

國立臺灣大學管理學院企業管理碩士專班

碩士論文

Global MBA

College of Management

National Taiwan University

Master Thesis

智慧型手機軟體之精實開發策略

Lean Development Strategy for
Smartphone Applications

歐珮珮

Pei-Pei Ou

指導教授：陳俊忠 博士

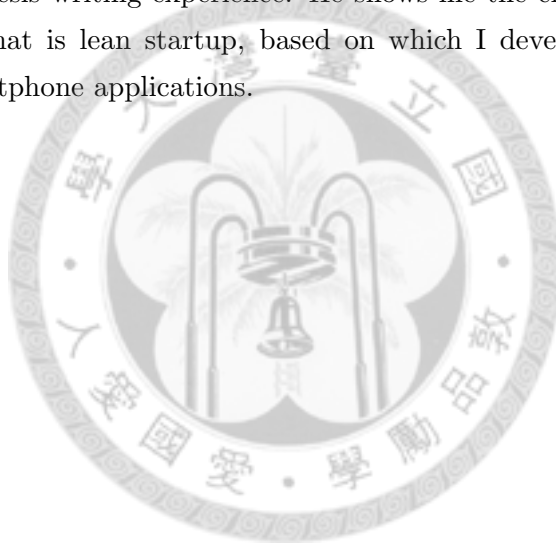
Advisor: Chun-Chung Chen, Ph.D.

中華民國 102 年 1 月

January, 2013

Acknowledgements

After working as an engineer for a few years, it is a breakthrough for me to go back school and study another master program. The MBA life kind of changes my mind from engineer orientation to management thinking. Each professor in NTU Global MBA enriches my knowledge from various managerial fields. I am very thankful for my previous manager, Charles, and colleague, Jeffrey. They kindly wrote the reference letter for me so that I could get GMBA application admission. During the one and half school year, I really appreciate the company of the my family and dear friends. It is also lucky for me to meet many sweet GMBA classmates with diverse background. In the final spurt of thesis writing, I am grateful to have OSIM's guidance. He encourages me a lot and helps me organize the thesis content for better. In addition, I do thank for Tim's sharing on his thesis writing experience. He shows me the critical idea about software development. That is lean startup, based on which I develop the lean development strategy for smartphone applications.



Abstract

The thesis proposes a development strategy for smartphone applications based on broad research, depth analysis, and dynamic process. The broad research involves four app categories and two popular apps for each category. The major app cases are *Angry Birds*, *Instagram*, *Evernote*, and *LINE* while the other comparative ones are *Fruit Ninja*, *Foursquare*, *WhatsApp*, and *Dropbox*. To thoroughly understand the influential factors on app development, we analyze these app cases from market environment, product strength, and competitor impact. As a result, we apply lean perspective to the dynamic process of app development.

Keywords: Smartphone, App Store, Google Play, Angry Birds, Instagram, Evernote, LINE, Fruit Ninja, Foursquare, WhatsApp, Dropbox



Contents

Acknowledgements	i
Abstract	ii
List of Figures	vi
List of Tables	viii
1 Introduction	1
1.1 Background	1
1.1.1 Smartphone App	1
1.1.2 App Stores	2
1.2 Motivation	2
1.3 Study Process	3
2 Literature Review	5
2.1 Lean Startup	5
2.1.1 Validated Learning	6
2.1.2 Build–Measure–Learn	6
2.1.3 Innovation Accounting	7
2.1.3.1 Establish The Baseline	7
2.1.3.2 Tune The Engine	7
2.1.3.3 Pivot or Persevere	7
2.2 Generic Strategies	8
2.2.1 Cost Leadership	8
2.2.2 Differentiation	9
2.2.3 Focus	9
3 Influential Factors on App Development	10
3.1 Category Matrix	10
3.2 Case 1 – Angry Birds	11
3.2.1 Market Attractiveness	11
3.2.2 Potential Substitutes	12
3.2.3 Resource Availability	12
3.2.4 Technology Capability	13
3.2.5 Development Process	13
3.3 Case 2 – Instagram	14

