 0.1751X1 + 0.5789

Cn + iPhone: Y2 = 0.0446X2+ 0.8073

Us + iPhone: Y3 = 0.0767X3 + 0.5919

Mobile app price elasticity of demand E_d for all iPhone apps on in France, China and the US are the following:

$$E_{d1} = -1/0.1751= -5.71$$

$$E_{d2} = - 1/0.0446= - 22.42$$

$$E_{d3} = -1/0.0767=- 13.04$$

$|E_{d2}|>|E_{d3}|>|E_{d1}|$, That means price elasticity of demand for all iPhone apps is the greatest in China, then in the US. Price elasticity of demand for all iPhone apps is the smallest in France (Figure 6- 16, Figure 6- 17).

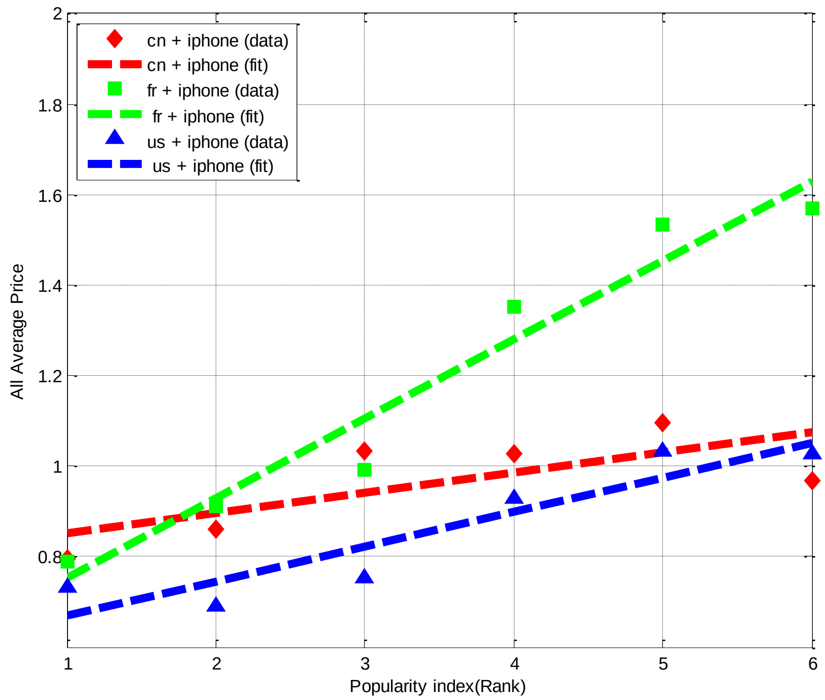

Figure 6- 14 Average prices and popularity index (Rank) fitting lines in Apple App Stores (all iPhone apps) in France, China and the US

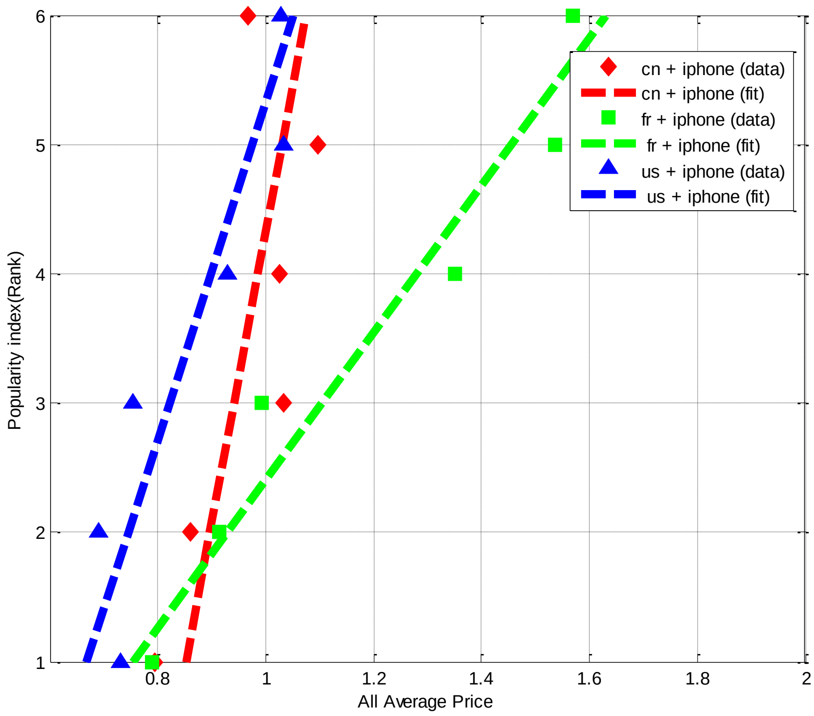

Figure 6- 15 App popularity index (Rank) and average prices fitting lines in Apple App Stores (all iPhone apps) in France, China and the US

(2) Fitting lines and regression equations for mobile app price elasticity of demand for all iPad apps App Stores

Data analysis gives average app prices for each rank of popularity (all iPad apps) over 18 months in French, Chinese and US Apple App Stores (Table 6- 9).

Table 6- 9 Average app prices in Apple App Stores (all iPad apps) from November 2011 to April 2013

Average price for all iPad apps (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	2.3187	1.0481	1.6117
	2	2.1654	1.1540	2.2922
	3	1.9205	1.9337	1.7117
	4	2.0917	1.6092	1.5900
	5	2.0412	1.2897	1.7283
	6	1.9674	1.2506	1.6853

(Source: iPadown)

The three regression equations for all iPad apps are the following:

$$\text{Fr+ iPad: } Y1= -0.0559X1 + 2.2799$$

$$\text{Cn + iPad: } Y2 = 0.0313X2+ 1.2714$$

$$\text{Us + iPad: } Y3 = -0.0413X3 + 1.9144$$

Mobile app price elasticity of demand E_d for all iPad apps in France, China and the US are the following:

$$E_{d1} = -1/-0.0559 = 17.89$$

$$E_{d2} = -1/0.0313 = -31.95$$

$$E_{d3} = -1/-0.0413 = 24.21$$

$|E_{d2}| > |E_{d3}| > |E_{d1}|$, that means price elasticity of demand for all iPad apps is the greatest in China, then in the US. Price elasticity of demand for all iPad apps is the smallest in France.
All average price elastic of demand for mobile apps are greater than paid average price elasticity of demand because of the high number of free apps (Figure 6- 16, Figure 6- 17).

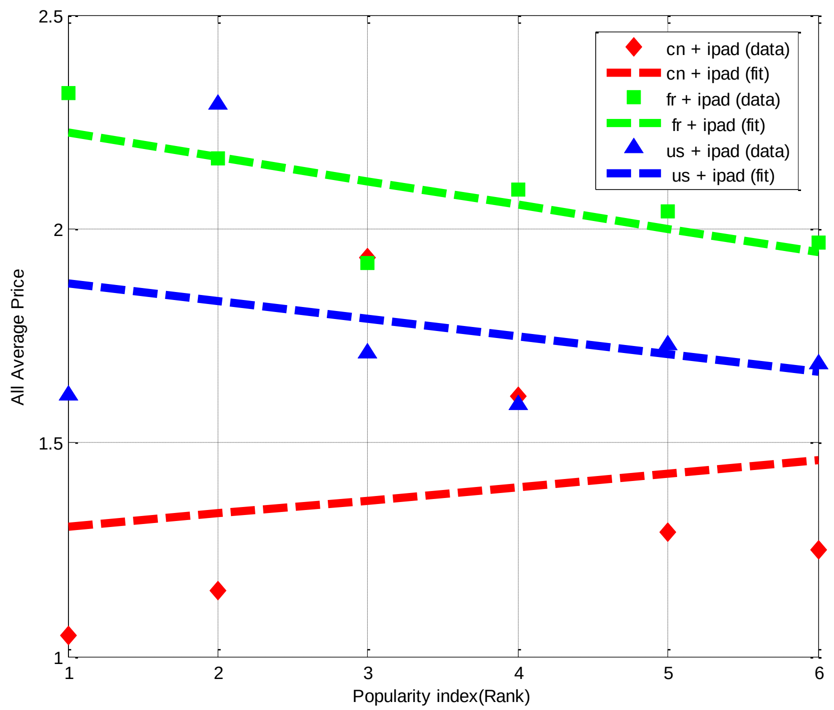

Figure 6- 16 Average prices and popularity index (Rank) fitting lines in Apple App Stores (all iPad apps) in France, China and the US

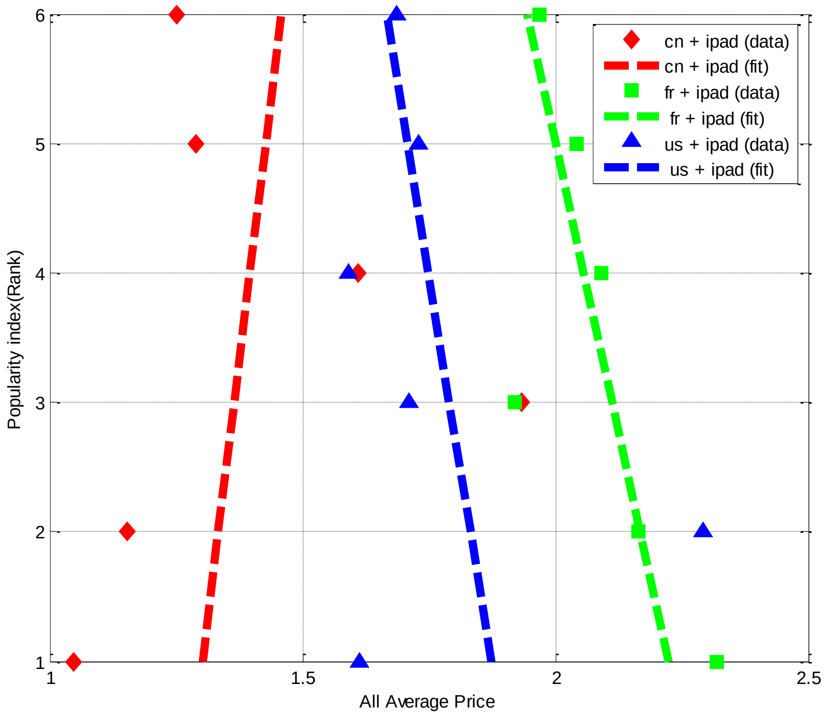

Figure 6- 17 App popularity index (Rank) and average prices fitting lines in Apple App Stores (all iPad apps) in France, China and the US

(3) Fitting lines and regression equations for mobile app price elasticity of demand for all apps in Mac App Stores

Data analysis gives the average app prices on each rank of popularity (all Mac apps) over 18 months in French, Chinese and US Apple App Stores (Table 6- 10).

Table 6- 10 Average Mac app prices from November 2011 to April 2013

Average prices for all Mac apps (US $)		**Country**		
		France (fr)	***China (cn)***	***US (us)***
Popularity Index (Rank)	1	7.7593	5.0012	6.5978
	2	17.3267	5.1841	19.7283
	3	12.3989	3.9917	11.1626
	4	6.9968	3.1436	7.7839
	5	6.1734	3.2852	5.7753
	6	5.9378	4.2457	6.1744

(Source: iPadown)

The three regression equations for all Mac apps are the following:

Fr+ Mac: $Y1= - 1.3706X1 + 14.2291$

Cn +Mac: $Y2 =- 0.2949 X2+ 5.1742$

Us + Mac: $Y3 = - 1.3530X3 + 14.2725$

Mobile app price elasticity of demand E_d for all Mac apps in France, China and the US are the following:

$$E_{d1} = -1/ -1.3706= 0.73$$

$$E_{d2} = -\ 1/- 0.2949= 3.39$$

$$E_{d3} = -1/ -\ 1.3530= 0.74$$

$|E_{d2}| > |E_{d3}| > |E_{d1}|$, that means price elasticity of demand for all Mac apps is the greatest in China, then in the US. Price elasticity of demand for all Mac apps is the smallest in France.

Average price elasticity of demand is greater for all mobile apps than for paid apps because of the high number of free apps (Figure 6- 18, Figure 6- 19).

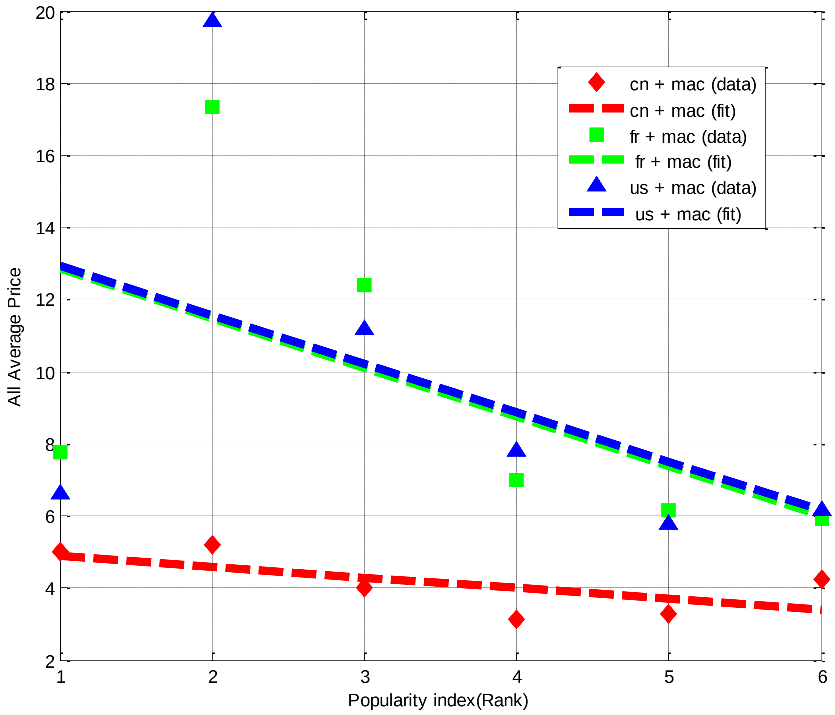

Figure 6- 18 Average prices and popularity index (Rank) fitting lines in Apple App Stores (all Mac apps) in France, China and the US

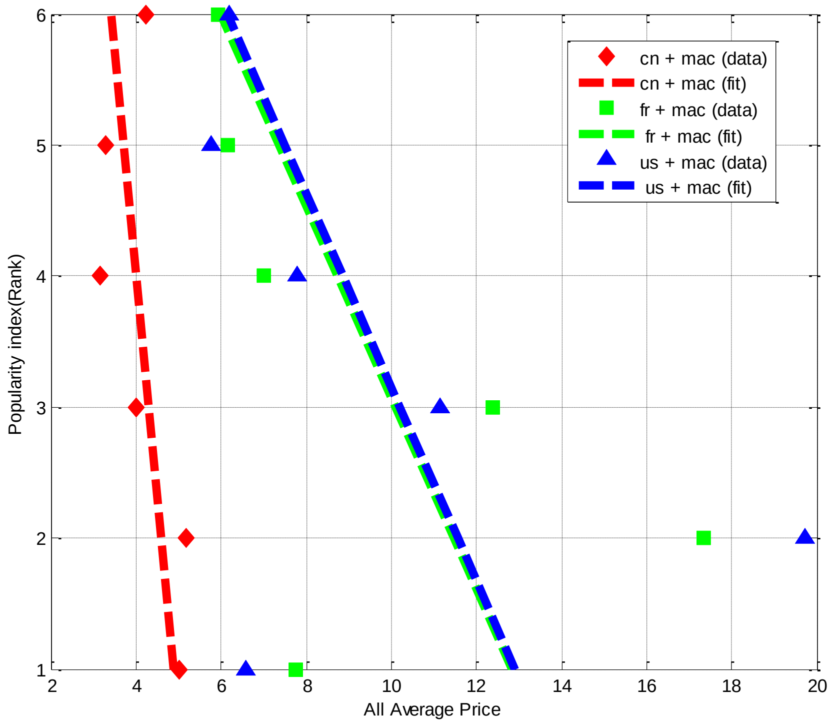

Figure 6- 19 App popularity index (Rank) and average price fitting lines in Apple App Stores (all Mac apps) in France, China and the US

6.3.1.3 Conclusions

6.3.1.4 Mobile app user's price elasticity of demand in France, China and the US

For both paid apps and all apps, China offers the greatest price elasticity of demand in Apple App Stores, whatever the platform (iPhone, iPad and Mac). The US come next. France offers the lowest price elasticity of demand.

This reveals that Chinese mobile app users are more sensitive to the price of apps than French users. In China, mobile app popularity index (Rank) plummets when the app price increases. In Apple App Stores, French app users are willing to pay more (expensive) than Chinese and US users.

Among the three devices, iPad apps are the ones which offer the greatest price elasticity of demand in Apple App Stores, then come iPhone apps and lastly Mac apps.

6.3.1.5 Mobile app price in France, China and the US

Regarding iPhone apps, average prices (considering only paid apps or all apps) are lower in China than in France but higher than in the US.

Regarding iPad and Mac apps, average prices (considering only paid apps or all apps) are the lowest in China and the highest in France. US app prices come in-between.

The following is the main reason why iPhone paid app average prices and all iPhone apps average prices are higher in China than in the US.

iPhone is the dominant iOS device for mobile app downloads. Here iOS devices mainly include iPhone and iPad. iPod Touch is not considered because of its low penetration. In 2012, iPhone unit sales accounted for 68% of iOS device sales and iPad for 32%. iPhone is the main app carrier device for Apple, and it's got a high penetration in China.

Chinese users like to hold the famous brand products to show their social status. And they can accept to pay more for the famous brand. Apple is the famous mobile device brand in China. iPhone from Apple is extremely popular. Apps sold in Apple App Stores are complementary items for iPhone. Therefore, Chinese users who purchase iPhone devices tend to accept to pay little more expensive apps.

Apple App Stores have adopted new app pricing tiers in July 2013. From 99 cents in the US and 6 yuan in China, apps prices have come to $1.30 and 8 yuan. Chinese app users have to pay more for the same app. In Europe, base app prices also increased to € 0.99 from €0.89. But it is still under €1.

Comparing the average prices for paid apps and all apps on iPhone in France, China and the US in Table 6- 4 and Table 6- 8, it is lower in China than in France except the slight abnormity for popularity index 1 and 3. Chinese app users tend to accept to pay a little more for apps in ranks 1-10 and 21-50.

6.3.2 Fitting curved surface for price, app popularity index (rank) and time

Using the data of paid app average prices and all app average prices, popularity index (rank) and time (18 months), we can present the following fitting curved surfaces for iPhone, iPad and Mac platforms in China, France and the US.

Axis X is popularity index (rank), Y is time and Z is average paid price.

6.3.2.1 Average paid app price vs. popularity index (rank) vs. time fitting curved surface

Figure 6- 20 shows the fitting curved surface of iPhone app popularity index (rank) vs. time vs. average paid app price in France, China, and the US .

Chinese iPhone users would accept to pay for apps with popularity index 1 (rank 1-10) and 3 (rank 21-50). Fitting curved surface is more inclined in China and Chinese iPhone users have highest price elasticity of demand. French iPhone users have lowest price elasticity of demand. In France and in the US, average iPhone paid app price grows with time. Users use to download paid apps gradually.

Figure 6- 21 shows the fitting curved surface of iPad app popularity index (rank) vs. time vs. average paid app price in France, China, and the US . Price elasticity of demand for iPad app users is also the highest in China. Average iPad paid app price decreases with time in the US. Average iPad paid app price increases slightly with time in France and in China.

Figure 6- 22 shows the fitting curved surface of Mac app popularity index (rank) vs. time vs. average paid app price in France, China, and the US . Price elasticity of demand for Mac app users is the highest in China. Average Mac paid app price decreases with time in China. Average Mac paid app price is higher in the second half of year 2012 in France and in the US.

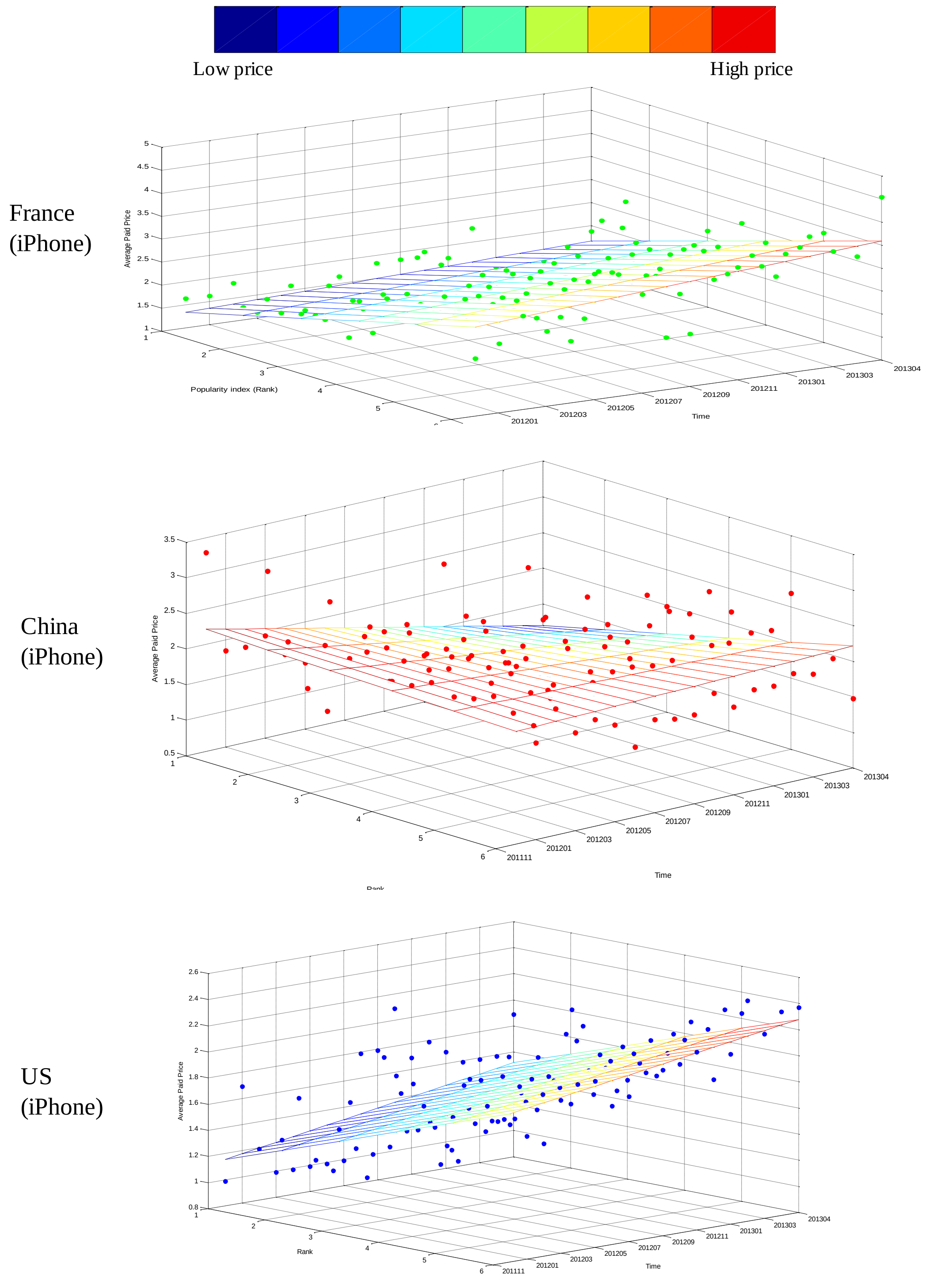

Figure 6- 20 iPhone app popularity index (rank) vs. time vs. average paid app price in France, China and the US