3.3.1	Market Attractiveness	14
3.3.2	Potential Substitutes	14
3.3.3	Resource Availability	15
3.3.4	Technology Capability	15
3.3.5	Development Process	15
3.4	Case 3 – LINE	16
3.4.1	Market Attractiveness	16
3.4.2	Potential Substitutes	16
3.4.3	Resource Availability	17
3.4.4	Technology Capability	17
3.4.5	Development Process	18
3.5	Case 4 – Evernote	18
3.5.1	Market Attractiveness	18
3.5.2	Potential Substitutes	19
3.5.3	Resource Availability	19
3.5.4	Technology Capability	20
3.5.5	Development Process	20
3.6	Matrix Analysis	20
3.6.1	Competitive Environment	20
3.6.2	Core Strength	21
4	Integrated Analysis of App Cases	23
4.1	Market Environment	23
4.1.1	User Loyalty	23
4.1.2	Product Diversity	24
4.1.3	Professional Demand	24
4.1.4	Investment Scale	24
4.2	Product Strength	25
4.2.1	Perceived Value	25
4.2.2	Emotional Need	25
4.2.3	User Experience	26
4.2.4	Cross-Platform Support	26
4.3	Competitor Impact	27
4.3.1	Fruit Ninja vs. Angry Birds	27
4.3.1.1	Overall Comparison	27
4.3.1.2	Special Finding	28
4.3.2	Foursquare vs. Instagram	29
4.3.2.1	Overall Comparison	30
4.3.2.2	Special Finding	31
4.3.3	WhatsApp vs. LINE	31
4.3.3.1	Overall Comparison	32
4.3.3.2	Special Finding	33
4.3.4	Dropbox vs. Evernote	33
4.3.4.1	Overall Comparison	34
4.3.4.2	Special Finding	35
4.4	Key Success Factors	36

5	Lean Development Strategy	37
5.1	Cross Review	37
5.2	Statistical Insight	39
5.3	Strategy Matrix	40
5.3.1	Property Summary of Strategic Roles	40
5.4	Lean Strategic Role – Warrior	42
5.4.1	General Profile	42
5.4.2	Development Strategy	42
5.5	Lean Strategic Role – Coordinator	43
5.5.1	General Profile	43
5.5.2	Development Strategy	43
5.6	Lean Strategic Role – Landlord	44
5.6.1	General Profile	44
5.6.2	Development Strategy	44
5.7	Lean Strategic Role – Educator	45
5.7.1	General Profile	45
5.7.2	Development Strategy	45
6	Conclusion	46
6.1	Research Finding	46
6.1.1	Lean Perspective	46
6.1.2	Lean Development Strategy	47
6.2	Research Contribution	48
6.3	Managerial Implication	49
6.4	Research Limitation and Future Research	49
	Bibliography	50

List of Figures

1.1	(a) App Store (b) Google Play	2
1.2	Study Process	4
2.1	Lean Startup	5
2.2	Build–Measure–Learn	6
2.3	Generic Strategies	8
3.1	App Category Matrix	11
3.2	Angry Birds	11
3.3	Independent vs. Established Games, Worldwide Sessions	12
3.4	Daily Smartphone App Consumption, Minutes per Category, Worldwide	13
3.5	Instagram	14
3.6	Fastest Growing App Categories, Time per Active User	14
3.7	LINE	16
3.8	Loyalty by Application Category	17
3.9	Evernote	18
3.10	Time Spent per Category, Smartphones versus Tablets	19
3.11	Case Study Matrix	21
4.1	Fruit Ninja	27
4.2	Android App Ranking in Category Arcade Game, by Total Ratings	27
4.3	Average Rating of Angry Birds vs. Fruit Ninja	28
4.4	Which one is your favorite? Fruit Ninja or Angry Birds.	29
4.5	Foursquare	29
4.6	Android App Ranking in Category Social, by Total Ratings	30
4.7	Average Rating of Instagram vs. Foursquare	30
4.8	Web Search Interest Worldwide 2011-2012, Instagram vs. Foursquare	31
4.9	WhatsApp	31
4.10	Android App Ranking in Category Communication, by Total Ratings	32
4.11	Average Rating of LINE vs. Whatsapp	32
4.12	Global Messaging App Market	33
4.13	Dropbox	33
4.14	Android App Ranking in Category Productivity, by Total Ratings	34
4.15	Average Rating of Evernote vs. Dropbox	34
4.16	Product Value over Time	35
4.17	Success Factors	36
5.1	Strategy Matrix	40
5.2	Development Flow Chart of Warrior	42

5.3	Development Flow Chart of Coordinator	43
5.4	Development Flow Chart of Landlord	44
5.5	Development Flow Chart of Educator	45
6.1	Lean Development Strategy	48
6.2	Lean Managerial Process	49