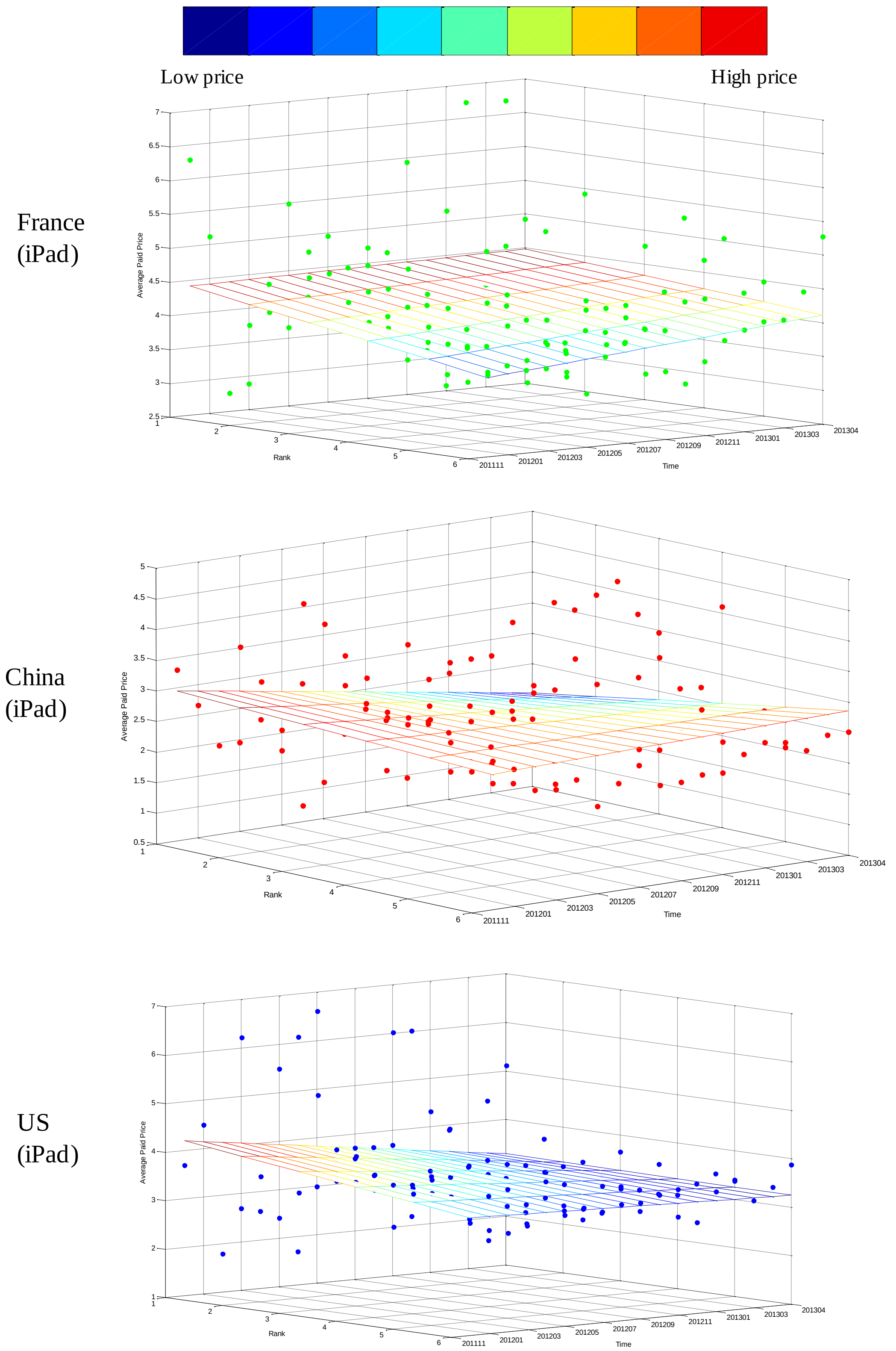

Figure 6- 21 iPad app popularity index (rank) vs. time vs. average paid app price in France, China and the US

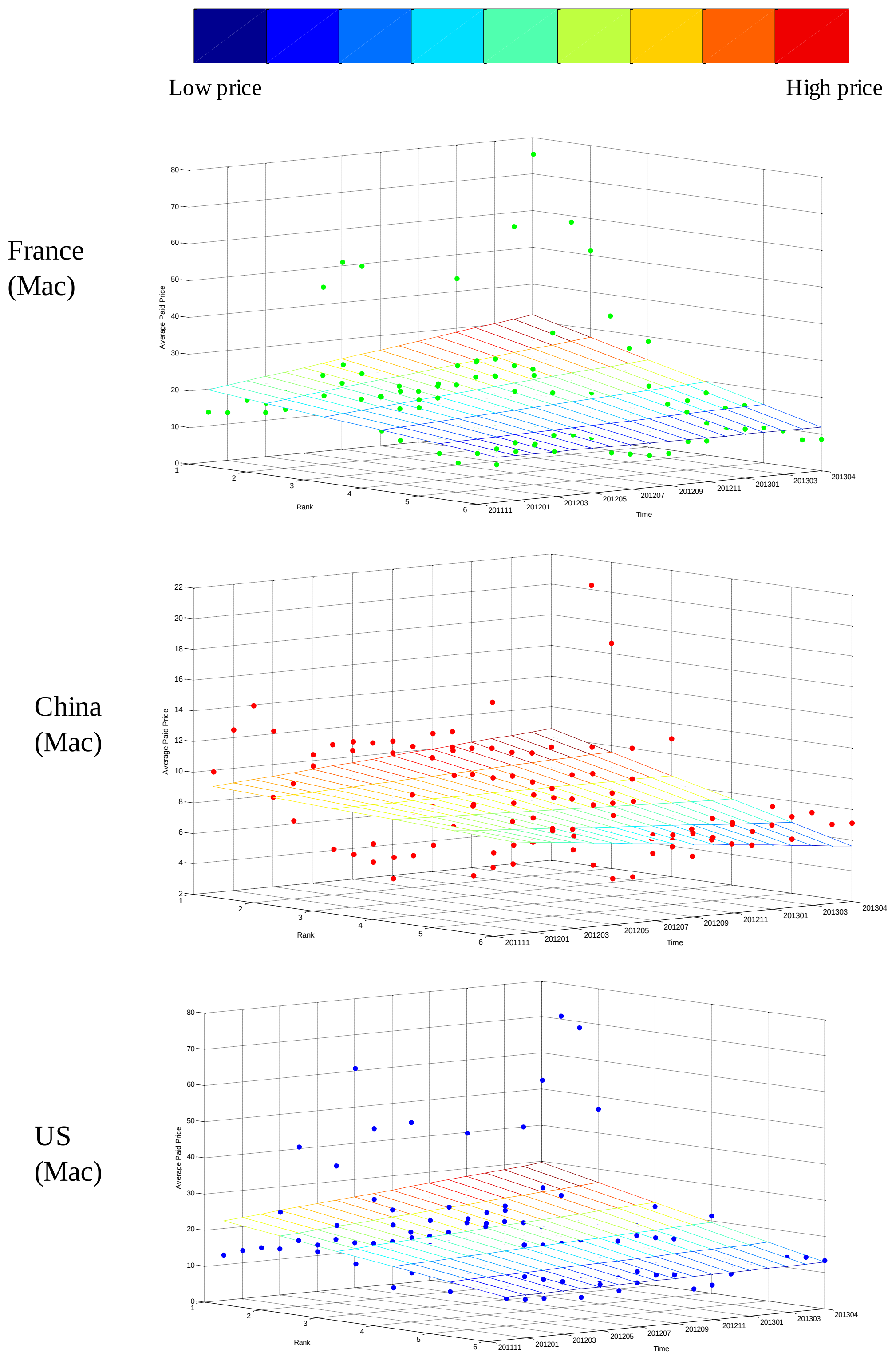

Figure 6- 22 Mac app popularity index (rank) vs. time vs. average paid app price in France, China and the US

6.3.2.2 Average price of all apps vs. popularity index (rank) vs. time fitting curved surface

The following analysis deals with the average price of all apps, i.e. the average price of free and paid apps for the different devices in the three countries. Generally speaking, the average price of all apps is lower than average paid app price.

Figure 6- 23) presents the fitting curved surface of iPhone app popularity index (rank) vs. time vs. the average price of all app in France, China, and the US. In France and the US, the average price of all iPhone app grows with time.

Figure 6- 24 presents the fitting curved surface of the average price of all iPad apps vs. popularity index (rank) vs. time in France, China, and the US. The average price off all iPad apps decreases with time in the US. The average price of all iPad apps increases slightly with time in France and in China.

Figure 6- 25 shows the fitting curved surface of average price of Mac apps vs. popularity index (rank) vs. time in France, China, and the US. The average price of all Mac apps decreases with time in China.

Chinese app users have highest price elasticity of demand for iPhone, iPad and Mac, followed by US app users. French app users have the lowest price elasticity of demand.

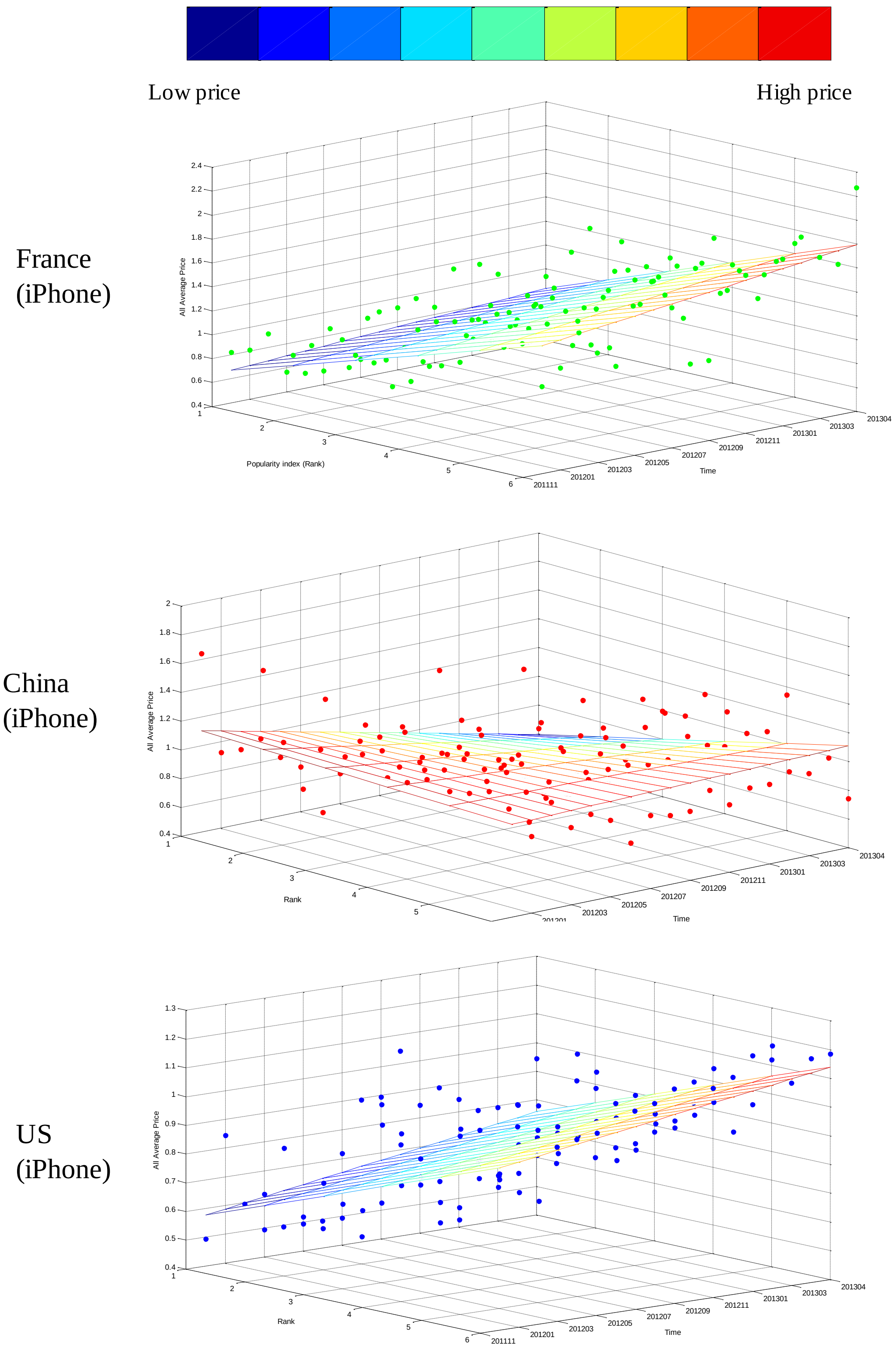

Figure 6- 23 App popularity index (rank) vs. time vs. average price of all iPhone apps fitting

curved surface in France, China, and the US

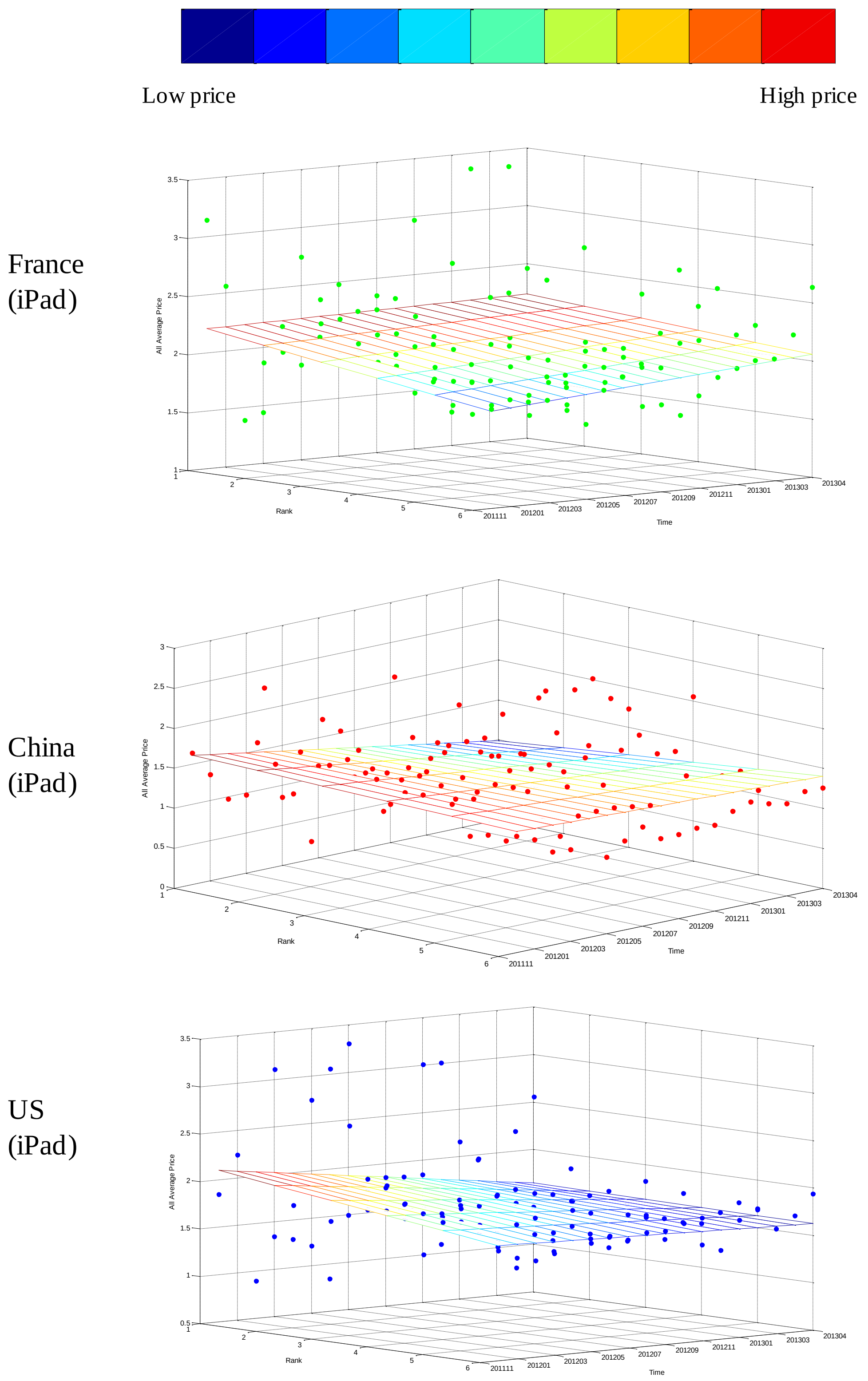

Figure 6- 24 App popularity index (rank) vs. time vs. average price of all iPad apps fitting curved surface in France, China, and the US

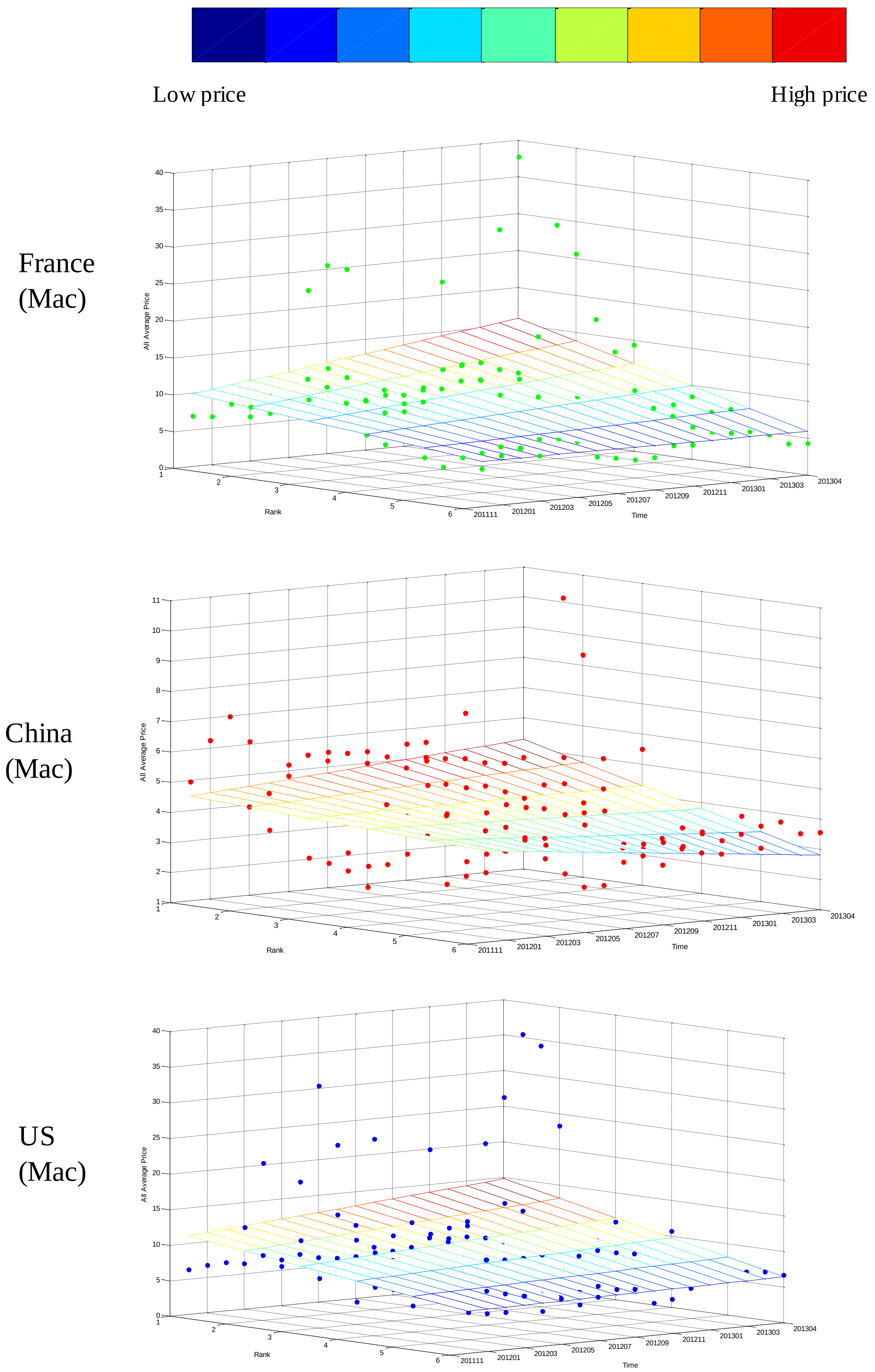

Figure 6- 25 App popularity index (rank) vs. time vs. average price of all Mac apps fitting curved surface in France, China, and the US

6.4 Rank and category

We analyze the popularity index (rank) distribution for each app category (see Table 6- 2 for the different app categories).

In France, China and the US, more than 50% of free iPhone apps in popularity index 1 (rank 1-10) belong to the category Games. In France, more than 10% of Entertainment apps are in popularity index 4 (rank 51-100) - popularity index 3 (rank 21-50) in China and popularity index 5 (rank 101-200) in the US. In France, Utilities apps are often in popularity index 4, whereas they often belong to popularity index 1 in China. In France, China and the US, Life style apps belong respectively to popularity indexes 5, 4 and 4 (Figure 6- 26).

In the three countries, more than 50% of iPhone paid apps in popularity index 1 belong to the Games category. Entertainment apps are usually in popularity indexes 5 (France), 6 (China) and 4 (the US). Utilities apps are usually in popularity indexes 5 (France and the US) and 2 (China). Life style apps are usually in popularity indexes 4 (France), 5 (China) and 6 (the US). News apps are usually in popularity indexes 3 (France), 2 (China and the US). Weather apps are usually in popularity indexes 4 (France), 2 (China) and 1 (the US).

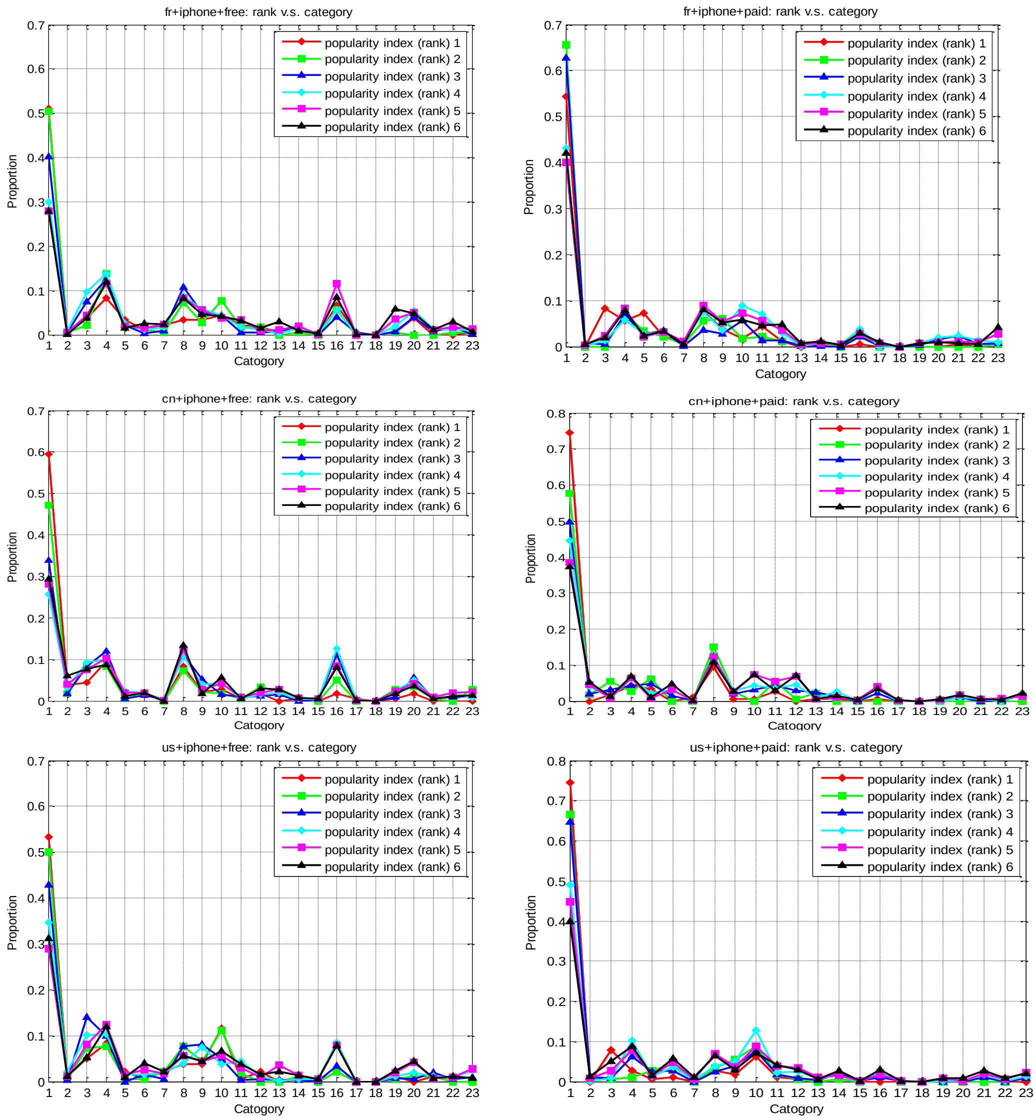

Figure 6- 26 iPhone app popularity (rank) vs. category in France, China and the US

In the three countries, more than 45% of free iPad apps in popularity index 1 belong to the category of Games. This part exceeds 60% in China. Entertainment apps are usually in popularity indexes 2 (France and the US) and 3 (China). Utilities apps are usually in popularity indexes 2 (France), 5 (China) and 4 (the US). Life style apps are usually in popularity indexes 6 (France and the US) and 5 (China). Free Utilities apps in France are popular (Figure 6- 27).

In the three countries, more than 60% of iPad apps in popularity index 1 belong to the category of Games. In China, this part ascends to 80%. Entertainment apps are usually in popularity index 3 (France), 5 (China) and 6 (the US). Utilities apps are usually in popularity index 6 (France), 5 (China) and 4 (the US). Life style apps are usually in popularity index 5 (France and the US) and 6 (China). Productivity apps are usually in popularity index 1 (France), 3 (China) and 2 (the US). Education apps are usually in popularity index 5 (France and China) and 6 (US). Paid Productivity apps in France are welcomed.

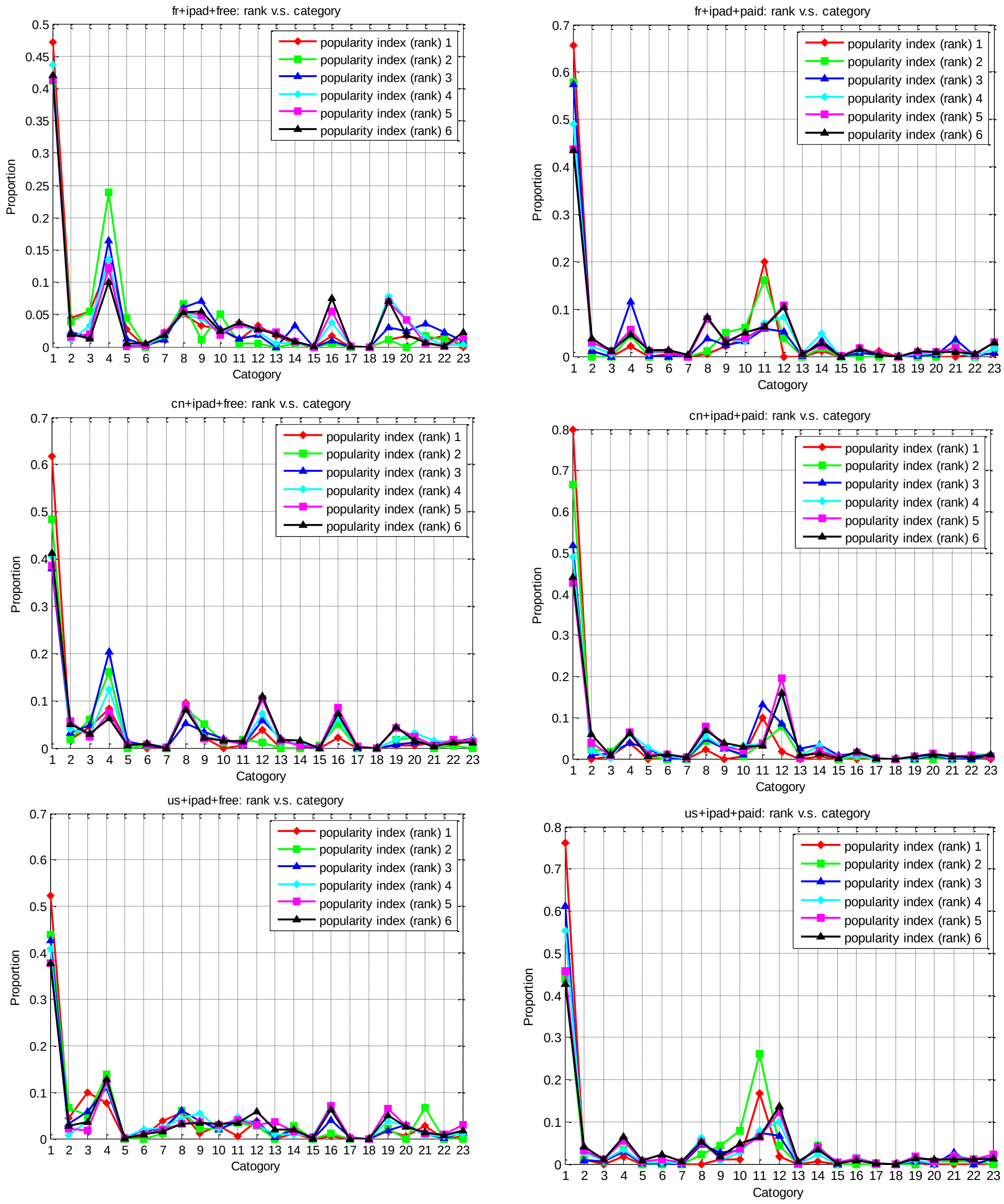

Figure 6- 27 iPad app popularity (rank) vs. category in France, China and the US

In the three countries,, more than 40% of free Mac apps in popularity index 1 belong to the category of Games. Games apps are usually in popularity indexes 5 (France) and 6 (China and the US). Entertainment apps are usually in popularity indexes 2 (France), 1 (China) and 5 (the US). Utilities apps are usually in popularity indexes 1 (France), 4 (China) and 2 (the US). Life style apps are usually in popularity indexes 2 (France) and 3 (China and the US). Productivity apps are usually in popularity indexes 2 (France and China) and 1 (the US). In the three countries, Social networking apps are usually in popularity index 1. Free Entertainment apps are not as popular in the US as they are in China (Figure 6- 28).

In the three countries, more than 40% of paid Mac apps in popularity index 1 belong to the category of Games. Games apps are usually in popularity indexes 2 (France and the US) and 5

(China). Entertainment apps are usually in popularity indexes 3 (France), 1 (China) and 5 (the US). Utilities apps are usually in popularity indexes 4 (France), 2 (China) and 5 (the US). Life style apps are usually in popularity indexes 5 (France), 2 (China) and 4 (the US). In the three countries, Productivity and Social networking apps are usually in popularity index 1. Mac paid apps belonging to the category of Games are not popular in China. Paid Entertainment apps are not so popular in the US.

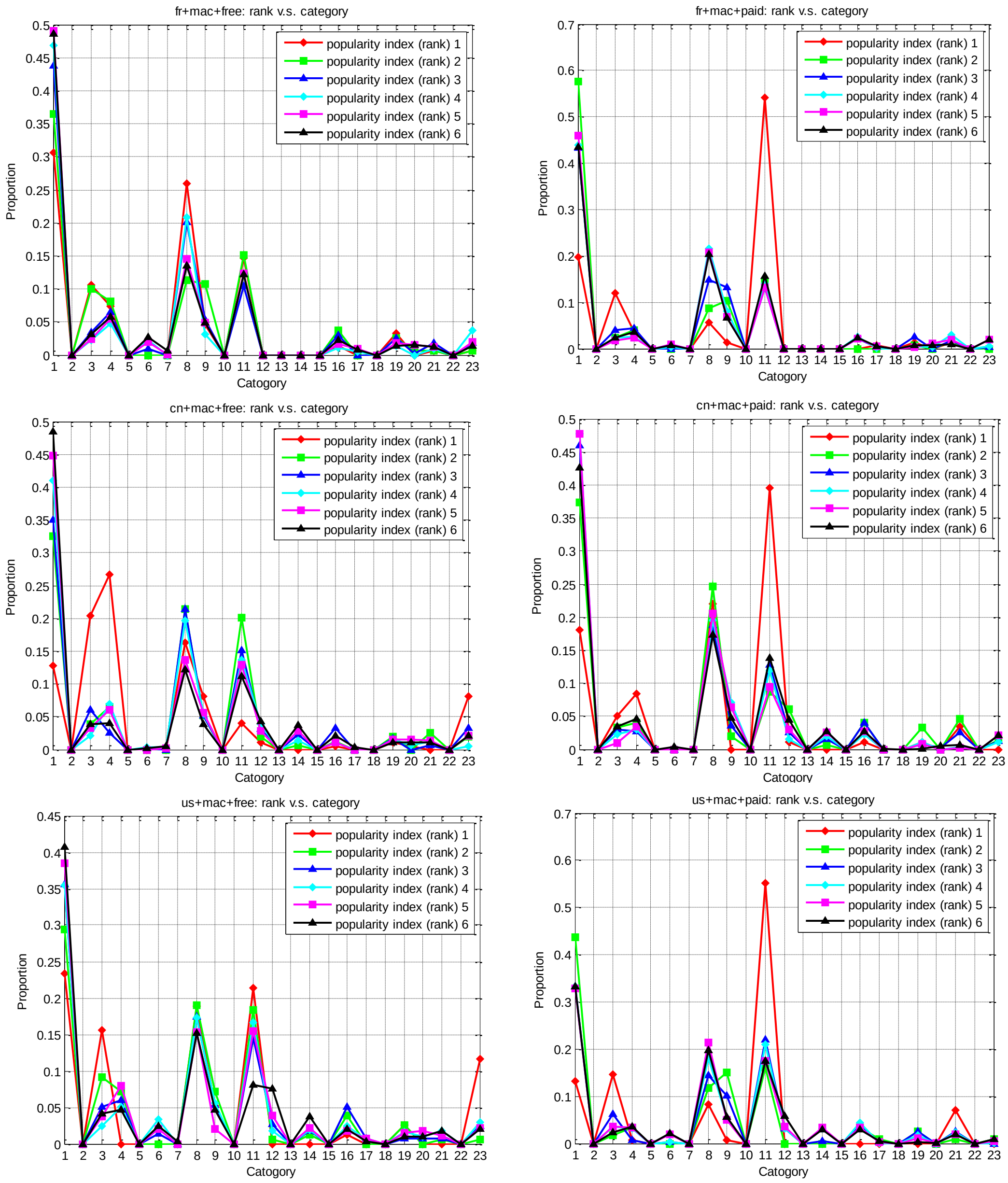

Figure 6- 28 Mac app popularity (rank) vs. category in France, China and the US

6.5 Mobile app lifetime

Data is from November 2011 to April 2013, 18 months in total. To obtain apps lifetime, we calculated the periods (number of months) during which apps stayed in the top 300 ranking list. These periods are not continuous. For exemple, an app was out of top 300 for 5 months, and it was defined to have a life time of 13 months. An app with long lifetime means that it had been continuously downloaded by app users with a high popularity.

Mobile app lifetime is analyzed by app popularity index (rank) and then by app category.

6.5.1 Mobile app lifetime by app popularity index (rank)

Life time for an app was repeatly counted into different popularity indexes in this analysis. If an app with 18 months lifetime was in popularity index 1 during the first 5 months and then dropped to popularity index 5 for the rest of the time, this app's lifetime was included in both popularity index 1 and 5.

For both free and paid apps, app lifetime usually decreases from popularity index 4. App life time is the longest in the US ; then comes France and lastly China. Paid apps' lifetime is longer than free apps' one. Mac apps' lifetime is longer than the ones of iPhone and iPad apps.

6.5.1.1 iPhone free and paid app lifetime

For iPhone free apps, app lifetime is the longest in the US[307]. App lifetime is shortest in China. For apps in popularity index 1, lifetime in the US is 7.83 months, 4 months in France and 2 months in China. Apps in China are quickly replaced because of the intense competition in mobile app market (Figure 6- 29). For apps in popularity index 3, lifetime in the US is 12.2 months, 10.8 months in France and 4.68 months in China. For apps in popularity index 6, lifetime in the US is 8.09 months, 9.06 months in France and 8.82 months in China.

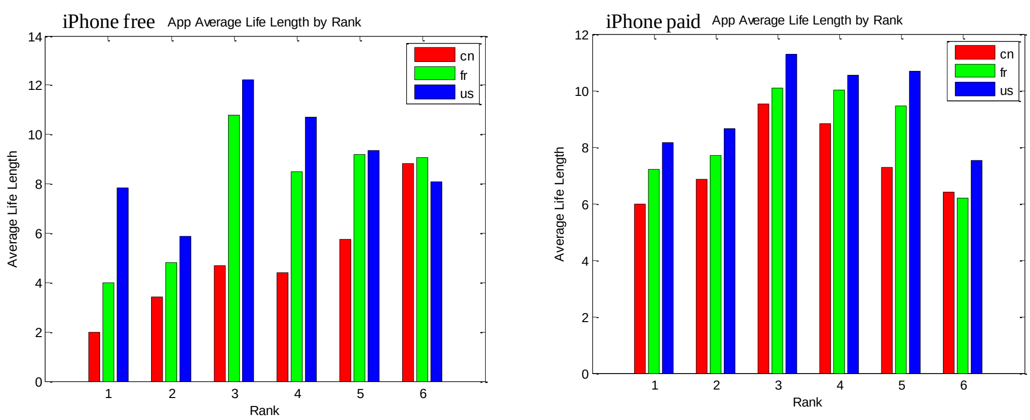

Figure 6- 29 iPhone free and paid app average life length by popularity index (rank) in France, China and the US

[307] Except that popularity index 6 for iPhone free apps, it is little lower in US than France.

iPhone paid apps' life time is longer than iPhone free apps'. For apps in popularity index 1, lifetime in the US is 8.17 months, 7.2 months in France and 6 months in China. For apps in popularity index 6, lifetime in the US is 7.54 months, 6.18 months in France and 6.39 months in China. iPhone paid apps in popularity index 6 is slightly longer in China than in France (Figure 6- 29).

6.5.1.2 iPad free and paid app lifetime

For iPad free apps, app lifetime is the longest in US and the shortest in China. Regarding apps in popularity index 1, life time is 8 months in the US, 3 months in France and 2.6 months in China. Apps in popularity index 6 have a lifetime of 7.22 months in the US, 6.87 months in France and 6.59 months in China (Figure 6- 30).

iPad paid apps' lifetime is also longer than iPad free apps'. App lifetime for apps in popularity index 2 is longer in France than in US. Apps in popularity index 2 have a lifetime of 9.67 months in the US, 11.9 months in France and 7.33 months in China. Apps in popularity index 6 have a lifetime of 7.39 months in the US, 6.8 months in France and 6.36 months in China.

Lifetime of iPad paid apps in popularity indexes 1, 2 and 3 is longer than iPhone paid apps with the same indexes. But iPad apps with popularity indexes 4, 5 and 6 have shorter lifetime than iPhone apps with the same popularity indexes.

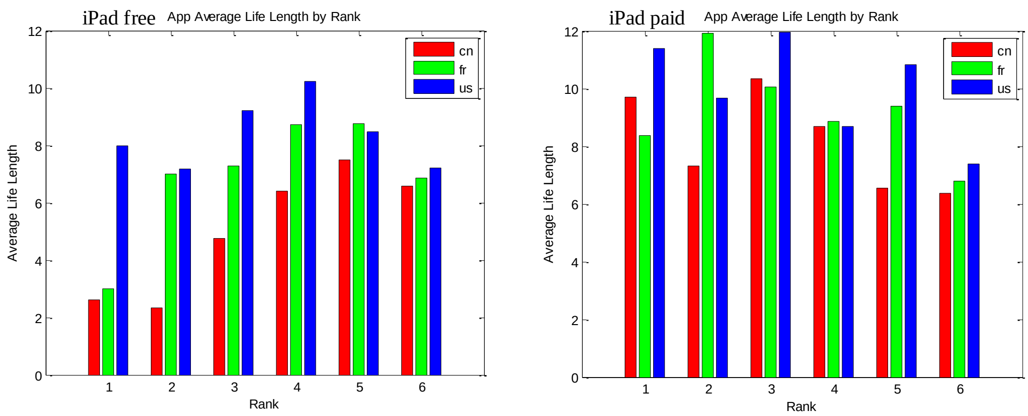

Figure 6- 30 iPad free and paid app average life length by popularity index (rank) in France, China and the US

6.5.1.3 Mac free and Paid app lifetime

For Mac free apps, app lifetime is the longest in the US except for popularity indexes 2 and 3. Apps in popularity index 2 have longest lifetime in China (followed by the US and France). Apps' lifetime in popularity index 3 is longest in France (followed by the US and China) (Figure 6- 31).

Mac free apps in popularity index 1 have a lifetime of 15.2 months in the US, 12.7 months in France and 9.78 months in China. Apps in popularity index 6 have a lifetime of 11 months in the US, 9.45

months in France and 8.57 months in China. There are not many differences for app lifetime in Mac free apps of different popularity index.

App lifetime of Mac paid apps is longer than iPhone and iPad free and paid apps.

Mac paid apps' lifetime is the longest in the US except for the apps in popularity index 5 and 6. Lifetime for apps in popularity index 5 and 6 is the longest in China. Apps lifetime in popularity index 1 is 16.8 months in the US, 16.7 months in France and 14.5 months in China. Apps lifetime in popularity index 6 is 8.87 months in the US, 10.2 months in France and 10.7 months in China (Figure 6- 31).

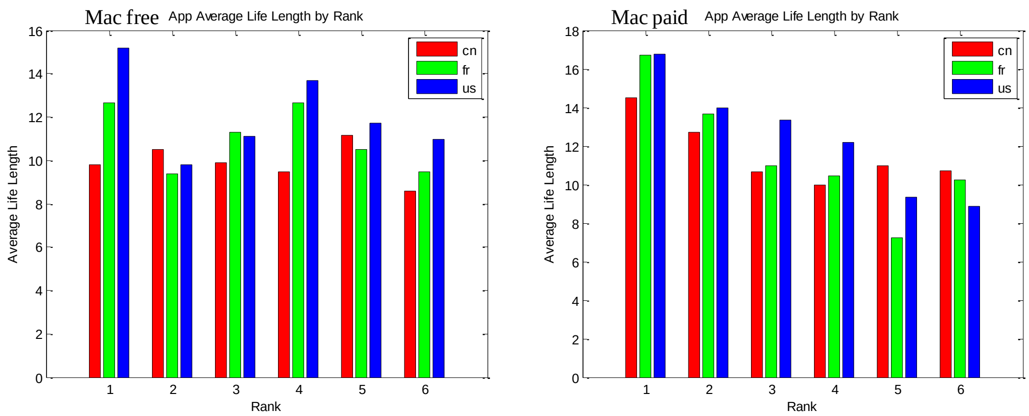

Figure 6- 31Mac free and paid app average life length by popularity index (rank) in France, China and the US

6.5.2 Mobile app life time by app category

There are 23 app categories in Apple App store. Newsstand's category apps are not widely downloaded. Mobile app lifetime is analyzed by app category in this part.

For iPhone free apps, Books apps' lifetime is the longest (5.5 months) in France, then comes the US (3.78 months) and finally China (1.77 months). Music app lifetime is the longest in the US (4.12months), then comes China (3.23 months) and lastly France (2.95 months). Finance app lifetime is the longest in the US (5.32 months) followed by China (5.29 months) and France (4.88 months). Weather app lifetime is the longest in China (6 months) followed by France (4.58 months) and the US (4 months) (Figure 6- 32).

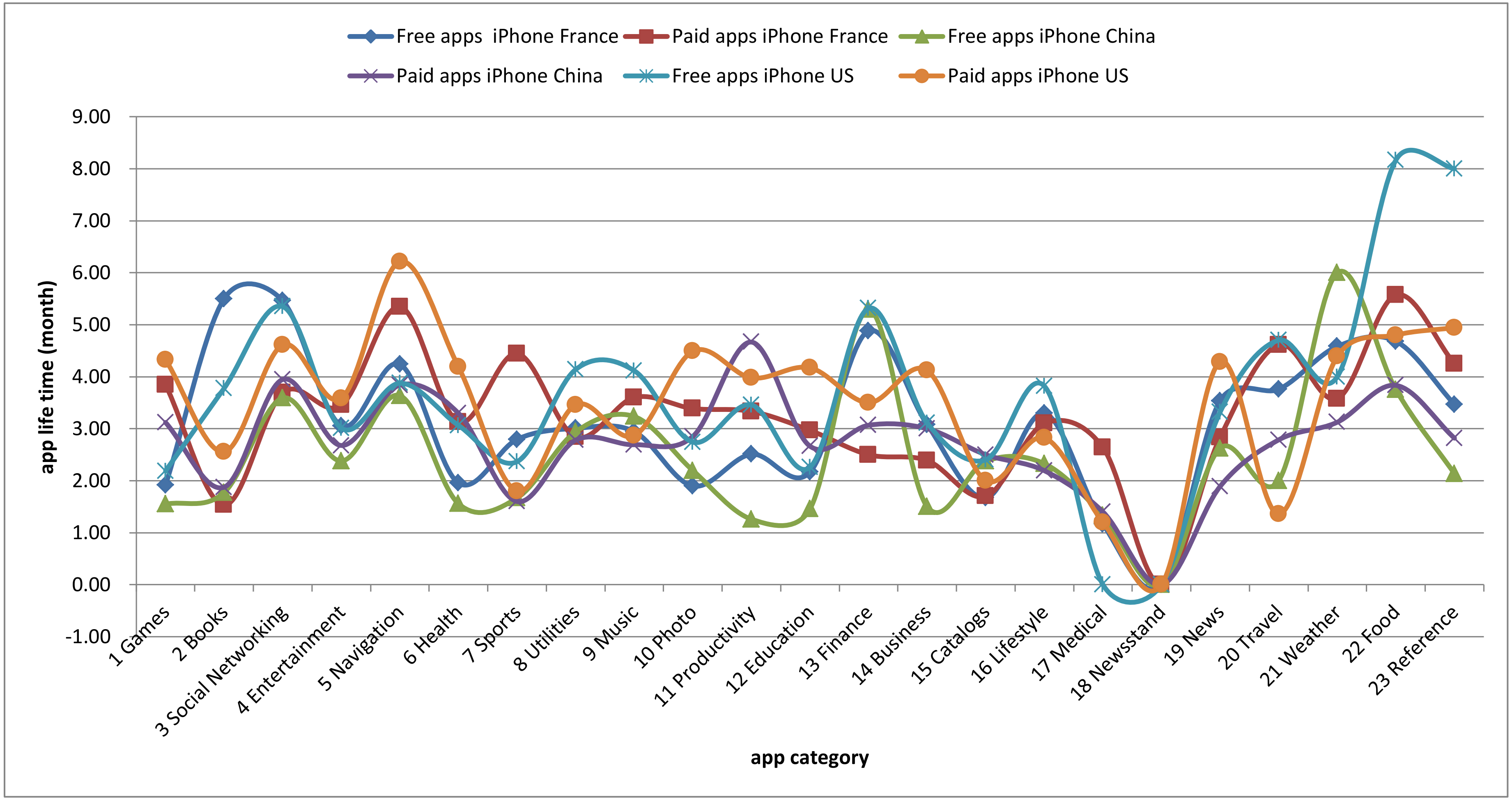

Figure 6- 32 Average app life length by category for free and paid apps on iPhone in France, China and the US

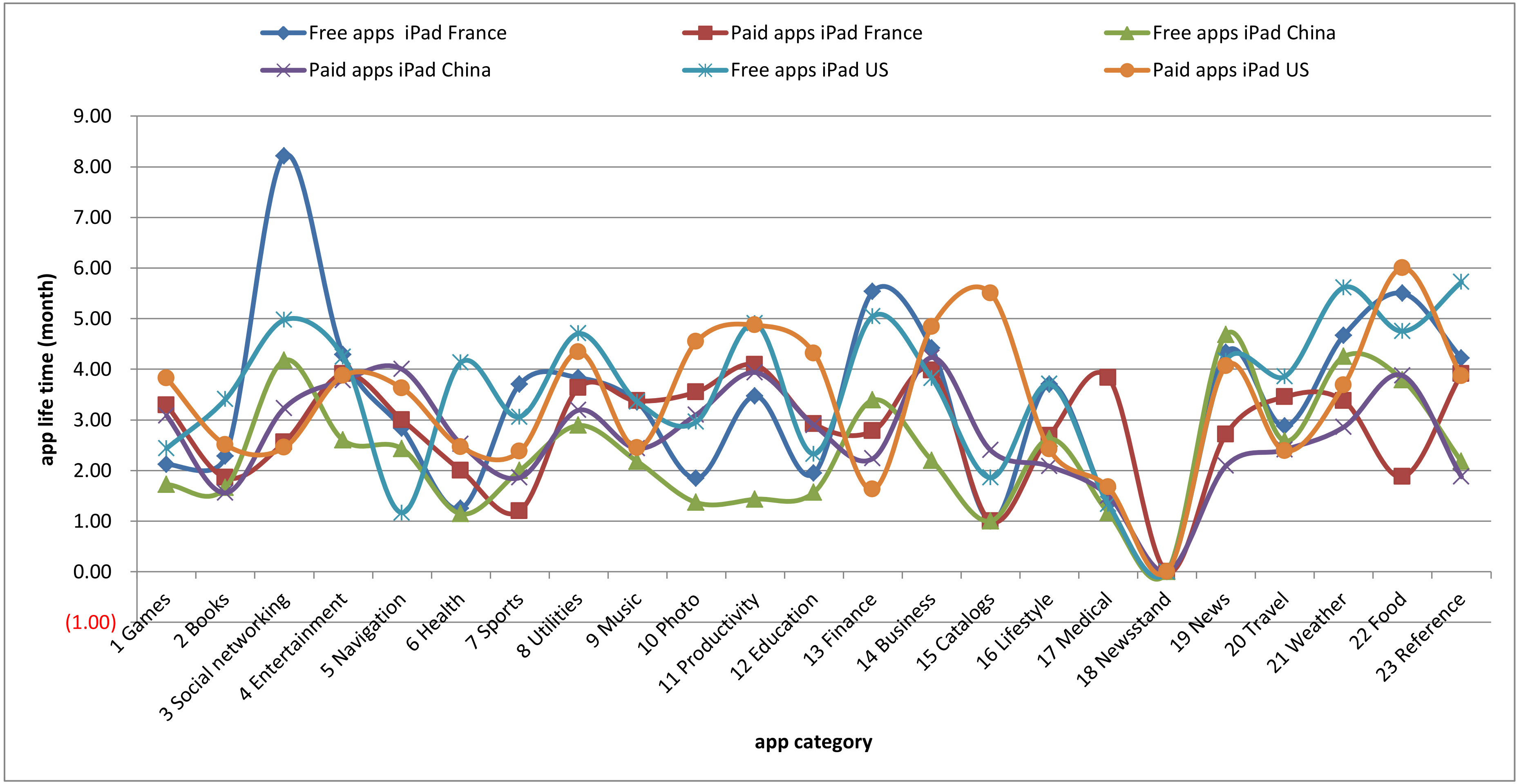

Figure 6- 33 Average app life length by category for free and paid apps on iPad in France, China and the US

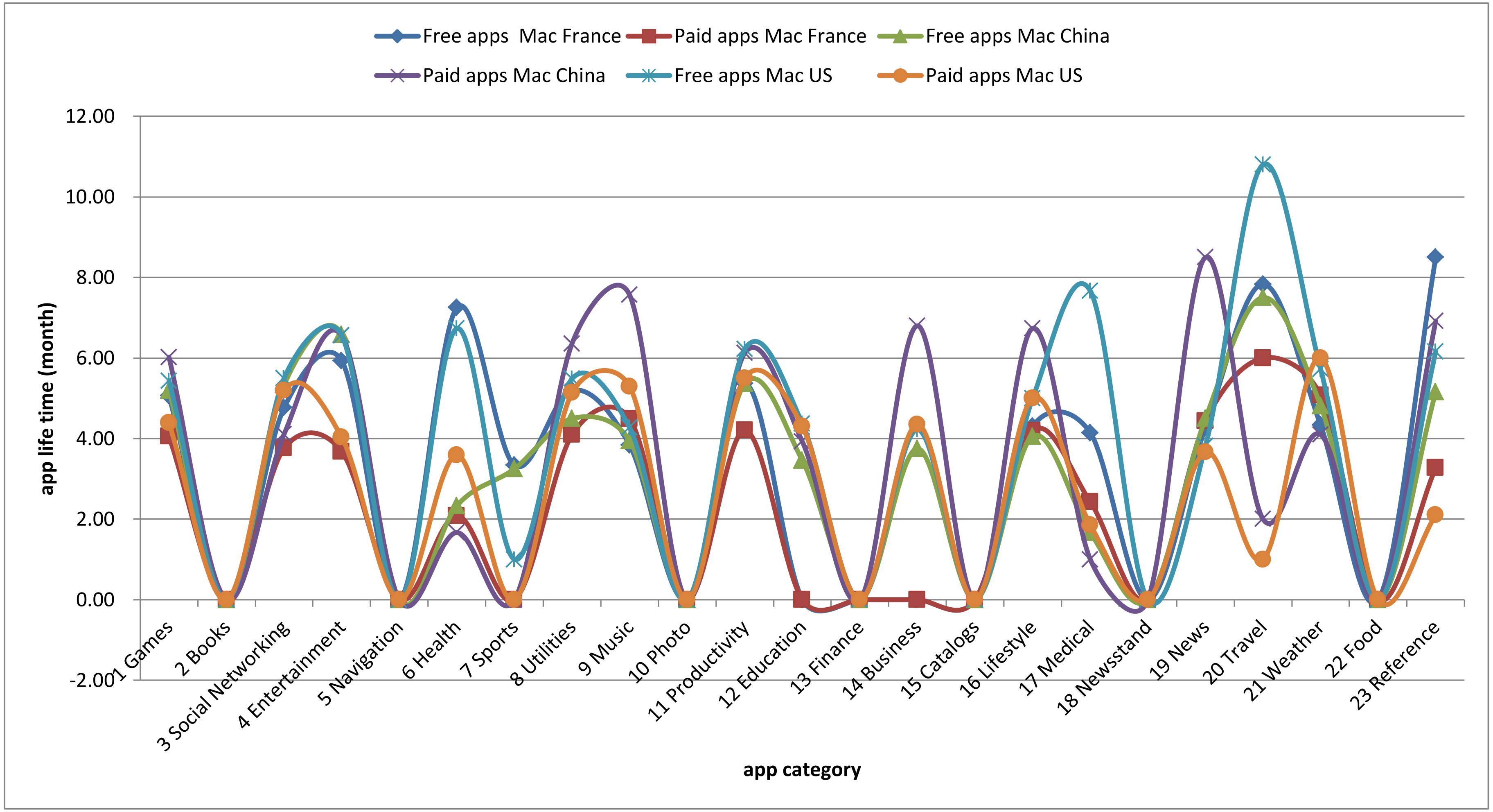

Figure 6- 34 Average app life length by category for free and paid apps on Mac in France, China and the US

For iPhone paid apps, Navigation app lifetime is longer in the US and shorter in China. Lifetime for Navigation apps are 5.35, 3.84 and 6.21 months in France, China and the US. Sports app lifetime is the longest in France (4.44 months) followed by the US (1.8 months) and China (1.6 months). Productivity app life time is the longest in China (4.67 months) then in the US (3.98 months) and finally in France (3.33 months). Travel app lifetime is the longest in France (4.62 months) followed by China (2.79 months) and the US (1.36 months).

For iPad free apps, lifetime for Social networking apps in France is the longest followed by the US and China. Social networking app life time is 8.21, 4.97 and 4.18 months in France, the US and China. Games app life time is 2.44, 2.12 and 1.72 months in France, the US and China. Lifetime for Games app is much shorter among the 23 categories. Finance app life time is 5.53, 3.39 and 5.05 months in France, the US and China. Lifetime for News apps is the longest in China and the shortest in the US. News app lifetime is 4.33, 4.68 and 4.17 months in France, the US and China. Food app lifetime is the longest in France and the shortest in China (Figure 6- 33).

For iPad paid apps, lifetime for Entertainment apps is almost the same. Utilities and Productivity app lifetime is longer in the US and shorter in China. Catalogs app life time is the longest in the US (5.5 months) followed by 2.4 months in China and the shortest is 1 month in France. Life style app lifetime is the longest in France (2.69 months) and the shortest in China (2.08 months).

For Mac free and paid apps, there are no significant differences for app lifetime by category. Books, Navigation, Photo, Finance, Catalogs, Newsstand and Food category apps didn't stay in top 300 from November 2011 to April 2013. So there is no app lifetime data for these apps.

For Mac free apps, Health app lifetime is the longest in France (7.25 months) and the shortest is in China (2.33 months). The longest Travel app life time is in the US (10.8 months) and the shortest is in China (7.5 months). Reference app lifetime is longer in France (8.5 months) and shorter in China (5.16 months) (Figure 6- 34).

For Mac paid apps, Music app lifetime in China (7.56 months) is the longest followed by the US (5.29 months) and finally France (4.49 months). Business app lifetime is longer in China (6.8 months) and shorter in the US (4.35 months). There is no data for calculating Business app life time in France. Reference app lifetime in China (6.92 months) is the longest followed by France (3.28 months) and the US (2.1months).

6.6 Revelations to pricing by app life time

Mobile app user's price elasticity is the highest for Apple App store in China followed by the US and lastly France. Users in China are more sensitive to app price.

Mobile app price is much higher in France, then comes the US and the lowest price is China (except for iPhone for which app price is higher in China than in the US).

Classified by app popularity index, app lifetime is the longest in the US followed by France and China. App lifetime for paid apps is longer than for free apps. App lifetime is longer for Mac than for iPhone and iPad.

Classified through app category, Games app lifetime is shorter. User's loyalty for Games is low and Games app market is in intense competition. French users download more Sports apps and Chinese prefer Weather apps. Navigation apps are more popular in the US.

23 apps categories are used and have different lifetimes. It indicates that users have high demand for app diversity. According to Hagiu (2009[308]), platform will mainly generate its profits from the producer side when consumer's demand for variety is higher for two bottlenecks platforms in two-sided markets[309]. In the mobile app market, Apple App store and Google Play can be assumed to two bottlenecks platforms, therefore the user side is charged less because they have high demands for app diversity.

308 Hagiu Andrei , Two Sided Platforms: Product variety and Pricing structures,2009

309 Since producers become less substitutable and there is less competition between producers.

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7 Chapter 7 Conclusions

Serious attention has been given to the mobile app market where three groups of end users affiliated with two Two-sided platforms. Developers, advertisers and users are the three groups or sides. App-store and Ad-store are the two platforms. It is one money-making market with big potential.Therefore people especially the economists are following this market closely.

The complexity of the ecosystem in the mobile app market makes platform pricing complicated and difficult.So my thesis focuses on App-store platform pricing determinants and strategies.

7.1 Highlights

App-store platform pricing determinants, strategies and app use features are specified below.

[1] There are widespread and interactive network externalities.

We can find network externalities in all branches in mobile app market ecosystem. Indirect network externalities exist among different groups (sides) even among different platforms. And direct network externalities exist inside of each group.

Indirect network externalities between free apps and paid apps, apps and mobile devices, apps and external products have a special role in this market. This rarely exists in other two-sided markets.

Network externalities widely present in mobile app market ecosystem. It is not wise to focus on one pricing determinant without taking into consideration the influences of other key pricing factors.

But there are also benefits which stimulate the entire ecosystem due to the network externalities. Positive network feedback effects are obvious in this ecosystem. One participant alone can play an important role.

[2] Powerful revenue sources exist behind the ‘freemium’ concept.

Free apps are the majority in mobile app market. Free apps bring considerable profits through improving user’s satisfaction and loyalty from app consuming. In-app advertising, freemium and in-app purchase are all revenue source for free apps.

[3] Mobile device purchasing cost influences platform pricing.

Mobile device is the carrier of receiving and running for apps. Mobile device purchase is the precondition to access the App-store platform and use apps for users. This purchasing cost influences the App-store platform’s pricing to the users who are usually singlehoming. As users are sensitive to app prices and platform charges, it is better to charge them less or free.

[4] Membership fee is negligible for app store platform pricing.

App-store platform inscription fee can be considered as the membership fee from developer side. This fee is negligible for developers in comparision to app sales revenues.

Users access to App-store through the device associated with MOS, whose cost is either internalized into mobile device cost or zero. It can be assumed as zero. Receiving apps is just part of the utilities from use of the device, so normally membership fee can be ignored from users.

There is another possibility. A certain part of device purchasing cost is taken as the app use cost hence the membership fee from users. In fact in this situation, this part of cost is actually minor compared to user's app use utilities.

As transactions between developers and users are observed from app store platform, so usage fee may be feasible for App-store platform.

[5] There are three potential profit-generating points and industry integration seems to be a good way to create profits.

Apps and mobile devices are the revenue roots for this ecosystem. Apps can bring app sales (paid apps, freemium and in-app purchase included) and in-app advertising revenues. To collect revenues, App-store and Ad-store are built for app distribution and app advertising. Mobile device generates revenues from sales.

When there is an app download, revenues may come either to App-store or to Ad-store. App-store shares app sales revenues with developers through paid app download. Ad-store shares in-app advertising revenues with developers through free app download.

Apps downloads also stimulate mobile devices sales due to their positive indirect network externalities. So app downloads create profits for the two platforms, developers and device suppliers.

App-store, Ad-store and mobile device, these three potential profit-generating sources are vital.Industry integration can maximize profits from mobile app markets. Operators who control more profit-generating points can bring in more revenues. Both the two giants -Apple and Google have their own App-stores and Ad-stores at the same time. Apple also controls its native mobile device distribution.

[6] Apple 's mobile device sales model and Google's in-app advertising model.

Apple is a traditional electronics vendor and continues its device sales revenue model in mobile app market. Apple App store is a platform which supplements mobile device sales through app distribution. Mobile device become more attractive through apps distribution. We can also say it is a bundling strategy for Apple between mobile device and App-store.

Google applies its web advertising strategies to mobile app market. In-app advertising is the main revenue model for Google. Google Play App-store does not generate enough revenues from paid app downloads and app sales. Google Admob Ad-store has a higher fill rates and coverage for in-app advertising. In August 2012, Google acquired Motorola mobile in order to increase its market gains.

$$\text{Apple} = \text{iOS device} + \text{App store} + \text{iAd} \quad (1)$$

$$\text{Google} = \text{Motorola device} + \text{Google Play} + \text{Admob} \quad (2)$$

[7] Higher income users have stronger app price elasticity of demand.

From my survey, it was found that users with higher income are more sensitive to app prices. They are the frequent app users but they do not like to pay for app downloads. 79% of users (n=90) with over €4,000 monthly income download apps frequently but only 7% of them paid less than €1 for app use per month.

[8] App price preferences for users in France and China

Free apps are the majority as more than 60% of both French users[310]and Chinese users[311] paid zero for app downloads in these countries.

Chinese users prefer free apps in comparision to French (70% compared to 54%). Chinese users in France are similar to Chinese users. 66% (out of 85) of them prefer free apps. Therefore Chinese users are more sensitive to app price.

[9] Comparisons between iOS and Android

Female users prefer iOS devices than Android devices (56% compared to 35%[312]).

Android users pay less and prefer free apps more than iOS users (69%compared to 56%[313]).

iOS devices are more popular in China whereas Android devices are more popular in France.(52% compared to 44%[314])

[10] Price elasticity of demand for users in Apple App store between France and China

310 n=269
311 n=222
312 n=270
313 n=303 for iOS users,n=246 Android users.
314 n=222 for Chinese users;n=269 for French users.

Chinese users have higher PED and France users have lower PED. US users are in the middle. That indicates Chinese users are more sensitive to app price than French users.

7.2 Pricing suggestions for app store platform

7.2.1 Platform pricing determinants

- **Price elasticity of demand (PED)**

The stronger the PED, the lower the charges.The platform charges less to the side with stronger price elasticity of demand. Usually PED for buyers is stronger than sellers.

According to our empirical study, app users were found highly sensitive to app prices. Price elasticity of demand for user side can be deduced as stronger. If we just take PED into consideration, we can suggest that platform charges less or nothing from user side. In this case, it is the user side that benefits.

- **Single or multihoming**

From our survey, we found that most of users were single mobile device holders and they mainly used just one App-store platform. Users are considered to be singlehoming. In 2012 more than 78% of developers used more than two App-store platforms[315], hence multihoming.

The pricing is low or free for the singlehoming side. Therefore the user side is charged less while developer side is charged more in this market.

- **Customer demand for variety**

As the users have strong demand for variety, there are 23 different app categories in Apple App store in 2013.

High demand for variety from customers usually leads to fewer charges from platform. Because of this the user side is charged less in mobile app market.

- **Mobile device purchasing cost**

Purchasing cost of mobile device influences platform pricing for user side. If we take part of device cost as membership fee, the users tend to be charged less by the platform due to users' strong price elasticity of demand.

- **Difficulty of monitoring transactions**

[315] Vision mobile, Developer Economics 2013, N=3400.

The observation of transaction shows the probability of app store platform charging usage fees.

Considering the pricing determinants above, we can see that user side is the well treated as less charged from platform, and usage fee is a feasible to charge.

7.2.2 rPlatform pricing comparisons among App-store, Game console and Operating System

Different platform pricing structures are presented when we do comparisons for App-store platform, Operating System platform and Game console platform (Table 7- 1). They are all part of the software industry. The App-store platform subsidizes developers and shares revenues from paid app sales and in-app purchase revenues. The OS platform subsidizes developer side and brings revenues from licensing the users. Game console platform generates revenues from both games sales from gamers and royalties from developers.

Table 7- 1 Comparisons of platform's pricing structure

Platform	Side 1	Side 2	Revenues source for platform	Notes
App-store	User	App developer	Side 2, Paid app sales and in-app purchase revenue shares	Subsidizes side 2
Game console	Gamer	Game developer	Side 1 and side 2; game sales from side 1 and royalty from side 2	Sells console below marginal cost; platform controls console distribution
OS	User	Software developer	Side 1, sales commission	Subsidizes side 2

Each two-sided market has its own pricing determinants and features. There is no uniform platform pricing strategies.

7.2.3 Comparisons between i-Mode service and mobile app

Mobile app originated from DoCoMo's iMode service. Pricing comparisions for iMode and mobile app, we found that operators for these two platforms and their business models are different. iMode service operator is a telecom operator (carrier) and it required platform access charges (membership fees) and usage fees from users. The developers are charged usage fees.This model is because the telecom operator controls the access to internet with objective of generating portal revenues. High price and insuffient applications forced iMode service out of business.

There are multiple types of vendors who operating app store platform, these include mobile operating system owner, mobile device manufacture, independent third-party, traditional e-commerce operator or carrier.

Platform vendor who controls mobile operating system and mobile device has leverage seen in Apple and Google. Users pay petty-amount or zero for app consumption, thereby stimulating mobile device sales or increasing in-app advertising revenues.The barriers are relatively low for these new entrants in this market. The market greatly encourages users' participation and developers' innovation through the asymmetric pricing of platform.

Many own-brand app stores operated by telecom operators have been abandoned like Vodafone AppSelect. Telecom operators now focus on leveraging their operating billing systems with mobile app users as the foothold in this content play era.

7.2.4 Conclusions

In resumé, App-store platform's pricing is influenced by a series of determinants in a complex ecosystem. It is difficult to build a mathematic model to explain the pricing strategies.

The pricing structure for the App-store platform can be analyzed from their pricing determinants. The charges to the user side are less. The developer side feeds the App-store platform. This study suggests that usage fee could be taken into consideration to the mobile app market.

It is a duopoly in the mobile app market. There are two successful models in mobile app market. Apple or Google, which one do you prefer?

Chinese users being more sensitive to app prices have stronger app price elasticity of demand than the French. French users are less sensitive to app price and they are accustomed to paying for the apps. Therefore we consider the Chinese users have stronger PED to App-store platform's charges. And we suggest that platform applies different membership and usage fees for users in different countries and regions.

There are high-end users in Chinese market who can afford to pay more than 5¥per month[316]. And Chinese users seem to have 'Herd mentaily' for apps on iPhone. Rank 1 to 10 apps on iPhone are the most popular paid apps by Chines users. Users often download the same apps as others. Powerful marketing is essential for those developers looking for the best sellers.

7.3 Trends in mobile app market

- Games and Social Networking apps are still dominant.HTML5, mobile payment, cloud based apps and customized apps are excellent perspective products.

Today Games and Social Networking apps have great impacts on users and will continue to do so in the future. Mobile payment apps make billing become more secure and more convenient. Due to the flourish of cloud computing, Cloud based apps will be in great need.

316 See 5.5.1 in chapter 5.

- App segmentation will accelerate.

Graphic apps and Finance apps suitable for professional needs will grow in popularity. Health, Navigation and Children related apps have built relatively complete ecosystems. Navigation apps can collect precious information to constitute a rich personal profile to provide customized services.More and more enterprises untilize mobile app as a distribution channel to their customers. With customized apps, business has excellent tools to promote sales of new products.

- As the market maturates and grows, competition will become more severe and tough for developers.

Developers have grown and maturated since the initial stage in 2008. They are familiar with this market that includes App-store platform, Ad-store platform, developing environments, business model, capital operations and their own limitations. Developers to be competitive on the market need to focus on multiple platforms and increasing the variety of apps.Recently there were only 2% to 3% new app developers in Apple App store and Google Play.

- Customized mobile app advertisement will be in demand.

Benefiting from cloud computing, user habits, price preferences and personal information can be collected. Customized in-app advertisements focusing on customer needs will have a role to play and sequentially bring in ad revenues.

- Industry divisions will be more detailed.

There are enterprises which have specialized in app advertising, app developing tools and app user analytics. Each branch in this ecosystem will be able to expand and grow.

- Competition and industry integration will be more intense.

Competition and mergers took place as the market expands.

From 2008 to 2013, numerous app store platforms have either disappeared or been acquired. TP App-stores are more vulnerable to being closed or acquired. MOS App-stores are still dominant seen in Apple App store, Google Play, Windows Store and Blackberry world.

It is an oligopoly in mobile app market. Two or more giant app store platforms which control key industry sources (like mobile operating system, app ad platform) dominate the market, and share the revenues with other participants in the ecosystem.

7.4 Regulations in mobile app market

Pricing, market barriers and antitrust are key subjects for regulations in both one-sided markets and two-sided markets.

'Getting both sides on board' and'the chicken and egg problem' are well known in two-sided markets. Platforms in two-sided markets face to make pricing structure and strategies to bring both the two sides on board. It is necessary for platform to surpass the critical level of end users to make profits and balance complementary member communities[317].

The Platform can provide considerable social value by internalizing network externalities among different members, and it works as a necessary intermediate creating products or services.

Because of the special business models in two-sided markets, antitrust and regulation scrutiny can be a problem and caution will be needed in distinguishing platform's pricing, exclusive contracts, mergers and so on. Is platform's asymmetric pricing structure cross-subsidy or not? Are low prices pro-competitive or anti-competitive? Does regulation increase consumer welfare after taking into account the role of the platform harnessing indirect network externalities?

Regulation rules in two-sided markets are clearly applicable to mobile app market. Regulation applied to payment card or Video game console industry can serve as exemples for mobile app market. Evans (2003[318]) worked on antitrust in multi-sided markets offering good guidance for regulations in this market. He explained the functioning of platform's asymmetric pricing and regulation differences between one-sided and two-sided markets.

7.5 Limitations and future research interests

7.5.1 Limitations

Pricing strategies for Ad-store platform have not been included for lack of time. Mobile app advertising is a huge independent market. App ads pricing, billing, discovery and production need for study.

Mobile devices do influence App-store platform's pricing to users, especially as the platform also controls device supply. Further study of device purchasing cost to platform pricing is not included in this study.

The empirical study of price elasticity of demand just focuses on user side based on the survey. Price elasticity of demand study for developers has not been covered because of the limitation of data available. Data applied in this study mainly comes from Apple App store and lacks the comparisons with other app stores.

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[317] David Evans and Marco Iansiti, Harnessing the power of market platforms, un published manuscript on file with Yale Journal on Regulation,2003

[318] David Evans,'The antitrust Economics of multi-sided platform markets',Yale Journal on Regulation,Volume 20,2003

Regulation and social welfare related study remain to be studied in details.

7.5.2 Future research interests

Future research interests could concentrate on completing App-store platform pricing model which includes comprehensive determinants and covers the general mobile app market.

Ad-store platform pricing is another area for future study. It will complete the platform pricing study in the mobile app market.

Further study will be desirable on the price elasticity of demand for developers and the revenue share between the developer side and the two platforms.

Future research could be on interaction between App-store and Ad-store.

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Appendixes

1 Questionnaire of mobile app consuming

Thank you very much for completing this questionnaire. This questionnaire is designed for PhD thesis and aims to investigate the using habits of users who download and use applications from Application stores like APPLE App store and Google Play. I will be very glad do share the research results with you after the analysis of data. Please leave your treasured experiences and advices. Hope everything goes well with you!

I. Information of Respondents

1 Sex

(1) Male (2) Female

2 Profession

(1) Student (2) IT industry (3) Civil servant-official (4)Professor or Researcher

(5) Self-employed (6) Jobless (7) Retired (8) Other, specify ---------------------

3 Age

(1) Under 20 (2) 20—30 (3) 30—45 (4) Over 45

4 Monthly income (Euros)

(1) Under 1,000 (2)1000—2000 (3)2000—4000 (4) over 4000

5 By which way did you come to this questionnaire?

(1) Friends or relatives (2) Social networking [like facebook, twitter, linkedin]

(3) Field investigation (4) other, specify----------------------

6 Do you use smart phone (like Iphone, Samsung, and HTC) or tablet (like Ipad) or e-book?

(1) Yes, Smart phone (2) Yes, Tablet

(3) Yes, Other mobile device (4) No, None

7 In which country do you live?

(1) France (2) China (3) America (4) Other-specify______

II. Applications

1 which operating system (within your smart phone or tablet) are you using for accessing to the application store?

(1)Apple iOS (2) Google Android (3) Windows mobile (4) Blackberry OS (5) other, specify ------------------------

2 Do you download and use applications from the application store based on your smart phones or tablet? (Like angry bird, talking Tom, book, weather forecast and navigator)

(1)Rarely used (2) Frequently used (3) Not used

3 Which type of application is your favorite? (Multiple choices possible)

(1)Games (2) Books (3) Social network (4) Entertainment

(5)Navigator GPS (6)Health (7)Sports (8) Other, specify-------------------------

4 How many free and paid applications do you download each month on average?

- Free applications : (1)0 (2) 1 (3) 2 (4) 3—5 (5) >5
- Paid applications: (1)0 (2) 1 (3) 2 (4) 3—5 (5) >5

5 How much do you pay for these applications each month on average (Euros)?

(1)0 (2)<1 (3) 1—2 (4) 2—5 (5)5—10 (6) >10

6 How do you pay for these applications?

(1)Through telecom operator's mobile billing system (2) By credit card or debit card

(3)Through a special package of applications (4) Through prepaid card for applications

(5) Other, specify-------------------------------

7 How do you choose your downloaded application?

(1) Friends' recommendation (2) Advertisement inside of apps (3) Ranking of applications

(4)Think it is funny and want to try (5) Number of downloads (6) other, specify-----------------------

8 Please note names of the most recent three applications that you had downloaded:

(1)---

(2)---

(3)---

9 Which is your preferred application price (Euros)?

(1) 0 (2) <1 (3) 1—2 (4) 2—5 (5)5—10 (6) >10

10 what do you think about the relation between price and downloads of an application?

(1)Totally free application has most downloads

(2) Much cheaper, more downloads

(3)Downloads depend on the value of the application, not the price

(4) Other ,specify-----------------------

11 What determines the value of an application for you?

(1) Many people use it

(2) It provides me valuable functionalities

(3) The price of the application

(4) The advices of friends or relatives

(5) The reputation of the publisher

(6) Other – specify--------------------------------

12 When searching an application, are you more often looking for a name of one specific application or for specific functionalities?

(1) A name of one specific application (2) For specific functionalities (3) Both

13 When downloading an application, what gives you the confidence that the application will be appropriate to your needs?

(1) The reputation of the application store (2) The identity of the application developer

(3)The description of the application (4) The number of downloads

(5) The recommendations of other users (6) The recommendations of friends or relatives

(7) Other: specify -------------------------

14 When using an application, do you usually update the app when a new version is provided?

(1)Yes (2) No

15 How do you choose an application store? (Multiple choices possible)

(1) The application store implanted in my smart phone or tablet

(2) The variety of applications in the store

(3) Many people use it

(4) The advices of friends or relatives

(5) The reputation of the application store

(6) Other,specify ------------------------------

16 In which store do you download your favorite applications? (multiple choices possible)

(1) Apple App Store (2) Google Play (3) Windows Phone store (4) Blackberry App World

(5) Nokia Store (6) Your telecom operator store (like Orange app store)

(7) Your device manufacturer store (8) Other, specify-------------------------------

17 Please choose your advices of using the current application store (multiple choices possible)

(1) Supplying more various applications

(2) Making proper price for application

(3) Making payments more convenient for the applications

(4) Interconnection with other application stores will be welcomed

(5) Improvement of user experience and after-sales services

(6) Targeted advertising for applications

(7) Other—specify

--;

2 Data normalization for questionnaire

Table Appendix 5- 1 Demographic characteristics data normalization

Variable	Sample size	Variable description
Sex	600 /(100%)	Latent variable
Male	330 /(55%)	0
Female	270 /(45%)	1
Age	600 /(100%)	Level variable
Under 20	18 /(3%)	0.25
20-30	432 /(72%)	0.5
30-45	135 /(23%)	0.75
Over 45	12 /(2%)	1
Income	600/(100%)	Level variable
< 1,000 €	144 /(24%)	0.25
1,000-2,000 €	216 /(36%)	0.5
2,000-4,000 €	150 /(25%)	0.75
> 4,000 €	90 /(15%)	1
Country	600/(100%)	Latent variable
France	354 /(59%)	0
China	222 /(37%)	1
America	6 /(1%)	0.5
Others	18 /(3%)	0.5

Table Appendix 5- 2 Mobile app price data normalization

Variable	Sample size	Variable description
Paid fee	600 /(100%)	Level variable
0	390 /(65%)	0
<1	96 /(16%)	0.5
1--2	54 /(9%)	1
2--5	24 /(4%)	0.7
5--10	24 /(4%)	0.9
>10	12 /(2%)	0.3
Preferred price	600 /(100%)	Level variable
0	366 /(61%)	0.1
<1	114 /(19%)	0.3
1--2	72 /(12%)	0.5
2--5	24 /(4%)	0.7
5--10	18 /(3%)	0.9
>10	6 /(1%)	0.9

Table Appendix 5- 3 Mobile app use data normalization

Variable	Sample size	Variable description
OS	600 /(100%)	Latent variable
Apple iOS	306 /(51%)	1
Google Android	246 /(41%)	0.75
Windows Mobile OS	6 /(1%)	0.5
Blackberry OS	8 /(1%)	0.25
Others	34 /(6%)	0
Frequency	600 /(100%)	Level variable
Not used	39 /(7%)	0
Rarely used	151 /(25%)	0.5
Frequently used	410 /(68%)	1
Diversity	600 /(100%)	Latent variable
1 type	158 /(27%)	0.125
2 types	129 /(22%)	0.25
3 types	116 /(20%)	0.375
4 types	102 /(17%)	0.5
5 types	46 /(8%)	0.625
6 types	16 /(2%)	0.75
7 types	30 /(3%)	0.875
8 types	3 /(1%)	1
Free downloads	600/(100%)	Level variable
0	48 /(8%)	0.1
1	120 /(20%)	0.3
2	132 /(22%)	0.5
3--5	126 /(21%)	0.7
>5	174 /(29%)	0.9
Paid downloads	600/(100%)	Level variable
0	468 /(78%)	0.1

1	108 /(18%)	0.3
2	15 /(2%)	0.5
3--5	6 /(1%)	0.9
>5	3 /(1%)	0.9
Payment mode	600 /(100%)	Latent variable
Through telecom operator's mobile billing	102 /(17%)	0.7
By credit card or debit card	294 /(49%)	0.9
Through a special package of applications	18 /(3%)	0.3
Through prepaid card for applications	12 /(2%)	0.5
Others[319]	174 /(29%)	0.1
Elasticity	600/(100%)	Latent variable
Totally free application has most downloads	330 /(55%)	0.1
Much cheaper, more downloads	84 /(14%)	0.5
Downloads depend on the value of the application, not the price	156 /(26%)	0.9
Others	30 /(5%)	0
Value determinants	600 /(100%)	Latent variable
Many people use it	78 /(13%)	0.7
It provides me valuable functionalities	461 /(77%)	0.9
The price of the application	12/(2%)	0.3
The advices of friends or relatives	24 /(4%)	0.5
The reputation of the publisher	12 /(2%)	0.1
Others	13 /(2%)	0
Confidence	600 /(100%)	Latent variable
The reputation of the application	60 /(10%)	0.5

[319] 29% of users choose others because that they just download free apps and don’t need to pay for apps.

store		
The identity of the software developer	18 /(3%)	0.1
The description of the application	186 /(31%)	0.9
The number of downloads	66 /(11%)	0.7
The recommend of other users	198 /(33%)	1
The recommend of friends or relatives	48 /(8%)	0.3
Others	24 /(4%)	0
Update	600 /(100%)	Latent variable
Yes	426 /(71%)	0
No	174/(29%)	1

3 Most recent three downloaded apps

1 Games
2 Books
3 Social Network
4 Entertainment
5 Navigation
6 Health
7 Sports
8 Utilities
9 Music
10 Photo and Video

Utilities	Abbreviation
Dictionary	D
Education	E
Finance	F
News	N
Others	O
Shopping	S
Travel and transport	T
Widget	W
Weather	WEA

火车指挥员 2		
新浪微博	QQ	中文报刊
唱吧	pdf 软件 (W)	美图秀秀
俄罗斯方块	贪食蛇	Google talk lite
dropbox (W)	subway surf	火车指挥员
Flipboard	Bilibili 动画	随手记 (F)
飞常准 (T)	Tube Map	唱吧
胖鸟修大桥	万年历(O)	装修指南(O)
QQ 农场	QQ 牧场	QQ 餐厅
QQ		
Talking Tom	地图	fruitNinja
QQ	新浪微博	百度地图
QQ 通讯录 (W)	QQ2012	百度地图
百度地图	UC 浏览器 (W)	微信
微信		
新浪微博	Facebook	Twitter
新浪比分	手机铃声	Skype
Need For Speed	dropbox (W)	bnp paribas (F)
微信	angry birds	某浏览器 (W)
Douban	Vente Privée (S)	Le Figaro
Ratp (T)	King of opera	
地图	导航	微博

angry birds	当当电子书	
booking (T)	Sncf (T)	facebook
Evernote (W)		
法语词典 (D)	flash cards (E)	
威锋网(W)	微博	Disneyland (N)
facebook	QQ	linkedin
subway run	whatsapp	torchlight
angry bird	微博	ratp (T)
微信 We chat	SNCF trasilien (T)	Bref
微博 weibo		
图吧	微博	平安口袋银行 (F)
阿里旺旺 （S)	图吧	微信
去哪儿 (T)	国家大剧院 (T）	pps
汤姆猫 Talking Tom	地图	天气预报 （WEA)
愤怒的小鸟 Angry birds	会说话的汤姆猫 Talking Tom	电子书
美图秀秀	微信	新浪微博
愤怒的小鸟 Angry birds	阅读器 (W)	书刊
新浪微博 sina Weibo	runtastic	douban
Bad Piggies	ActiMonitor	Scrabble
莫言全集	法语助手 (D)	网易新闻(N)
prixing (S)	logo quiz	cdiscount (S)
pad 管家 (W)	books	收音机闹钟 (W)
La fourchette (W)	Cdiscount (S)	Mes finances (F)
TripAdvisor (T)	BlaBlaCar (T)	Fete des Lumieres (O)
Backpacker (T)	asphalt 8	bing (W)
QQ	微信	新浪微博
Angry bird	QQ	whatsapp
随手记 (F)	俄罗斯方块	支付宝(F)
迅雷看看	poco 相机	subway surf
QQ reader (W)	baidu (W)	pptv
微信	微盘(W)	andftp (W)
中信银行 (F)	北京地铁 (T)	爱帮公交 (T）
QQ	浏览器 （W)	3D 炸弹人
autocad (W)	google 地球	灵格斯翻译家 Lingoes (D)
果壳网	多看阅读	宝石迷阵

天涯	Weico	去哪儿旅行 (T)
angry bird	91 记账 (F)	墨迹天气 (WEA)
微信	导航	
google 地图	巴黎 ratp 公交 (T)	
MobileVoip	MeteoFrance (WEA)	Solar Walk
美丽说 (S)	蘑菇街 (S)	新浪微博
pplive		
导航系统		
iknow 英语 (E)	voyages-sncf (T)	k 歌年度精选
圆明园复原 (T)	巴黎地铁系统（T）	双人对战游戏
咖啡	唐宋八大家	巧克力的故事
微信	QQ	微博
Téléloisir		
Flipboard	rope escape	sleep time (O)
唱吧	微博	奇艺
中国国航 (T)	掌上百度 (W)	sfr wifi (W)
快播	风行	狂野飙车
easyJet (T)	K 歌达人	AppZilla 5 (W)
随手记 （F）	linkedin	springpad (W)
DiamondDash	Viva 手机杂志	云中书城
微博	微信	QQ
手电筒 (O)	卢浮宫 (T)	有道词典(D)
微博	网易新闻（N）	微信
墨迹天气 (WEA)	360 手机卫士 (W)	江苏电信 (W)
欢乐斗地主	QQ	微信
电子书		
QQ	微信	
欢乐斗地址	QQ	微信
导航	微信	杀毒软件 （W）
youtube	linkedin	微博 weibo
skype	Facebook	temple run
Aerox	51 信用卡管家 (F)	法语助手(D)
Angry birds	Renren	ErHu
Nike running	Dragon vale	Stanza
Pdf expert (W)	djay	百词斩 (E)
火药猴	赛尔号	ROPE'N'FLY
微信	youtube	手机电视
金山词霸 （D）	酷狗音乐	微信
法语助手 （D）	德语助手（D）	欧陆词典（D）

微信	地图	吉他谱
king of opera	ebook	Office (W)
youtube		
盗墓笔记	极品飞车	新浪微博
世界史上下五千年	中国象棋	巴黎地图
QQ 浏览器 (W)	Ratp (T)	Sncf (T)
google 地图	google 翻译 (W)	微信
Here maps	youtube	Translation (W)
ice age village	密友	
游戏	电源键替代应用(W)	公交查询(T)
游戏	公交查询(T)	
酷我音乐盒	宜搜小说阅读	高德地图
火花电影	四库全书	胡雪岩
QQ	ibook	ireader (W)
愤怒小鸟 angry birds	贪食蛇 snake	
Linkedin	deezer	booking (W)
360 (W）	QQ	微博 weibo
水果忍者 fruit ninja	网易公开课 (E)	乐动达人
坦克大战	ireader (W)	百度地图
微博	心动小狗	夫妻相
微信	飞信	老虎地图
足球经理	PPTV	极品飞车
会说话的本 talking Ben	会说话的圣诞老人 talking Santa	会说话的汤姆 talking Tom
微博	唱吧	人人网
愤怒的小鸟 Angry birds	植物大战僵尸	shazam
大智慧	UC	手机阅读
热血海贼王	微信	美丽说 (S)
手机阅读	企业彩云 (W)	招商银行 (F)
会说话的汤姆 talking Tom		
大众点评 （W）	彭博商业周刊	豆瓣活动
神庙逃亡 temple run	日常英语学习 900 句(E)	快速问医生
天翼终端(W)	微信	善听 （W)
Magic Piano	百度地图	南周阅读器 (W)
QQ	微博	游戏
随手记(F)	网易公开课(E)	wing 资讯(N)
百度地图	京东商城(S)	Chrome 浏览器(W)
ZAKER (N)	微博冬季版	微信
愤怒的小鸟 Angry birds	小雨伞 tiny umbrella (W)	曼陀罗 Mandora

地图	游戏	音乐
新浪微博	豆瓣 FM	墨迹天气（WEA)
微信	知乎（W)	数独世界
热门壁纸（O)	Mandora	畅销书 2012
暴风影音	ireader (W)	UC 浏览器 (W)
数独	斗地主	视频
fix-it	Pixar trivia	
fix-it	Pixar trivia	
QQ	微信	微博
clash of clans	爱丽丝快跑	疯狂攀岩家
cut the rope	口袋房产(W)	腾讯微博
Qrafter (W)	魔鱼小钓手	金山词霸（D)
飞常准（T)	市民主页 （W)	沃友
五子棋	QQ	糗事百科
愤怒的小鸟 Angry birds	植物大战僵尸	淘宝 taobao(S)
weicoPro	virtuaTennis	ioverTheNet2011
民生手机银行(F)	沃友	私信
布丁相机	Manga generator	微博
微信 weixin	QQ	momo
围棋	墨迹天气 (WEA)	地图
微信	UC 浏览器(W)	愤怒的小鸟 angry birds
植物大战僵尸	dinner dash	携程订票(T)
Zaker	One	亿部书城
小鳄鱼爱洗澡	糗事百科	新浪微博
切客	愤怒的小鸟	中国象棋
Libon	weibo	instagram
catapult king	cut the rope	bubble island
微博密友	微博	东莞证券（F)
表情符(W)	photaf	顺丰速用通(O)
ibooks	文件全能王（W)	密码管家(W)
微信	MSN	guitar tuner
淘宝(S)	支付宝(F)	58 同城
暴力摩托	QQ 音乐 HD	K 到爆 HD
k 歌达人	宝石迷阵	漫画无限
NBA 2K12	MOST WANTED	微博
Angry Birds Star Wars	Instagram	Ski Safari
淘宝(S)	阿里旺旺(S)	微信
微信	人人	
Vente Privée (S)	爱丽丝快跑	下厨房(O)
搜狗语音助手(W)	opera 浏览器(W)	
Google 翻译 (W)	pplive	ratp (T)

ireader (W)	Le monde	
有道词典 (D)	愤怒的小鸟 angry birds	暴风影音
法语 7jours (E)	Vida	豆瓣音乐
微信	美图贴贴	天涯论坛
QQ	微信	人人
QQ	Skype	老虎地图
google authenticator (W)	toeicFL (E)	Obama speech
angry bird	renren	QQ
stormtrain	aerox	jetpack
seloger (O)	e-restaurant (W)	
法语助手 (D)		
爱聊	meteo (WEA)	instagram
当当	新闻头条 (N)	中国农历 (O)
电子书	打印机 （W）	工具合集(W)
飞信	导航	酷我音乐盒
qq HD mini	Bad Piggies	Anger of Stick2
腾讯 QQ	水果忍者 fruit ninja	墨迹天气(W)
水果忍者 fruit ninja	万年历 (O）	墨迹天气(W)
微博	微信	啪啪
有道词典 (D)	wechat	francetv
微博 weibo	QQ	ibooks
sudoku	dolphin browser (W)	transilien (T)
淘宝（S)	阿里旺旺(S)	携程无线 (T)
德语词典 (D)	德语广播	德语电视
支付宝(F)	微信	杂志
skyscanner (T)	sncf-voyage (T)	gaumont-pathe
有道英语(E)	法语助手(D)	Skype
Hill Clime Racing	air droid (W)	Chrome (W)
dropbox (W)	skype	voipraicer
next day (O)	豆瓣小组	evernote (W)
QQ	微信	google map
网易新闻 （N)	搜狐视频	中国天气通 (WEA)
网易新闻 (N)	搜狐视频	中国天气通 (WEA)
Swampy	壁纸 (O）	禅语
逆转三国 1	Zaker (N)	微博
凯立德导航	微信	谷歌地图
微博 weibo	QQ	必应词典（D)
我爱背单词(E)		
微博	微信	搜狗地图
PLAY GAME		

布丁优惠券(S)	skype	天猫 (S)
soso 地图	指南针	天气 (WEA)
EDF recrute (O)	meteojob (O)	
Ratp (T)	Dropbox (W)	QQ
renren	heartbreaker	weibo
悠悠导航	网易公开课 (E)	割绳子 cut the rope
会说话的汤姆猫 Talking Tom	QQ	
ice village	temple run	sncf (T)
wechat	fidme (S)	手机杂志
网易新闻 (N)	一个 one	QQ 空间
viber	zedge (W)	smart tools (W)
天气通 （WEA)	陌陌	唱吧
iTunes U (E)	App Map	Logo Quiz
中国象棋	四大名著	职场百科全书
YOUKU	QQ	植物大战僵尸
宝宝学数字(E)	宝宝学汉字(E)	Talking Tom
宝宝学汉字(E)	宝宝学数数 (E)	Talking Tom
金山卫士 (O)	手机管家 (W)	天气预报(WEA)
导航	银行客户端 (F)	公交地铁查询(T)
植物大战僵尸	愤怒的小鸟 angry birds	卡丁车
doit.im (W)	保卫萝卜	百度云阅读
google 地球	bike baron	real racing2Hd
微博	微信	QQ
微博	微信	QQ
手机助手（W)	QQ	快播
QQ	斗地主	地图定位
搜狐视频	QQ	图吧
风行	快播	奇艺
天气通(WEA)	微信	熊猫看书
天气通(WEA)	微信	
快播	微信	风行
快播	风行	
QQ	风行	快播
唱吧	酷狗	熊猫看书
唱吧	酷狗	熊猫看书
酷我	风行	快播
百阅	淘宝（S）	股票（F)
阿里旺旺(S)	微信	QQ 游戏
虾米电台	百度音乐	啪啪
淘宝(S)	QQ	微信
唱吧	微博	我查查 (S)
唱吧	微博	

搜狐	风行	快播
搜狐	风行	快播
风行	酷狗	搜狐
风行	酷狗	搜狐
图吧	微信	狂野飙车 8
神庙逃亡 temple run		
ireader (W)		
微信	QQ	唱吧
Mappy GPS Free	Sytadin (T)	SeLoger (O)
le monde	6park	wechat
fidme (S)	evernote (W)	flipboard
speed appel (W)	skype	mozila firefox (W)
instagram	flipboard	runtastic
Camscanner (W)	Evernote (W)	Third blade
Facebook	Angry Birds	Marmitton(O)
file explorer (W)	Ratp (T)	mobile Ip
Evernote (W)	Angry Birds	Logo Quiz
OffMaps 2	Wiki Offline (W)	WhatsApp
marmiton (O)	750grammes (O)	mapmyride
Ingress	Chrome (W)	Banque (F)
easyJet (T)	Lighter	Cuisine par le journal des femmes (O)
superUser (W)	cpuTuner (W)	app2SD (W)
runkeeper	fourchette (O)	paris.fr (W)
jeux de golf	biblioth èque de roman	
fais moi chauve	google musique	ratp (T)
Angry Bird	Angry bird star wars	Avego (T) (covoiturage)
Angry bird Star wars	voyages-sncf (T)	Jabiru
Kingdom Rush	Lemonde.fr	Wikipedia (W)
angry birds		
bluestream	groovemobile	hungry shark free
Ratp (T)	facebook	wordreference (D)
talking tom		
Gmail	Deezer	Ecoute
Ratp (T)	Voila Mail	Linkedin
Le bon coin (O)	Ratp (T)	angry bird
La centrale (T)	La Fourchette (O)	Convertisseur de devises (F)
francetv	20minutes (N)	m étro (T)
Angry birds	M6	Le Monde
Shrooms	Bubble Island	Prezi (W)
Duomi music	Endomondo	Sina microblog
Shu Xiang Yun Ji (书香云集)	Weibo	autolib (T)

TripleTown	nespresso (S)	instagram
Kakao talk	Google drive (W)	新浪视野 (N)
Tiny Trooper	EpocCam (W)	
UGC direct (O)	Ice age village	FreeCell
flight track (T)	delta (T)	babycenter (O)
Pleco (D)	法语助手 (D)	微信
travel guide (T)	pano camera (W)	talking lila
Number	Prixing (S)	12 days of Christmas
Baidu Application Store (W)	Asphalt5	SquiggleApp
Deezer	Linkedin	Voyage SNCF (T)
eventbrite	audiogalaxi	velib (T)
Uno	angry bird	k Rd guide
Figaro	Boursorama (F)	Weibo
Ratp (T)	Essence Free (O)	Skype
saint lazare (S)	photos noël	rest'oh! (O)
Slovoed dictionary (D)	RU grammar (E)	Whatsapp
banking (F)	logo quizz	chrome (W)
Chérie FM	RATP(T)	Allociné
google map	k-9 mail	wikipedia(W)
Tweetbot		
almanach	draw something	jelly jump
angry birds	facebook	marmitton (O)
LiliGo (T)	News Republic (N)	SuperGnes
Sina weibo	home design story	Allociné
Swampy	Mappy GPS	
Ratp (T)	wechat	mymaps
Plants vs zombies	cut the rope	fruits ninja
shazam	hoffmann (W)	lbpa
Etsy (S)	nespresso (S)	Words Free
Cloud orange (W)	Shazam	Pinball Deluxe
Shazam		
Google Apps Lookup (W)	Finance (F)	Bourse(F)
you tube	google reader (W)	
INSTAGRAM	Adobe PS EXPRESS	GMAIL
Bubble island	GOF2	Airspin
Poids et santé	MX player (W)	Farm frenzy
Ratp (T)	Angry birds	Météo (WEA)
Météo (WEA)	actualités journaux Français	Sports
google maps	8 tracks	viber

fidme (S)	Deezer	Dooors
Angry bird	fruit ninja	cut the rope
Zombie plantes	snake	block VS
Inspirational quotes	iQuran	NASA (E)
Manga	Pixiv	bilibili
Runner	Angry birds	Wikipedia (W)
Euro sport	Nin jump	Facebook
Run tastic	QR Droid (W)	Taper moi
Sleep time (O)	Net Swiss tool free (W)	Google Play Musique
Larousse Francais (D)	Guide pal (T)	ratp (T)
Navigo(T)	Dilandau	Chaine Meteo (WEA)
Bingo bash	Uno	Fruit ninja
le monde	Mappy	Navigo (T)
Dictionnaire(Francais-Espagnol)(D)	Fruit ninja	Meteo (WEA)
Mappy	Pages jaune (T)	le monde
Bulid a train	Finger tennis	Chess
Talking Tom	Shazam	Piano
Fruit ninja	Labyrinth	Gomoku Free
Finger tennis	Runner	taper moi
Bump (W)	instagram	Here Maps
Viber	Shazam	Mon calendrier (O)
Wechat	Sound hound	Facebook
Facebook	talking Tom	Angry bird
Google Calender (O)	Zombi nami	Wenyi jia chang cai (O)
Angry bird	Dictionnairy (D)	Pdf reader (W)
RA (resident advisor)FR	facebook	NBA
flow	PathPix Joy	jorte calendar (O)
Score	Faubourg Simone	Need for speed
Instagram	Facebook	Windows Live mail
Draw Something	Dropbox (W)	Google Agenda (O)
Quizz	Allocin é	Sims Gratuit
drawsomething		
easy pro photo	asking quiz	shark dash

Draw Free (W)	Capitales	Quiz capitales
démineur	whatsapp	
Boursorama Banque (F)	Paris ci la sortie du metro (T)	Google Maps nouvelle version Apple iOS
Angry Birds Space	Shazam	Babel Rising 3D
Evernote (W)	AngryBirds	VLC (W)
Mind map (W)	Angry birds Rio	Logo quiz
seloger (O)	Ebay (S)	Angry Birds
Surfer subway	Gtalk	Running Nike
Le Monde	La vie éco (N)	angry pigs
TwitchTv	Amazon App Store (W)	Unified Remote (W)
94 seconds	Endomondo	Pleco (D)
instagram	facebook	ted (E)
cineplex	compass	easy voice recorder (W)
SNCF (T)	RATP(T)	Talking Tom
Meteo.fr (WEA)	RATP (T)	Kakaotalk
Ruzzle	wordfeud	whatsapp
Ratp (T)	Allociné	
Lufthansa APP (T)	Twitter	Ebook Reader (W)
Transilien (T)		
PMP Flashcard (E)	eTOM Browser (W)	WeChat
ireader (W)	Duokan reader (W)	LinkedlIn
skype	audiobooks	BBC
Angry bird		
space invader	QQ	斗地主
ted (E)	bbc news (N)	
Xcode (W)	Angry birds	Calender (O)
Angry birds star wars	Sherlock wolms e-books	Finger tennis BD
Compass	Calendar(O)	Pdf reader (W)
Ratp (T)	Runner	Joke
Sougou input (W)	Youtube	Weibo
Talking Tom	Fruit ninja	Fall down
Mino piano	English-French dictionnairy (D)	Radio France
Bump (W)	Emoji	Block vs
Google talk lite	QQ	Shazam
Skype	Ebuddy	Angry birds
Pdf reader(W)	RATP(T)	Pages jaune (T)
QQ	Poker	Runner
Meteo (WEA)	Calendar(O)	Angry birds
Emoji	mini piano	solitaire
Logo quiz	Candy crush saga	Le massacre Gangnam

		style
Draw something free	Sephora France (S)	instagram
Here Maps	Youtube	Tiny Troopers
Showroom prive (S)	My little pony	Zombie Tsunami
Facebook	Walk tracker pro	Death moto
Sephora France (S)	Extreme Road trip	Showroom prive (S)
Ratp (T)	Localiser mes aims	Jeu de Chevalerie
Viber	show room prive (S)	Logo quiz
Mappy	Draw something free	shooting showdown
Facebook	Piano	Angry birds space free
Death moto	Tiny trooper	Mcdo France (O)
Piano	Deezer	Shooting showdown
QQ	微信 Weixin	Angry birds
Heroes of order & chaos	simpson:Spring field	Mon calendrier (O)
Mappy	RATP (T)	Zombie wood
Logo quiz	viber	Doors &Rooms
Show room prive (S)	Lampe-torche (W)	Draw something free
Skype	微信 WeChat	WhatsApp
facebook	youtube	google (W)
facebook	youtube	google (W)
angry birds	facebook	google (W)
angry birds	facebook	google (W)
angry birds	facebook	google (W)
angry birds	google (W)	
QQ	google map	angry birds
googletalk	google map	google+
QQ	豌豆荚 (W)	google map
Temple Run	QQ,	微信 we chat
fruit ninja	ireader (W)	Kugou Music
fruit ninja	ireader (W)	Kugou Music
fruit ninja	ireader (W)	Kugou Music
QQ	ireader (W)	360 卫士 (W)
Endomondo	Deezer	My Student Life
WhatsApp	RATP (T)	Messenger
google sky maps	xbmc remote	sfr tv
xiaonei	BNP comptes (F)	France Info
Snake 2k	Robot unicorn	Jeune Afrique
RecForge	ZJM	Dictionnaire Fran çais-Italien (D)
Aurasma	Chinese Japanese Translator (W)	Chrome (W)
Google Drive (W)	NY Times	Subway Surf

viber	instagram	leboncoin (O)
instagram	Google Maps	Shark Dash
Face book messenger	Candy Flick	PDF Max pro (W)
Blueprint 3D	Angry birds star wars free	Logo quiz by country
PIP Camera	Gangnam Dancebooth	Bubble seasons
Facebook messenger	Localiser mon iphone	Angry birds star wars free
Angry birds star wars	Shark dash	Le petit bac
Google Maps	PIP Camera	instagram
Fitness	Logo quiz by country	Candy crush saga
Mad skills BMX	Subway Surfers	PDF Max pro (W)
Apps fire (W)	Fruit ninja	Logo quiz Ultimate
instagram	Skype	Emoji&unicode icons
Bubble season	Draw something free	Candy crush saga
Google Maps	instagram	Bubble seasons
Angry birds star wars free	Falling down	Subway surfers
Pages jaune (T)	Logo quiz Ultimate	Gangnam Dancebooth
PDF Max pro (W)	Le bon coin (O)	Skype
Skype	Angry birds	Face book messenger
Block VS	Meteo (WEA)	Angry birds
Skype	Facebook Messenger	instagram
Deezer	Bike race free	Amazon mobile FR (S)
Bike race free	Ebay mobile (S)	BNP mobile (F)
PDF Max pro (W)	instagram	Logo quiz
SFR TV	Google traduction (W)	Meteo (WEA)
Live messenger free	Amazon mobile (S)	Angry birds rio
Radars France (T)	Amazon mobile (S)	Euro sport
My little pony	Carrefour (O)	Showroom prive (S)
Facebook messenger	Skype	Weixin
SmartSWF	Capitals Quiz	Paris by Bike (Velib)(T)
Wikitionary (D)	Giggity	9GAG
Deezer	facebook	
Skype	Le bon coin (O)	
Subway suffers	Bubble season	Draw something free
RATP (T)	SFR TV	Meteo (WEA)
angry birds	My little pony	PDF Max pro (W)
Pages jaune (T)	Gangnam Dancebooth	Logo quiz
Logo quiz	viber	Doors &Rooms
SFR TV	Google traduction (W)	Meteo (WEA)
Google map	Apps fire (W)	Carrefour (O)
Le bon coin (O)	RATP (T)	Angry birds
Facebook messenger	PDF Max pro (W)	
instagram	xbmc remote	Paris by Bike Velib(T)
WhatsApp	RATP (T)	Messenger

facebook	youtube	google (W)
Endomondo	Deezer	My Student Life
viber	instagram	leboncoin (O)
Mappy	Draw something free	shooting showdown
Facebook	Walk tracker pro	Death moto
Emoji	mini piano	solitaire
Logo quiz	Candy crush saga	Le massacre Gangnam style
QQ	Skype	MSN
Here Maps	Youtube	Tiny Troopers
Compass	Calendar(O)	Pdf reader (W)
Ratp (T)	Runner	Joke
Sougou input (W)	Youtube	Weibo
Talking Tom	Fruit ninja	Fall down
Mino piano	English-French dictionnairy (D)	Radio France
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Angry bird	Dictionnairy (D)	Pdf reader (W)
RA (resident advisor)FR	facebook	NBA
flow	PathPix Joy	jorte calendar (O)
Score	Faubourg Simone	Need for speed
Instagram	Facebook	Windows Live mail
Draw Something	Dropbox (W)	Google Agenda (O)
Quizz	Allocin é	Sims Gratuit
Finger tennis	Runner	taper moi
Bump (W)	instagram	Here Maps
Viber	Shazam	Mon calendrier (O)
le monde	Mappy	Navigo (T)
Dictionnaire (D)	Fruit ninja	Meteo (WEA)
Mappy	Pages jaune (T)	le monde
whatsApp		
instagram		
face book messenger	PDF Max pro (W)	
google sky maps	SFR TV	
temple Run	angry birds	sherlock
skype	shazam	Radio France
微博 weibo	QQ	必应词典（D)
我爱背单词(E)		
GAMES		
布丁优惠券(S)	skype	天猫 (S)
soso 地图	指南针	天气 (WEA)
EDF recrute (O)	meteojob (O)	

Ratp (T)	Dropbox (W)	QQ
renren	heartbreaker	weibo
悠悠导航	网易公开课 (E)	割绳子 cut the rope
会说话的汤姆猫 Talking Tom	QQ	
ice village	temple run	sncf (T)
wechat	fidme (S)	手机杂志
Instagram	Facebook	Windows Live mail
网易新闻 (N)	一个 one	QQ 空间
水果忍者 fruit ninja	万年历 (O）	墨迹天气(W)
微博	微信	啪啪
有道词典 (D)	wechat	francetv
微博 weibo	QQ	ibooks
sudoku	dolphin browser (W)	transilien (T)
淘宝(S)	阿里旺旺(S)	携程无线 (T)
德语词典 (D)	德语广播	德语电视
skyscanner (T)	sncf-voyage (T)	gaumont-pathe
angry birds	心动小狗 doggy sweetie	
sina weibo	QQ	
有道英语(E)	法语助手(D)	Skype
莫言全集	明朝那些事儿	网易新闻(N)
微博	微信	搜狗地图
支付宝(F)	微信	杂志
Subway suffers	mandora	temple run
google map	facebook	ibooks
weather report (WEA)	Amazon mobile (S)	ebay mobile (S)
Hill Clime Racing	air droid (W)	Chrome (W)

4 Sythèse en Français

Content

I. Motivation et intérêt

En 1999, les applications mobiles commencent à l'origine au Japon avec le service de NTT DoCoMo iMode. En 2002, iMode est étendu à la France et au Royaume-Uni. En 2007 et 2008, il fait faillite en raison des prix élevés, du manque de soutien et de l'insuffisance de fournitures d'applications. En 2008, Apple commence à distribuer les applications numériques à un moment parfait quand iMode s'est éteint, et Google fait de même. Depuis 2008, nous voyons l'âge fantastique des applications mobiles naître. 2009 et 2010 étaient des années fastes pour les applications ; Nokia, RIM, Microsoft ont tous rejoint l'aventure en marche. En 2011 et 2012, les nouveaux arrivants comme Amazon App Store sont présentés. Des boutiques d'applications pour les ordinateurs de bureau sont également apparues comme Apple Mac App Store et Windows store. 2013 est une année de développement stable.

Au cours des dernières années, les applications mobiles (app pour faire court) qui s'exécutent sur le système d'exploitation des appareils mobiles sont devenues un canal important de réseau mobile. En 2013, il y avait un milliard de Smartphone, deux million d'applications, 110 milliards de téléchargements, et 26 milliards de dollars en ventes sur le marché de l'application mobile. Un écosystème de marché d'applications mobiles complexe, complet et efficace a été construit avec l'objectif de produire des revenus considérables. Il y a une série de participants avec des externalités de réseau serrés dans le marché de l'application mobile.

La question la plus intéressante est qu'il y a effectivement deux plates-formes à deux faces de travail interconnectées de manière coordonnée sur le marché des applications mobiles. Ces deux plates-formes magiques sont la plate-forme de vente d'applications et la plate-forme de vente publicitaire pour les applications, appelées App-store et Ad-store dans cette étude.

Le marché de l'application mobile est un marché biface compliqué. Comme dans d'autres marchés bifaces traditionnels, des études de stratégies de tarification et de points à générer des bénéfices sur le marché des applications mobiles sont en grand besoin. En raison de l'écosystème complexe, il y a, aujourd'hui, peu d'études connexes sur ces sujets.

Cette étude se concentre sur les stratégies tarification des plate-formes de vente d'applications et l'élan derrière l'écosystème du marché de l'application mobile. Cela viendra compléter l'étude de tarification des plates-formes à double face sur les marchés et d'introduire des points de recherche utiles.

II. Les questions de recherche et le cadre de la thèse

Sur le marché des applications mobiles, les utilisateurs doivent généralement acheter des appareils mobiles pour accéder à la plate-forme App Store. La plateforme App store dépend de la distribution de l'application et la plate-forme ad est financée par la fourniture de services in-app publicitaires. Les grandes questions, les recherches critiques commencent par la définition du modèles d'affaires et le fonctionnement de l'ensemble de l'écosystème. La vérification et l'analyse des habitudes de l'utilisateur de l'application et des préférences de prix sont très importantes. Voici les principales questions de recherche dans mon étude.

1 Quel est le marché d'applications mobiles et quel est son écosystème? Comment fonctionne l'écosystème?

2 Est-ce vraiment un marché biface? Quels sont les liens entre le marché de l'application mobile et les marchés bifaces?

3 Quelles sont les structures de prix et la dynamique de la plate-forme App Store?

4 Y a-t-il des différences d'utilisation de l'application et des prix des app ou des préférences selon les pays? France et la Chine? Pourquoi?

5 Peut-on mesurer des déterminants de prix de la plateforme App-Store? Si oui, quelles sont les principales différences entre la France et la Chine?

Dans le chapitre 1, les questions de recherche, les méthodes de recherche et le résumé de la littérature des marchés bifaces sont couverts.

Le Chapitre 2 élabore les attributs, le développement et la chaîne de l'industrie sur les marchés bifaces. La question 2 est discutée dans ce chapitre.

Le Chapitre 3 est la description du marché de l'application mobile comme un marché biface. La question 1 est discutée dans cette partie.

Dans le chapitre 4, je me réfère aux déterminants de la tarification sur les marchés bifaces et ensuite pour la plate-forme App Store. Puis j'analyse les modèles d'affaires, y compris dans l'application de la publicité, les applications payantes, freemium et les achats in-app. Les relations monétaires sur le marché sont définies et les avantages, les coûts et les charges sont analysés. Les limites de la modélisation sont exprimées et le modèle de conduite du matériel d'Apple et les modes in-app publicitaires de Google sont présentés. Enfin, j’ai présenté des suggestions de prix. La question 3 est couverte dans le chapitre 4.

Le chapitre 5 est basé sur une enquête de consommation application mobile en France et en Chine grâce à internet. La question 4 est mentionnée dans le chapitre 5.

Le chapitre 6 est une étude empirique sur l'élasticité-prix de la demande de l'utilisateur de l'app en France, en Chine et aux États-Unis grâce à la collecte de données de seconde main. La question 5 est couverte dans cette partie.

Dans le chapitre 7, les suggestions de tarification de la plateforme app store sont présentées. La limitation de cette étude et intérêts futurs de recherche sont expliqués.

III. Le marché de l'application mobile est un marché biface

1 Description du marché biface

Il y a six caractéristiques particulières pour les marchés bifaces fondées sur l'étude de Rochet et Tirole (2004), Wright (2004) et Jullien (2008).

(1) Deux groupes distincts et bien identifiés des agents ou des utilisateurs;

(2) Les externalités de réseau (positifs ou négatifs) existent entre les deux côtés;

(3) Une plate-forme fournit des produits ou services à deux côtés et fixe les prix à deux côtés en même temps;

(4) Une plate-forme peut internaliser les externalités de réseau entre les deux côtés (Wright, 2004) et réduit les coûts de transaction;

(5) La structure tarifaire est non neutre sur les marchés bifaces;

(6) la plate-forme peut affecter le volume des transactions à travers sa structure asymétrique des prix aux deux côtés d'un montant égal du niveau de prix total.

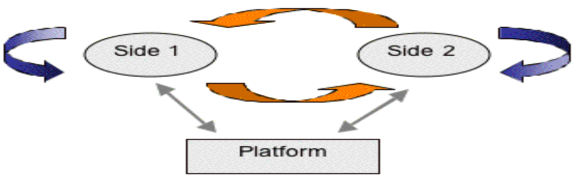

Figure 9 Two-sided markets

Les marchés bifaces existent généralement dans Internet, les télécommunications, les médias et les industries de cartes de paiement. Nous pouvons également trouver les exemples de deux côtés marchés dans les industries intermédiaires comme la plate-forme E-commerce, datant club, supermarché, Voyage ou agence immobilière.

L'application store est un nouveau type de plate-forme dans les marchés bifaces. Comme la console de jeu vidéo et le système d'exploitation de l'ordinateur, l'app store tente également d'atteindre les développeurs d'applications et les utilisateurs à bord pour la distribution de l'application.

2 Ecosystème sur le marché des applications mobiles

1.1 Ecosystème mobile de marché des applications

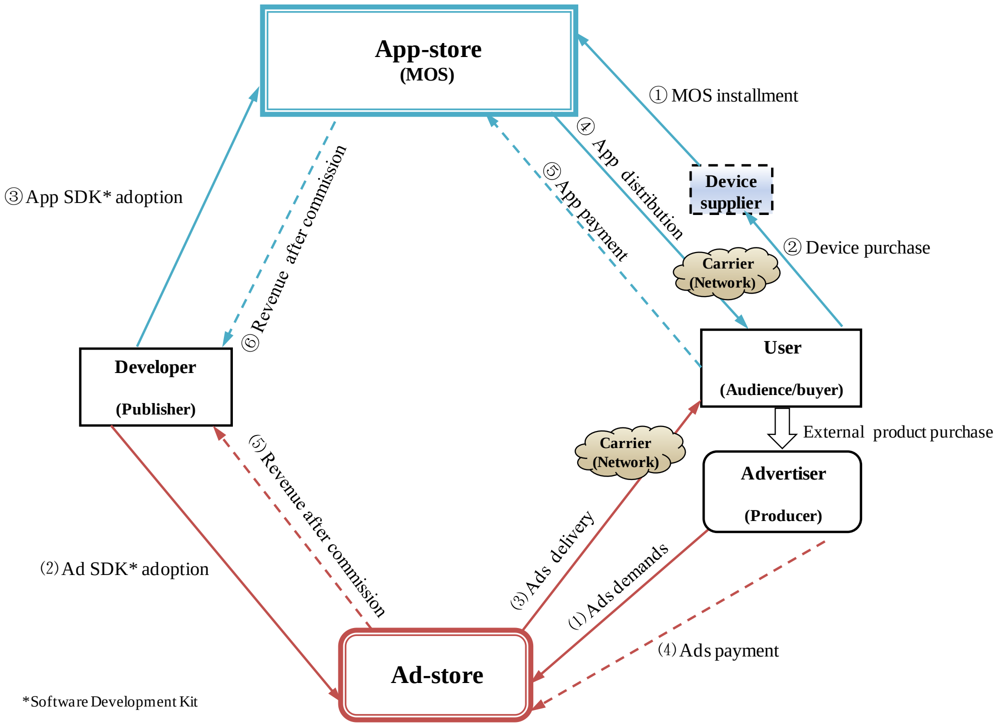

Figure 10 Ecosystem of the mobile app market

Il y a deux plates-formes: App-store et Ad-store. Trois groupes d'utilisateurs finaux: les développeurs, les utilisateurs, les annonceurs (Figure 10).

Les applications s'exécutent sur le système d'exploitation mobile (MOS pour faire court). iOS d'Apple et Google Android sont les exemples de MOS. Le MOS est considéré comme la plate-forme App Store dans cette étude. L'appareil mobile est le support pour les applications.

L'écosystème a été décrit par la distribution de l'application sur les appareils mobiles.

①+②: Fournisseurs d'appareils mobiles installent un MOS sur leurs appareils, puis les envoyent aux utilisateurs.

③: Les développeurs s'abonnent à la plate-forme app-store et sont faiblement facturés pour les frais d'adhésion, $ 99 dans Apple App Store, 25 $ dans Google Play. Ils adoptent le système de développement d'application et soumettent les applications pour l'app-store.

④: Les utilisateurs viennent à l'App-store pour choisir et télécharger leurs applications préférées. L'App-Store distribue les applications via le réseau mobile sur les appareils mobiles des utilisateurs. Les applications sont généralement classées en celles qui sont gratuites et celles qui sont payantes.

⑤: Lorsque les utilisateurs téléchargent les applications payantes ou font des achats in-app, ils paient à l'App-store directement. L'App-store conserve une commission d'un certain pourcentage qui est prédéterminé avec les développeurs.

⑥: Il envoie le reste des revenus aux développeurs.

Il existe un processus de publicité in-app lorsque les utilisateurs téléchargent des applications gratuites.

(1): Les annonceurs aussi appelé producteurs, proposent leurs demandes de publicité à l'ad-store. L'Ad-store recueille les annonces et les met à disposition dans un espace de stockage de publicité.

(2): Dans le même temps, les développeurs aussi appelés éditeurs, ayant l'accès à l'ad-store, fournissent les espaces d'édition d'annonces et adoptent les annonces.

(3): Lorsque les utilisateurs téléchargent des applications gratuites sur l'App store, Ad-store enverra les annonces correspondantes à ces applications gratuites téléchargées via le réseau mobile pour les utilisateurs.

(4): Lorsque les utilisateurs lisent, cliquent sur ou installent les annonces, les annonceurs paient un prix pour ces annonces à l'ad-store.

(5): Ad-store conserve également une commission prédéterminée et passe le reste des recettes publicitaires aux développeurs.

Les utilisateurs peuvent acheter les produits ou d'autres applications payantes au travers de ces publicités des annonceurs.

Si les utilisateurs achètent d'autres applications payantes, cela va répéter cette opération.

C'est l'écosystème dans ce marché: deux plates-formes et trois groupes d'utilisateurs finaux.

3 Le marché de l'application mobile est un marché biface

Basé sur la définition des marchés bifaces dans Rochet et Tirole (2004), le volume des transactions réalisées sur la plate-forme dépend de la réaffectation de son prix total entre les deux parties. Sur le marché de l'application mobile, la plate-forme App-store charge les développeurs et les utilisateurs, le volume réel des transactions d'applications dépend de la réaffectation du montant total entre les deux parties. Lorsque les plateformes App-Store chargent Δa plus frais du côté utilisateur et en même temps diminue les mêmes frais Δa du côté développeur, les téléchargements d'applications des utilisateurs diminueront rapidement. Le volume des transactions baisse dans ce cas. Cela se produit également dans le cas inverse.

La plate-forme Ad-store charge les développeurs et les annonceurs. Le volume des transactions publicitaires des apps dépend de la réaffectation du prix total entre des développeurs et les annonceurs.

Sur le marché des applications mobiles, les développeurs, les annonceurs et les utilisateurs sont trois groupes d'utilisateurs finaux. L'App-Store et Ad-store sont les deux plates-formes bifaces. L'App-Store partage les revenus des ventes d'applications avec les développeurs. L'Ad-store partage les revenus publicitaires avec les développeurs.

Nous pouvons observer l'importance des externalités de réseau, les rôles de la plate-forme App-Store et de la plateforme Ad-store, et les stratégies de tarification asymétriques de plateforme sur le marché des applications mobiles. Et nous confirmons que le marché des applications mobiles est clairement un marché biface. Il y a trois groupes d'utilisateurs finaux qui sont affiliés à deux plates-formes bifaces, et ces plateformes sont florissantes et dynamiques.

3.1 La classification d'App-store et Ad-store

Il y a quatre catégories d'App-store dans cette étude: Système d'exploitation mobile (MOS App-Store, Ex.Apple et Google Play); Opérateur de réseau mobile (MNO App-Store, comme AT & T App centre); Third-Party (TP App-Store, Ex. Appia et Amazon) et la fabrication des appareil mobile (DM App-Store, comme LG smart world).

In-app store Ad-store (comme iAd et Admob), Third-party Ad-store (comme inMobi) and Aggregator Ad-store (Mobclix) sont les trois types des Ad-store.

3.2 Les externalités de réseau sur le marché des applications mobiles

Sur le marché des applications mobiles, les externalités de réseau non seulement existent entre les différents groupes, côtés / plates-formes, mais aussi au sein d'un même côté. Les externalités de réseau existent même entre applications gratuites et payantes, les applications et les appareils mobiles, les applications et les produits externes. L'écosystème de marché des applications est, sans aucun doute, un monde fascinant des externalités de réseau (Table 1).

Table 1 Network externalities in the mobile app market

Group 1	**Group 2**	**Direct network externalities in group 1**	**Direct network externalities in group 2**	**Indirect network externalities between group 1 and 2**
Developer	User	+/-	+	+
Developer	Advertiser	+/-	-	+
Developer	Device supplier	+/-	-	+
Advertiser	User	-	+	(1 to 2) – (2 to 1) +
Free apps (Ad-funded apps)	Paid apps	+/-	+/-	(1 to 2) + (2 to 1) -
Apps	Mobile devices	_	_	+
Apps	External products	_	_	+
App-store	Ad-store	_	_	+

3.3 La structure de prix est non neutre sur le marché des applications mobiles

Si nous supposons que le volume de transaction de l'application est v, la structure de tarification de plateforme influe sur v. Les redevances d'adhésion (membership fee) ne sont pas considérées dans cette étude. Les frais aux développeurs sont les redevances d'usage (usage fee). La plate-forme peut modifier la part du revenu prélevé pour changer les frais pour les développeurs.

Les coûts de transaction ou l'interdiction (ou la contrainte) posées par la plate-forme entre les des deux côtés affectent la neutralité de la structure des tarifications.

La structure des prix pour plate-forme mobile App-store est non neutre avec les raisons suivantes.

(1) Les développeurs et les utilisateurs ne peuvent pas accéder à la négociation directe et efficace. Il y a un grand nombre de développeurs et d'utilisateurs. Il est difficile de trouver une agence qui peut représenter pleinement les avantages des deux parties développeurs et utilisateurs. Donc à la fois les deux côtés vont essayer de maximiser leurs propres avantages au cours de la négociation. En plus de l'information asymétrique, un résultat efficace sur les transactions de l'application par la négociation est difficile à réaliser. C'est une condition de non-neutralité de la structure des prix.

(2) Les coûts de transaction existent pour les développeurs et les utilisateurs, et c'est une autre condition de non-neutralité de la structure des prix. Les développeurs ont des coûts de transaction et ne peuvent pas transmettre aux utilisateurs. Les utilisateurs ont des coûts d'opportunité de remplacer les appareils portables.

(3) la plate-forme App-Store peut imposer des clauses de contraintes pour les développeurs sur le marché des applications mobiles.

Apple App store et Amazon App store imposent des restrictions sur les développeurs d'applications à la soumission de contenu numérique. Les prix de l'App dans Apple App Store et Amazon App Store ne sont pas autorisés à être plus élevés que dans les autres plates-formes. Apple et Amazon imposent une clause de client le plus favorisé pour les développeurs d'applications. Donc le développeur ne peut pas passer la majoration du prix de la plateforme App-store à l'utilisateur.

Relativement peu de plates-formes se concurrencent sur les marchés bifaces en raison des effets de réseau indirects sur le côté de la demande et des coûts fixes de l'établissement de plates-formes. Ceci se concrétise sur le marché de l'application mobile où existent quelques monopoles. Apple App Store et Google Play sont les deux géants suivis par Windows store et Blackberry world. Les deux Ad-stores dominantes iAd et Admob sont exploités par Apple et Google. Mobiles Ad-store et App-Store travaillent ensemble pour apporter une application monde prospère.

IV. Que nous dit la littérature

L'étude du marché biface a commencé dans les années 1990. Il y a principalement quatre parties sur les marchés bifaces. Étude: externalités de réseau, les déterminants et les stratégies plateforme prix, étude de l'industrie empirique et la réglementation et la protection sociale.

1 Une structure de prix sur les marchés bifaces

Sur les marchés bifaces, il est répandu de facturer deux taxes différentes interdépendantes : redevances d'adhésion (membership fee) pour rejoindre la plate-forme et redevances d'usage (usage fee) pour l'utilisation de la plate-forme.

Table 2 Pricing structure in two-sided markets

Platform	Side	Membership fee	Usage fee
Real estate	Buyer	×	×
	Seller	×	√
Newspaper	Reader	√(≦MC)	×
	Advertiser	×	√
Super market	Consumer	×	×
	Supplier	√	×
DoCoMo iMode	User	√	√
	Content provider	×	√
Operating system	Buyer	√	×
	Software developer	√(<MC)	×
Video game console	Player	√(≦MC)	×
	Game developer	√(<MC)	√
Payment card system	Card holder	√(<MC)	×
	Merchant	×	√
Mobile app store	User	× or √*[320]	×
	Application developer	√(<MC)	√

(Reference: Evans David (2008))

La fonctionnalité de tarification particulière sur les marchés bifaces est indiquée dans Table 2. La tarification asymétrique des marchés bifaces est la structure des prix sur les marchés bifaces. La tarification asymétrique est commune. La plupart des plates-formes à deux faces apparaissent pour obtenir la prépondérance de leurs bénéfices d'exploitation principalement d'un côté. Certaines plates-formes à deux faces spéciales pratiquent des prix qui sont inférieurs au coût marginal ou en dessous de zéro.

Pour l'app store mobile, les utilisateurs sont soit facturés sans frais ou une partie des frais d'achat d'appareils mobiles sont pris comme les redevances d'adhésion. Les développeurs sont facturés avec des redevances d'adhésion faibles pour accéder à la plate-forme et des redevances d'usage par transaction. Les redevances d'usage sont généralement une part des revenus des ventes d'applications.

2 Déterminants de la tarification de la plate-forme dans les marchés bifaces

Les niveaux de la structure des prix et prix sur les marchés bifaces sont déterminés par une série de

[320] √* indique ici que des redevances d'adhésion sont chargées par la plateforme app store qui fournit également l'appareil mobile. Il s'agit d'une redevance d'accès positive (souvent une proportion du cout de l'achat du mobile) de la part de l'utilisateur

considérations, comprenant l'élasticité-prix de la demande; externalité de réseau; singlehoming ou multihoming; la différenciation des produits ou la demande des clients pour la variété; le pouvoir de marché de producteur; Interconnexion des plates-formes; engagement; type de plate-forme; la difficulté des opérations de surveillance; difficulté de charge et le coût de la plate-forme d'exploitation. Outre les facteurs clés communs ci-dessus, le coût d'achat appareils mobile est un déterminant de la tarification spéciale sur le marché de l'application mobile.

La plupart des études sont illustrées en prenant une plate-forme monopolistique et de maximisation des profits comme une référence pour obtenir les principes de base de stratégies de prix sur les marchés bifaces. Les prix sous la concurrence de plates-formes a été élargie fondée sur l'étude de plate-formes en situation de monopole.

2.1 Redevances d'adhésion/d'usage et élasticité-prix de la demande - Rochet et Tirole (2004)

La redevance d'adhésion est le coût pour joindre les frais de plate-forme et la redevance d'usage est le coût d'utilisation de la plate-forme par transaction.

L'élasticité-prix de la demande (PED ou Ed) est une mesure conçue par Alfred Marshall utilisée en économie pour montrer la réactivité, ou l'élasticité, de la quantité demandée d'un bien ou un service à une variation de son prix.

L'étude de Rochet & Tirole (2004) a indiqué que le prix de cette plate-forme à deux côtés était inverse de l'élasticité de la demande par rapport au prix. Le côté supérieur élasticité-prix sera facturé moins par plateforme.

2.2 Elasticité-prix de la demande & externalités de réseau & singlehoming ou multihoming -- Armstrong (2006)

Le côté avec élasticité-prix de la demande élevé peut être subventionné par une plate-forme en monopole;

Les externalités de réseau indirectes créent des compétitions de marché;

Le côté Singlehoming est facturé moins sur les marchés des goulots d'étranglement compétitifs.

2.3 Externalités de réseau -- Parker and Van Alstyne (2000, 2002)

Le côté avec de grandes externalités de réseau indirect, est facturé moins par la plate-forme.

2.4 La demande de variété des clients & le pouvoir de marché du vendeur -- Hagiu (2002, 2009)

Le côté vendeur est chargée plus lorsque le côté acheteur a une plus forte demande pour la variété dans les marchés de goulot d'étranglement.

Le côté acheteur est facturé plus quand le vendeur a le pouvoir de marché le plus fort sur des marchés concurrentiels.

2.5 La différenciation des produits -- Armstrong and Wright (2004)

Les deux côtés sont plus facturés lorsque la différenciation des produits est plus grande dans les marchés concurrentiels.

Le côté sera facturé moins quand la différenciation des produits n'existe que sur ce côté.

2.6 Tarification des applications avec ou sans accès à la plate-forme App-Store -- Gans (2009)

Les coûts d'accès à la plateforme (dépenses d'achat de l'appareil mobile) rendent les charges liées à la plateforme nul voire négatifs pour l'utilisateur.

2.7 Autres

D'autres facteurs existent comme la difficulté des opérations de surveillance; difficulté de charge pour deux côtés; type de plate-forme (Hagiu (2006)) et le coût d'exploitation de la plateforme qui influencent également les stratégies de fixation des prix de la plateforme. Et ils ont été mentionnés dans les formules de stratégies de tarification de plate-forme sur le marché biface.

V. Discussion sur les stratégies de tarification de la plate-forme App store

1 Relations monétaires pour la plate-forme App Store

Les relations monétaires sur le marché des applications mobiles doivent être analysées avant l'étude des stratégies tarifaires pour la plate-forme App-store. Les avantages, les coûts, les redevances d'adhésion et les redevances d'usage pour les participants sont nécessaires doivent être exprimées clairement pour obtenir ces relations monétaires. Le schéma suivant (Figure 11) synthétise les relations monétaires et les flux pour la plateforme App-Store, avec en lettres majuscules les redevances d'adhésion (A) et en minuscules les redevances d'usage (a). Parallèlement à ces redevances, on note par B,b les bénéfices d'usage et C,c les coûts. Toutes ces valeurs peuvent être positives, nulles ou négatives.

1.1 Avantages et coûts

La plate-forme App-store fait face à deux côtés - Côté développeur et côté utilisateur. Les développeurs qui vendent des applications à un prix ou dans le modèle financé par la publicité gratuite sont prises en tant que vendeur, côté étiqueté S. Les utilisateurs qui téléchargent et consomment les applications sont côté acheteur, étiquetés B.

Le bénéfice de l'utilisateur d'application est bb. Le développeur obtient des revenus des ventes d'applications, des revenus publicitaires ou de revenus d'achat in-app étiquetés bs avec chaque téléchargement de l'application. Le bénéfice d'adhésion de l'utilisateur pour se connecter avec la plate-forme App Store est Bb. Les bénéfices d'adhésion de l'utilisateur peuvent être le volume et la diversité de l'application dans l'App-store ou des services connexes. Le bénéfice de l'adhésion pour le développeur est Bs. Les bénéfices de l'adhésion peuvent être l'environnement de développement comme l'accès à des forums de développement, le service de facturation des app, ou autres utilitaires de distribution ou de développement de l'App-Store.

La plate-forme App-Store encourt des coûts fixes Cb et Cs par membre, côté utilisateur et côté développeur, et un coût marginal c par l'interaction entre les deux membres de côtés opposés. Les coûts fixes de plate-forme pour l'utilisateur, sont tels que la promotion de la plate-forme, le stockage de données et autres coûts. Pour le développeur les coûts de développement et de maintien de l'environnement de développement et autres coûts de développement d'infrastructure. Le coût marginal par transaction est tel que l'audit, le traitement, le paiement et les coûts de surveillance des données pour chaque application.

1.2 Redevances d'adhésion ou redevances d'usage pour la plate-forme App-Store

On décrit ci-après l'écosystème constitué autour de la distribution d'applications sur terminaux mobiles. Ce système est constitué de deux plateformes inter-reliées de nature biface qui constituent deux "boucles" d'externalités.

Pour utiliser des applications sur un équipement mobile, il est nécessaire de disposer d'un terminal intelligent, c'est-à-dire doté d'un système d'exploitation (OS), que celui-ci soit une tablette, un smartphone, ou tout autre équipement pouvant jouer ce rôle. En règle générale, ce terminal est livré avec son système d'exploitation de façon intégrée. Nous considérons ce système d'exploitation comme l'expression de la première plateforme. Ce terminal intégrant du hardware et un OS est vendu par un acteur fréquemment indépendant (fabricant du hardware, faisant lui-même appel à un réseau de distribution, opérateur de réseau, boutique d'équipements électroniques, etc.). Nous l'appellerons DS (Device Supplier). Celui-ci se fournit auprès de la plateforme pour acquérir l'OS et vend un device à l'usager intégrant l'OS pour lequel il a été conçu.

Il est nécessaire de disposer d'un terminal (device) pour bénéficier des applications offertes sur l'OS du terminal (Figure 11). L'acquisition du terminal (à un prix Ad) peut dès lors être considérée comme un acte d'affiliation à la plateforme. Cette acquisition est infiniment plus onéreuse que les redevances d'usage demandées ensuite pour le chargement d'applications. Le fournisseur de terminaux bénéficie grandement du spectre et du nombre d'applications offertes sur la plateforme applicative, qui constitue un des arguments principaux de vente des terminaux. Ce fabricant se procure l'OS auprès de la plateforme de façon gratuite ou onéreuse (coût Ac). Ce fabricant délivre en général son terminal chargé d'un premier ensemble d'applications de base pour en élargir les fonctionnalités321.

Ac pourrait être nul ou positif. Apple a intériorisé ses iOS coûtent dans l'achat de l'appareil comme

[321] Par exemple, doté d'une appli de sauvegarde des données dans le cloud avec un espace gratuit de stockage d'une taille limitée. La plateforme ou le fournisseur de terminaux (fabricant ou distributeur) peut dès lors acquérir un sous ensemble d'applications auprès des développeurs pour les fournir installées sur les terminaux.

iPhone/iPad/iPod touch. Et Ac est inclus dans Ad dans cette situation. Il est de même pour Windows et Blackberry. Google Android MOS est gratuit pour les fournisseurs de l'appareil mobile. Android est largement utilisé par les fournisseurs de l'appareil mobile en raison de son coût de installation gratuit et de l'environnement le développement ouvert. Nous pouvons donc supposer Ac=0.

La communauté des développeurs se fournit auprès de la plateforme d'un kit de développement (SDK) et paye pour cela une redevance As qui s'apparente à une redevance d'adhésion (membership fee). As est souvent chargée sous la forme de frais annuels. L'usager peut acquérir ces applications via la plateforme App-Store auprès des développeurs.

L'acquisition d'une App peut être gratuite ou payante. Si l'app chargée est payante ou amène à un achat in-app, l'App store garde une commission sur la transaction qui est distribuée entre le développeur et l'usager. La commission de transaction (as) est considérée comme la redevance d'usage des développeurs. Les redevances d'usage des utilisateurs à la plate-forme App-Store (ab) est nulle. Cela signifie que les utilisateurs peuvent télécharger ou acheter des applications sur l'App-store sans frais d'utilisation. Cela peut être dû à la faible consommation d'app de chaque utilisateur et à sa plus grande élasticité-prix de la demande. L'obtention des utilisateurs pour attirer plus de développeurs et d'applications pourrait être plus rentable pour App-store.

Il y a un paiement entre développeurs et utilisateurs lors de chargement d'application payante et d'achat in-app. Nous supposons que ad est le coût d'une application livré de l'utilisateur au développeur à chaque téléchargement d'app payante ou à chaque achat in-app. Ce sont les relations et les flux qui les accompagnent dans la première boucle.

La plupart du temps, les applications téléchargées sont gratuites. La plateforme App-store n'est pas rémunérée pour cette transaction. L'usager ne paye dans tous les cas de figure rien à la plateforme App-store. Dans certains cas, les applications sont payantes, avec des fonctionnalités améliorées ou supplémentaires. Un modèle freemium est parfois mis en place pour certaines applications.

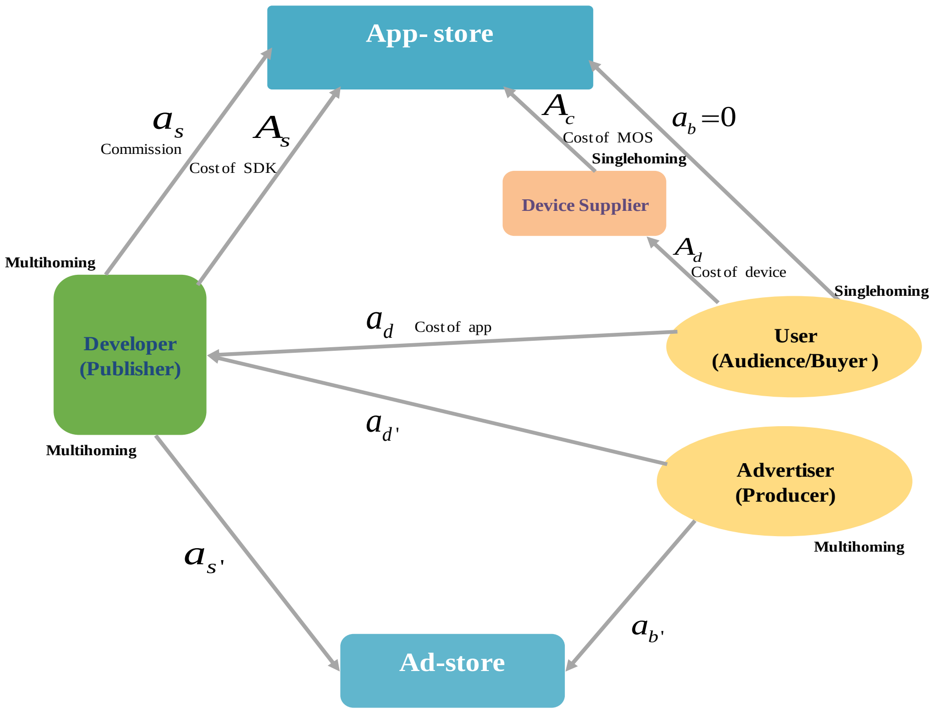

Figure 11 Monetary relations for App-store platform

Cette première boucle ci-dessus, biface, doit être complétée par une seconde boucle manifestant les effets publicitaires canalisés par les applications. De nombreuses applications, notamment celles diffusés gratuitement, délivrent en sus des services offerts, de la publicité, via un second type de plateforme, les plateformes de livraison publicitaire (Ad-store). En ce cas, la manne publicitaire associée est pour partie reversée au développeur (partagée entre la plateforme Ad-store et le développeur).

Un développeur d'applications reçoit donc potentiellement trois types de revenus:

a. Des recettes publicitaires canalisées à travers son application.

b. Des recettes tirées de la vente, généralement selon un modèle freemium, de son application: les usagers payants, recevant une application aux fonctionnalités plus développées, subventionnent pour partie les usagers gratuits.

c. Un bénéfice externe éventuellement sur son activité tiré de la diffusion de son application, s'il est lui-même producteur (meilleure fréquentation, fidélité et transformation accrue en transactions le plus fréquemment = relation commerciale plus rémunératrice).

Deux types de plateformes (App-store et Ad-Store) sont nécessaires pour cela. Elles sont généralement liées à un producteur d'OS de terminaux mobiles.

On est donc en présence d'un dédoublement des fournisseurs et des usagers que nous repérerons par un ' : s' et b' dans le second boucle. Développeur et annonceur sont les deux côtés connectés avec Ad-store. Les utilisateurs qui achètent des produits grâce à la publicité in-app sont les audiences publicitaires. L'annonceur paie pour les frais de publicité à l'Ad-store. L'Ad-store prend une commission par transaction et fournit le reste au développeur. ad est le coût de l'annonce. as' est la commission par publication d'annonce du développeur à l'Ad-store. ab' est la redevance d'usage de l'annonceur à l'Ad-store et il est habituellement de zéro (ab' =0). Ad-store partage les revenus publicitaires avec les développeurs et il conserve la commission. Les redevances d'adhésion des développeurs (As') et des annonceurs (Ab') sont considérés comme zéro. Les développeurs sont encouragés à se connecter avec l'Ad-store pour offrir des places d'affichage de publicité sans les redevances d'adhésion, même s'il existe un coût ad-SDK pour l'Ad-store. Les annonceurs n'ont aucune redevance d'adhésion. Mais le coût de publication publicitaire par transaction est facturé comme des redevances d'usage par l'Ad-store. Le coût d'Ad-SDK sera couvert par les achats de l'annonceur. Dans le cas du chargement d'une application gratuite, même si le prix payé est nul, nous pouvons considérer une utilité (affichage publicitaire ou chargement pouvant amener à l'achat d'une application de meilleure qualité et payante): la différence (b-a) se dégrade du côté des usagers (b).

On peut considérer les redevances d'adhésion comme globalement négligeables (As=0) dans le marché des applications mobiles. Du côté des développeurs, les coûts SDK restent très marginaux par rapport aux gains issus des applications. Du côté des usagers, les redevances de licence pour systèmes d'exploitation ne sont guère connues, soit nulles pour Google Android, soit internalisées pour Apple ou d'autres constructeurs. Donc, nous supposons également Ac=0. On se situera donc dans un contexte de marché biface fonctionnant sur redevances d'usage, sauf en ce qui concerne l'acquisition des terminaux (Ad).

Cet écosystème se mobilise donc comme suit:

1. L'attractivité des terminaux est fonction du volume et de la diversité des applications qui y sont offertes.

2. Cette offre est fonction des perspectives de revenus, issus soit de la vente de ces applications, soit des avantages qu'elles procurent à des tiers (directement par une fréquentation accrue qui compense leur coût de développement/distribution, ou indirectement par la capacité à délivrer un flux publicitaire rémunéré).

3. Les avantages procurés par ces applications sont fonction de leur diffusion, et donc du nombre de terminaux sur lesquels elles peuvent être portées.

Les redevances d'adhésion et d'usage pour App-store et Ad-store sont conclues en Table 3. App-Store peut être supposé travailler sur les redevances d'usage, sauf si l'on considère une partie du coût d'achat de l'appareil mobile comme redevances d'adhésion des utilisateurs. Le côté développeur est la source de revenus pour l'App-Store.

Table 3 Membership fee and usage fee for App-store

	Side 1	Side 2	Revenue source for platform
	User	**Developer**	**App-store platform**
Membership fee	$A_c = 0$ (cost of MOS) λA_d (cost of device for receiving apps, $0 < \lambda \leq 1$)	$A_s = 0$ (cost of app SDK)	Side 2, Revenues share with developers from paid app sales and in-app purchases
Usage fee	$a_b = 0$	a_s (commission)	
	Advertiser	**Developer**	**Ad-store platform**
Membership fee	$A_{b'} = 0$	$A_{s'} = 0$ (cost of ad SDK)	Side 2, Ads revenues share with developers
Usage fee	$a_{b'}$ (cost of ad)	$a_{s'}$ (commission)	

2 Business model du marché des applications mobiles

Il existe quatre principaux modèles de revenus pour les applications mobiles: la publicité in-app, les applications payantes, les freemium et l'achat d'in-app (Table 4). Toutes ces quatre modèles d'affaires pourrait également apporter des revenus provenant de la vente d'appareils mobiles pour le fournisseur de l'appareil et d'autres participants de l'écosystème de marché d'applications mobiles.

Le coût pour les applications vient du développement de la contribution de développeurs, des frais bancaires, du traitement et de la distribution de l'application, et des coûts d'exploitation de la plate-forme de vente des applications.

La répartition du chiffre d'affaire entre les développeurs d'applications et l'App-Store pour la vente des applications payantes et l'achat in-app sont de 70:30. La répartition du chiffre d'affaire entre les développeurs d'applications et les Ad-store est souvent de 60:40.

Table 4 Business models du marché des applications mobiles

Modèle	Résumé du Fonctionnement	Fonctionne mieux pour ces types d'app	Source de revenus pour la plateforme
Publicité in-app (app ad revenue)	Les publicités apparaissent sur un espace vendu dans une application, les revenus dépendent du nombre d'affichages utilisateur, de clics ou d'installations	Jeux, News, Réseaux Sociaux, Divertissement	L'Ad-store reçoit un paiement des publicités partagé avec le développeur
	<u>Parrainage</u> Entreprise ou individu soutenant une application et mettant une publicité ou un logo en échange pour en tirer des bénéfices en retour.	Focus Local ou lié à un événement, Focus sur une audience restreinte	

Applications payantes	L'utilisateur paye une unique fois pour télécharger l'application	Utilitaire, Productivité, Musique et Vidéo	L'App-store partage les revenus des applications vendues avec le développeur
Freemium (bonus / vente incitative)	Version partielle gratuite et version complète payante ou essai gratuit nécéssitant l'achat pour continuer l'utilisation	Jeux, Livres, Finance	
Achat In-app[322]	L'utilisateur achète directement des marchandises virtuelles comme des privilèges additionnels, badges, photos, ...	Jeux, Style de vie, News	L'App-store partage les revenus des applications vendues avec le développeur
	<u>Souscriptions</u>: L'utilisateur paye une faible souscription pour utiliser l'application ou l'utilisateur souscrit un service de contenu et reçoit des informations	Livres, Jeux, Style de vie, News	

3 Discussion sur les stratégies de prix des plateformes de vente d'application

Nous constatons que cet écosystème de marché d'applications mobiles est complexe et ne s'adapte pas facilement dans des schémas de prix classiques de plateforme sur les marchés bifaces.

3.1 Limitations de tarification pour les plateformes de vente d'application

① L'appareil mobile est acquis pour ses propres caractéristiques (téléphone, tablette, photo... et toutes les fonctionnalités natives de l'appareil) et sa capacité à recevoir des applications externes représente sans doute pour une partie, probablement faible, de son prix d'achat. Il ne peut pas être assimilé au coût du dispositif, mais à une fraction du coût qui varie d'un utilisateur à l'autre et d'un terminal à l'autre.

② La plate-forme fonctionne à la fois (principalement) avec des applications gratuites sans transaction monétaire (paiement) entre les deux parties. Il travaille également avec les applications payantes où il y a transaction monétaire (paiement) entre les deux parties.

Rochet et Tirole (2004) ont étudié les redevances d'adhésion et les redevances d'usage de la plate-forme dans le cas où il n'y a pas de paiement entre les deux parties. Il n'est pas facile d'appliquer ce modèle de tarification des plateformes de l'étude de Rochet et Tirole.

③ Les applications gratuites fonctionnent avec ou sans interaction avec la plate-forme publicitaire. En effet, certaines applications gratuites génèrent des externalités positives sur leur cœur de métier externe par le biais de la distribution de l'application.
Nous ne pouvons pas dire que le modèle de revenus pour les applications gratuites est juste la

322 Appelé "in-app billing" dans Google Play.

publicité in-app. La publicité in-app, l'achat in-app et les freemium sont toutes les sources de revenus pour les applications gratuites.

④ Il y a des externalités de réseau indirectes répandues entre les deux côtés de la plate-forme de vente d'Applications, et également d'importantes externalités de réseau directs (ex. Des applications de réseaux sociaux) au sein d'un même côté.
Il y a des externalités de réseaux directs évidents à l'intérieur de groupes d'utilisateurs, en particulier pour ceux qui utilisent la même application, tels que Facebook. Comme pour les services de télécommunication traditionnels, les utilisateurs d'applications de réseaux sociaux profitent des avantages de communiquer avec les autres membres potentiels dans le même réseau social quand il y a plus d'utilisateurs.

Les externalités de réseau existent également entre les développeurs et les annonceurs, les annonceurs et les utilisateurs, les applications gratuites et les applications payantes, les applications et les appareils mobiles, les applications et les produits externes et même entre App-Store et Ad-Store. C'est un réseau complexe pour les externalités de réseau du marché des applications mobiles. Nous ne pouvons pas étudier un seul de ces externalités de réseau sans tenir compte des influences d'autres parties ou groupes.

La plupart des chercheurs se concentrent soit sur les externalités de réseau directs ou de réseau indirects pour le prix de plate-forme. Rochet et Tirole (2004) ont exclus les externalités de réseau directs dans un même côté.

⑤ De nombreux facteurs économiques sont inconnus en raison de l'intégration industrielle présentée dans cet écosystème. En effet, les deux acteurs majeurs, Apple et Google, se concentrent non seulement essentiellement sur les plates-formes App-Store, mais aussi sur diverses activités de fourniture de publicité et d'équipements.

Les principes traditionnels de tarification de plate-formes bifaces ne sont pas adaptés pour évaluer les stratégies et les recettes tarifaires pour les App-store. App-store, ad-store et appareils mobile sont les trois points générateurs de profit de base. Basé en majorité sur les applications gratuites sur le marché des applications mobiles, les revenus des App-Store sur la vente d'application payante et l'achat in-app ne représente qu'une petite partie des bénéfices de l'opérateur de l'App Store. L'Ad-store qui crée des recettes publicitaires considérables pour la majorité des applications gratuites a efficacement complété la chaîne de profit. Le développement des App-Store et Ad-store apporte un grand volume et une diversité d'applications. Les applications doivent fonctionner sur des appareils mobiles associés à MOS. Cela amène une augmentation des ventes de terminaux mobiles en plus. Apple est un bon exemple d'entreprise qui génère des revenus principalement des ventes d'appareils mobiles par l'animation de son App Store.

Suggestions de tarification de la plate-forme App-Store

Les externalités de réseau réciproques sont très développées et renforcées entre les différents côtés, différentes plates-formes et dans côté. En plus des problèmes de tarification nous l'avons mentionné ci-dessus, il est complexe et difficile à simuler. Ainsi, le modèle canonique développé dans la littérature ne peut pas simplement se appliquer.

Toutefois de l'étude, nous pouvons obtenir quelques App-Store suggestions plateforme de fixation des prix raisonnables:

a. Dans le cas d'applications gratuites, les plates-formes intervient principalement de deux façons, selon l'hypothèse des coûts négligeables d'affiliation (les redevances d’adhésion):

i. Flux des ventes d'appareils mobiles (modèle Apple).

ii .Flux de la publicité In-App (modèle Google[323])

En 2012, les revenus d’Apple App store était d'environ 2,000 millions de dollars. les revenus de iAd (Ad-store de Apple) en 2012 etait d'environ 125 millions $. les ventes d'iPhone 2012 était 80,477 millions de dollars et les ventes nettes totales pour Apple était 156,508 millions de dollars. Nous pouvons voir que les rvenus de l'App Store ne était que de 2.5% des ventes de l'iPhone et de 1.3% des ventes nettes totales d'Apple. Les revenus de iAd a juste pris 0.02% des ventes de l'iPhone. Pour Apple, son revenus principale génère des ventes d'appareils mobiles. App Store est une plate-forme de distribution de l'application numérique qui vise à obtenir à la fois côté développeur et côté utilisateur en application Apple écosystème. App Store garde marché de l'application d'Apple de la vitalité à travers diverses applications approvisionnement. iAd a été fixé à ‘améliorer les utilisateurs de l'expérience et aider les développeurs à financer le développement de nouvelles applications’ par Steve Jobs en 2010. Les deux App Store et iAd stimuler les ventes d'appareils d'Apple à la fin.

Les recettes des ventes applications Android était environ $ 540million revenus en 2012. Cela pourrait être considérée comme Google Play revenus en 2012. Il a fallu 1.2% des revenus totaux de Google 46,039 millions de dollars (exclus les revenus liés Motorola) en 2012. Les revenus de Admob Ad–store ont été estimés à environ 300 millions de dollars selon les données d'IDC. Ce était plus de la moitié des revenus de Google Play. La source de revenus principale de Google est la publicité qui comprend la publicité web et la publicité mobile.

b. Dans le cas des applications payantes, le schéma classique d'une plate-forme biface peut être considéré à appliquer. Mais son fonctionnement est largement impactée par la mise en œuvre d'applications gratuites.

Il est clairement multihoming pour les développeurs / éditeurs (à la fois pour des deux plates-formes) et les annonceurs / producteurs. Il est clairement singlehoming (sauf pour les utilisateurs avec différents appareils MOS) sur les utilisateurs (acheteurs) côté. Frais de la plate-forme principalement viennent de côté multihoming à augmenter le coût de conversion de la plate-forme de l'utilisateur. Les développeurs sont multihoming sur le marché d'applications mobiles et de ce côté est du côté de la source de revenu pour App-Store. Les utilisateurs sont facturés gratuite pour l'utilisation App-store et ils sont du côté bien traités.

Tous ces phénomènes sont inextricablement liés. L'étude vise d'abord à documenter ces phénomènes, et d'autre part, pour documenter le comportement des utilisateurs dans cet écosystème. App élasticité-prix de la demande pour les utilisateurs sera mesurée dans le chapitre 6.

[323] L'élasticité-prix pour les développeurs sera plus faible quand il n'y a pas de revenu de l'Appr -store pour ses applications gratuites. Les revenus de la publicité in-app sont vitaux pour les développeurs. Les parts des revenus publicitaires sont souvent de 60:40 entre les développeurs et l'Ad-store. Apple iAd a monté ce partage à 70:30 en Avril 2013.

VI. Les études empiriques d'utilisateurs en France et en Chine

1 Préférences de prix d'applications pour les utilisateurs

Cette partie vise à étudier les facteurs qui influencent de préférences de prix pour les utilisateurs d'applications mobiles. Basé sur les relations théoriques entre les différents facteurs qui influencent les préférences des utilisateurs d'applications mobiles de prix, les hypothèses suivantes sont formés. Caractéristiques démographiques, l'utilisation de l'appareil mobile et l'utilisation de l'application influencent préférences de prix de l'app et app choisissant décisions pour usagers. Ces hypothèses sont testées et mesurées par l'enquête sur l'utilisation de l'app du français et chinois usagers. SEM (Structural Equation Modeling) a été appliquée pour analyser les données du questionnaire. Cela a permis la construction de la relation entre le préférences de prix pour les utilisateurs et ses facteurs d'influence.

Un questionnaire qui se concentre sur les facteurs influents sur les préférences de prix de l'application pour les utilisateurs a été conçu, produit et réalisé par sondage en ligne et enquête de terrain (5%) sur une période de neuf semaines entre le début de Décembre 2012 et mi Février 2013. Il y avait 600 répondants participé principalement de la France et la Chine.

Les conclusions sont les suivantes:

- Applications gratuites sont populaires.
- Les apps dont le prix est inférieure à 1 dollar sont plus téléchargés.
- Les utilisateurs ayant un revenu élevé sont prêts à payer plus pour l'utilisation de l'app.
- Les utilisateurs qui ont payé plus pour les apps préfèrent la hausse des prix de l'app.
- Les utilisateurs avec une plus forte demande pour la variété préfèrent prix inférieurs des apps.
- Les utilisateurs chinois préfèrent des prix plus bas en comparaison avec les Français.
- Les utilisateurs d'Android préfèrent des prix plus bas que les utilisateurs iOS, notamment en Chine.

2 L'élasticité-prix de la demande pour les utilisateurs en France et la Chine

Dans cette étude empirique, le top 300 gratuites et top 300 payés apps téléchargées dans App Store d'Apple en France, en Chine et aux États-Unis à partir de Novembre 2011 to Avril 2013 (18 mois au total) ont été recueillies. Les données comprennent le nom, le grade, le prix et la catégorie de toutes les applications iPhone et iPad dans l'App Store d'Apple. Il y a 29,754 apps mobiles sans double compte.

Dans cette étude, 1, 2, 3, 4, 5 et 6 sont pris que l'indice de popularité app mobile et qu'ils correspondent également séparément à la gamme de rang application 1-10; 11-20; 21-50; 51-100; 101-200 et 201-300. Numéro 1 correspond à des apps les plus populaires (plus téléchargé), alors que le numéro 6 correspond à les moins populaires. App indice de popularité a une relation inverse avec le nombre de téléchargements. App indice de popularité représente le volume app téléchargements dans les analyses du chapitre 6. L'élasticité-prix de la demande (PED) est analysée pour les applications payantes ici.

Selon la définition de l'élasticité-prix de la demande (PED), le PED d'app présente la réactivité des volumes app de téléchargement pour l'évolution des prix de l'app. Dans cette étude, l'app PED est présenté par la réactivité de l'indice de popularité de l'app aux variations des prix de l'app Analyse linéaire unaire de régression a été mis en œuvre par Matlab..

Il a été constaté que l'élasticité-prix de la demande des apps payés pour iPhone et iPad est le plus grand en Chine, puis aux Etats-Unis (Figure 12).

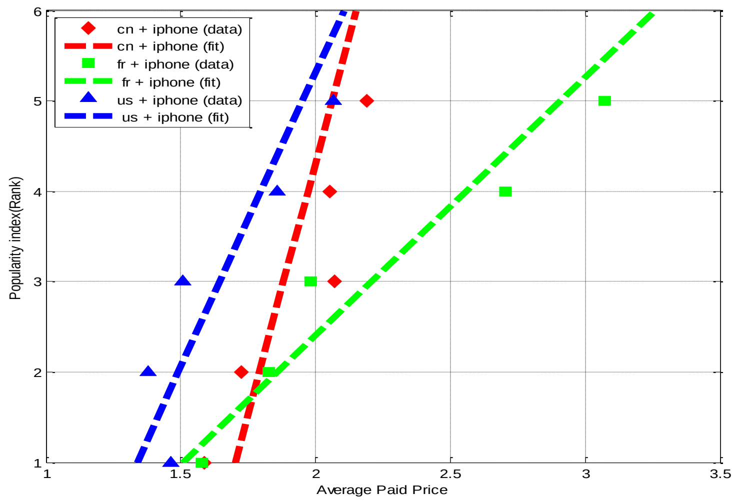

Figure 12 Popularity index (Rank) and average paid price fitting line in Apple App Stores (iPhone) in France, China and the US

VII. Conclusions

Une attention particulière a été donnée au marché des applications mobiles où existent trois groupes d'utilisateurs finaux affiliés avec deux plates-formes bifaces. Les développeurs, les annonceurs et les utilisateurs sont les trois groupes ou côtés. L'App-Store et l'Ad-store sont les deux plates-formes. C'est un marché bénéficiaire avec grand potentiel. En conséquence, le monde et en particulier les économistes suivent de près ce marché.

La complexité de l'écosystème dans le marché des applications mobiles crée une tarification de plateforme complexe et difficile. Ma thèse se concentre donc sur les déterminants et stratégies de tarification de la plateforme App-Store.

1 Points principaux

Déterminants et stratégies de tarification de la plateforme App-store et caractéristiques d'utilisation de l'app sont précisées ci-dessous.

[11] Il y a des externalités de réseau étendues et interactives

Nous pouvons trouver des externalités de réseau dans toutes les branches de l'écosystème du marché de l'application mobile. Des externalités de réseau indirectes existent entre les différents groupes (côtés), même parmi les différentes plates-formes. Et des externalités de réseau directes existent à l'intérieur de chaque groupe. Externalités de réseau indirectes entre apps gratuites et payantes, apps et appareils mobiles, apps et produits externes ont un rôle particulier dans ce marché. Ceci existe rarement dans d'autres marchés bifaces.

Des externalités de réseau sont largement présentes dans l'écosystème de marché d'apps mobiles. Il y a aussi des avantages qui stimulent l'ensemble de l'écosystème en raison des externalités de réseau. Des effets de rétroaction positives de réseau sont évidents dans cet écosystème. Un participant seul peut jouer un rôle important.

[12] Des sources de revenus puissants existent sous le concept de ‘freemium’

Les applications gratuites sont la majorité dans le marché de l'application mobile. Les applications gratuites apportent des bénéfices considérables grâce à l'amélioration de la satisfaction et la fidélisation de l'utilisateur de l'application consommée. Publicité In-App, freemium et achat in-app sont tous source de revenus pour les applications gratuites.

[13] Le coût d'achat des appareils mobiles influence la tarification de la plateforme

L'appareil mobile est le moyen de recevoir et exécuter des applications. L'achat d'un appareil mobile est la condition préalable pour accéder à la plate-forme App-Store et utiliser des apps pour les usagers. Ce coût d'achat influe sur la tarification de la plate-forme App-store pour les utilisateurs qui sont habituellement en singlehoming.

[14] Les redevances d'adhésion sont négligeables pour la tarification de la plate-forme App -store

Les frais d'inscription à la plate-forme App-store peuvent être considérés comme la redevance d'adhésion du côté développeur. Ces redevances sont négligeables pour les développeurs en comparaison du revenu des ventes d'applications. Les utilisateurs accèdent à l'App-store au travers d'un appareil associé à un MOS, dont le coût est soit internalisé dans celui de l'appareil mobile soit nul. il peut être considéré comme nul. Recevoir des apps n’est qu'une partie des services de l'appareil, donc normalement la redevance d'adhésion peut être ignorée par les utilisateurs. Il y a une autre possibilité. Une certaine partie du coût d'achat appareil est considéré comme le coût de l'utilisation de l'app donc les redevances d'adhésion des usagers. En fait, dans cette situation, cette partie du coût est en fait mineur comparée à l'utilisation de l'app store par l'utilisateur. Comme les transactions entre les développeurs et les utilisateurs sont observés par la plate-forme App store alors les redevances d'usage pourrait être faisable par la plate-forme App store.

[15] Il y a trois points potentiels de génération de profits et l'intégration dans l'industrie semble être une bonne façon de créer des profits.

Les apps et les appareils mobiles sont les racines de revenus pour cet écosystème. Les apps peuvent amener d'autres ventes d'apps (apps payantes, freemium et achat in-app inclus) et des revenus publicitaires in-app. Pour percevoir des revenus, App-store et Ad-store sont construits pour la distribution de l'app et de l'app de la publicité. Les appareils mobiles génèrent des revenus des ventes.

Quand il y a un téléchargement d'application, les recettes peuvent venir soit à l'App-store soit à l'Ad-store. L'app-store partage les revenus des ventes d'application avec les développeurs pour le téléchargement d'applications payantes. L'Ad-store partage les revenus publicitaires in-app avec les développeurs pour le téléchargement d'applications gratuites.

Les téléchargements d'Apps stimulent également les ventes d'appareils mobiles en raison de leurs externalités de réseau indirects positifs. Donc les téléchargements d'applications génèrent des profits pour les deux plates-formes, les développeurs et les fournisseurs d'appareils.

L'App-Store, l'Ad-store et l'appareil mobile : ces trois sources potentiellement génératrices de profits sont vitales. L'intégration à l'industrie peut maximiser les profits des marchés d'applications mobiles. Les opérateurs qui contrôlent le plus de points générateurs de bénéfices peuvent recevoir le plus de revenus. Les deux géants -Apple et Google ont leurs propres App-store et Ad-store en même temps. Apple contrôle aussi la distribution de son propre appareil mobile.

[16] Modèle de vente d'appareils mobiles d'Apple et modèle publicitaire in-app de Google.

Apple est un fournisseur d'électronique traditionnel et poursuit son modèle de revenus de vente d'appareils sur le marché des apps mobiles. L'App Store d'Apple est une plate-forme qui complète les ventes d'appareils mobiles grâce à la distribution d'app. L'appareil mobile devient plus attractif grâce à la distribution des applications. Nous pouvons aussi dire que c'est pour Apple une stratégie regroupement entre l'appareil mobile et App-Store.

Google applique ses stratégies de publicité sur le web au marché des apps mobiles. La publicité In-App est le principal modèle de revenus pour Google. Google Play App store ne génère pas suffisamment de revenus de téléchargements d'apps payantes. Google AdMob Ad-store a un taux de remplissage supérieur et une meilleure couverture pour sa publicité in-app. En Août 2012, Google a racheté Motorola mobile afin d'augmenter ses gains du marché.

$$\text{Apple} = \text{iOS device} + \text{App store} + \text{iAd} \quad (1)$$

$$\text{Google} = \text{Motorola device} + \text{Google Play} + \text{Admob} \quad (2)$$

[17] les utilisateurs ayant un revenu plus élevé ont plus forte élasticité-prix sur la demande d'app.

De l'enquête réalisée, il a été constaté que les utilisateurs ayant un revenu plus élevé sont plus sensibles au prix de l'application. Ils sont des utilisateurs fréquents d'apps, mais ils n'aiment pas payer pour des téléchargements d'apps. 79% des utilisateurs (n = 90) avec plus de € 4,000 de revenu mensuel téléchargent des apps fréquemment, mais seulement 7% d'entre eux ont payé moins de 1 € d'app par mois.

[18] Préférences de prix pour les utilisateurs d'apps en France et la Chine

Les Apps gratuites sont la majorité puisque plus de 60% des utilisateurs français (n = 269) et chinois (n = 222) n'ont jamais payé pour des téléchargements d'apps dans ces pays. Les utilisateurs chinois préfèrent les applications gratuites en Comparaison aux Français (70% contre 54%). Les utilisateurs chinois sont plus sensibles au prix de l'app.

[19] Les comparaisons entre iOS et Android

Les utilisateurs femmes préfèrent les appareils iOS aux appareils Android (56% contre 35%, n = 270). Les utilisateurs d'Android paient moins et préfèrent les apps gratuites plus que les utilisateurs iOS (69% comparativement à 56%, n = 303 pour les utilisateurs iOS, n = 246 utilisateurs d'Android). Les appareils iOS sont plus populaires en Chine alors que les appareils Android sont plus populaires en France (52% contre 44%, n = 222 pour les utilisateurs chinois; n = 269 pour l'utilisateur français).

[20] L'élasticité-prix de la demande pour les utilisateurs de l'App Store d'Apple entre la France et la Chine

Les utilisateurs chinois ont un PED supérieur aux utilisateurs français. Les utilisateurs américains se placent au milieu. Cela indique que les utilisateurs chinois sont plus sensibles aux prix des applications que les utilisateurs français.

2 Suggestions de tarification pour les plates-formes de vente d'applications

2.1 Les déterminants de la tarification de la plate-forme

- **Elasticité - prix (Price elasticity of demand - PED)**

Le plus fort la PED, le plus faible seront les frais. La plate-forme charge moins le côté avec la plus forte élasticité-prix. Habituellement la PED pour les acheteurs est plus fort que pour les vendeurs (Table 5).

Selon notre étude empirique, les utilisateurs d'applications sont très sensibles aux prix de l'application. L'élasticité-prix peut être estimée la plus forte pour le côté utilisateur. Si nous prenons en considération uniquement le PED, nous pouvons suggérer que la plate-forme charge moins ou ne charge pas du tout du côté de l'utilisateur. Dans ce cas, c'est le côté de l'utilisateur qui en bénéficie.

- **Single ou multi-homing**

De notre enquête, nous avons constaté que la plupart des utilisateurs étaient détenteurs d'un seul appareil mobile et qu'ils utilisaient pur la plupart juste une plate-forme de vente d'applications. Les utilisateurs sont considérés comme faisant du single homing. En 2012, plus de 78% des développeurs utilisaient plus de deux plates-formes de vente d'applications, donc multi-homing.

Le prix est faible ou nul pour le côté single-homing. Par conséquent, le côté de l'utilisateur est moins facturé, tandis que côté développeur est plus chargé dans ce marché.

- **Demande de variété de la part des clients**

Les utilisateurs ayant une forte demande de diversité, il y a 23 différentes catégories d'applications dans l'Apple App store en 2013.

La forte demande de diversité des clients amène toujours à des charges moins importantes de la part de la plate-forme. A cause de cela, le côté utilisateur est moins chargé dans le marchés des applications mobiles.

Coût d'achat de l'appareil mobile

Le coût d'achat du dispositif mobile influence le prix de la plateforme pour le côté utilisateur. Si nous prenons une partie du coût du dispositif comme des frais d'adhésion, les utilisateurs ont tendance à être moins chargés par la plate-forme grâce à leur forte élasticité-prix.

Difficulté de la surveillance des transactions

L'observation de la transaction a pu montrer la probabilité qu'a la plate-forme de vente d'application de charger des frais d'utilisation. Considérant les déterminants de prix ci-dessus, nous pouvons voir que côté utilisateur est le mieux traité, comme étant le moins chargé de la plateforme, et il est possible de charger les frais d'utilisation.

Table 5 Les déterminants du prix des plate-forme de vente d'applications

	Side 1 Users	Side 2 Developers	App-store Platform pricing
Price elasticity of demand	Higher	Lower	Lower on side 1
Network externalities	(1 *to* 2) > (2 *to* 1)		Lower on side 1
Single or multihoming	Singlehoming	Multihoming	Lower on side 1
End user demand for variety	Higher	Lower	Lower on side 1
Mobile device purchasing cost	√	×	Lower on side 1
Difficulty of monitoring transactions	Easy observation		Workable Usage fee

2.2 Conclusions

Selon les analyses des déterminants de la fixation des prix, les comparaisons App-Store avec la console de jeu et le système d'exploitation et les comparaisons App-Store avec le service i-mode, nous pouvons obtenir les suggestions pour la plate-forme App-Store.

En resumé, la tarification de la plate-forme App-Store est influencé par une série de facteurs déterminants dans un écosystème complexe. Il est difficile de construire un modèle mathématique pour expliquer les stratégies de tarification.

La structure de tarification pour la plate-forme de vente d'applications peut être analysé à partir des déterminants de prix. Les frais pour le côté utilisateur sont moindres. Le côté développeur alimente la plate-forme de vente d'applications. Cette étude suggère que des frais d'utilisation pourraient être pris en considération pour le marché de l'application mobile.

C'est un duopole sur le marché des applications mobiles. Il existe deux modèles de réussite dans le marché de l'application mobile. Apple ou Google, lequel préférez-vous?

Les utilisateurs chinois étant plus sensibles au prix des applications ont une plus forte élasticité-prix sur le prix des applications que les Français. Les utilisateurs français sont moins sensibles au prix de l'application et ils sont habitués à payer pour celles-ci. Par conséquent nous considérons que les utilisateurs chinois ont une PED plus forte aux coûts de la plate-forme de vente d'applications. Et nous suggérons que la plate-forme applique frais d'adhésion et d'utilisation pour différents en fonction des pays et régions.

Il y a des utilisateurs haut de gamme sur le marché chinois qui peuvent se permettre de payer plus de 5 ¥ par mois. Et les utilisateurs chinois semblent avoir une « mentalité de troupeau » pour les applications sur iPhone. Les applications de rang 1 à 10 sur iPhone sont les applications payantes les plus populaires pour les utilisateurs chinois. Un utilisateur télécharge souvent les mêmes applications que les autres utilisateurs. Un marketing puissant est essentiel pour les développeurs qui recherchent les meilleurs vendeurs.

3 Limitations et futurs axes de recherche

3.1 Limitations

Les stratégies de tarification pour la plateforme de vente publicitaire n'ont pas été incluses par manque de temps. La publicité au sein des applications mobiles est un énorme marché indépendant. La tarification, la facturation, la découverte et la production des publicités liées aux applications mobiles ont besoin d'être étudiés plus avant.

Les appareils mobiles influencent la tarification de la plate-forme de vente d'applications pour les utilisateurs, d'autant plus si la plate-forme contrôle également la fourniture desdits appareils. Une étude plus approfondie du coût d'achat du dispositif aux couts de la plateforme pourrait compléter cette étude.

L'étude empirique de l'élasticité-prix se concentre juste sur le côté de l'utilisateur sur la base de l'enquête. L'étude de l'élasticité-prix pour les développeurs n'a pas été couverte en raison de la limitation des données disponibles. Les données utilisées dans cette étude proviennent principalement d'Apple App Store et manquent les comparaisons avec d'autres app stores.

3.2 Futurs axes de recherche

Les axes de recherche futurs pourraient se concentrer sur l'achèvement du modèle de tarification de la plate-forme de vente d'application, qui comprend des déterminants complets et couvre l'ensemble du marché des applications mobiles.

La tarification des plates-formes de vente publicitaires est un autre axe pour de futures recherches. Cela completera l'étude de tarification du marché des applications mobiles.

Une étude plus approfondie de l'élasticité-prix pour les développeurs et de la part du chiffre d'affaires entre le développeur et les deux plates-formes sera également intéressante.

Des recherches futures pourraient également porter sur l'interaction entre les magasins de vente d'applications et les magasins de vente publicitaires.