List of Tables

4.1	Market Environment	23
4.2	Product Strength	25
5.1	Cross Review	38
5.2	Statistical Summary	39
5.3	Property Summary of Strategic Roles	41
6.1	Lean Perspective	47



Chapter 1

Introduction

1.1 Background

Smartphones are devices that offer the ability to make telephone calls, and add features found on a personal digital assistant (PDA) or a computer. Manufacturers typically target such devices at particular smartphone platforms and operating systems. Early smartphones like the BlackBerry were primarily used as enterprise devices and were unavailable to the public. From the launch of iPhone in 2007, Apple successfully brings smartphones to a mass consumer market and creates the most competitive technology market in the world. With advanced computing capability, smartphones have multiple functionality like global positioning system (GPS) navigation, digital camera, and media players. The digital devices also offer customers bigger touch screen to make data functions easier to use.

1.1.1 Smartphone App

A smartphone is not just about the device itself. It's about the apps customizing the phone. Like Apple trademark slogan says, "There is an app for that." Smartphone apps are software applications designed to run on smartphones. They are available through the distribution platforms which are mainly operated by the owner of the mobile operating system, such as the Apple App Store, Google Play, and Windows Phone Store. Smartphone apps can come preloaded on the handheld device as well as can be downloaded by users from the Internet. Which smartphone apps users can run on a particular model mainly depend on the installed operating system rather than the hardware. However, some apps are designed only to function with particular hardware components such as touch screens.

1.1.2 App Stores

There are many smartphone platforms in the world. Apple iOS and Google Android are among the most widely used smartphone operating systems which allow users to install additional apps from the app marketplaces. App stores, application distribution platforms for mobile devices, are really popular nowadays for customers to download mobile apps and for developers to sell their applications. These online stores differ vastly in terms of billing, presentation, and support. Some apps are free to download and are supported financially through in-app advertising or purchasing. Others are available at a set cost and are payable upon the installation. Apple's App Store [1] shown in Figure 1.1(a) helps users download both free and paid applications from the iTunes store onto their iPhone, iPod Touch, and iPad. In Figure 1.1(b), Google's Google Play [2] is the official Google app store and is available on most Android devices. Moreover, it supports storing user library in the digital cloud.

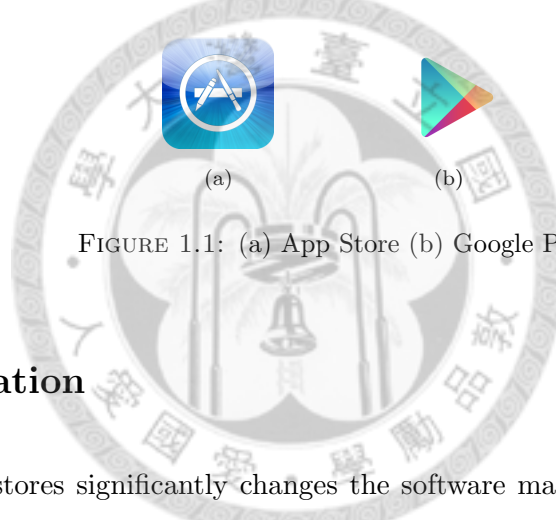


FIGURE 1.1: (a) App Store (b) Google Play

1.2 Motivation

The rise of app stores significantly changes the software market. While most app developers cannot afford massive investment in marketing and distribution, online app stores enable them to sell products directly to consumers. As more developers enter the customer-to-customer app market, the competition over there becomes intenser than ever before. Since in app stores there is no quality control and the developer fee is reasonable, the market entry barrier is quite low and independent developers are the major participants. In addition, these developers usually have limited resource in money and people. To help them succeed in such competitive but potential market, we work out the lean development strategy by analyzing the proven app cases.

As an app developer, I know the difficulty to make a popular app in such competitive environment. While having no enough understanding about the dynamic app market, developers usually spend valuable resource in uncertain demand. Occasionally I learn the idea of lean startup [3], which is a software development methodology and emphasizes on validated learning. However, lean startup is designed for general software development and cannot handle influential factors from external environment and competitors. As

a result, I refer to some software development procedures proposed in lean startup and build a further flexible and practical lean development strategy for smartphone applications. I hope app developers could follow the strategy to decide their app features and clearly understand what is their focus in the development process.

1.3 Study Process

The thesis follows the sequence of the study process in Figure 1.2. The initial part would discuss the influential factors on app development. Based on historical app ranking, external environment and internal strength play important roles in the process of app development. As developers look for target market, market attractiveness and potential substitutes are usually taken into consideration. While the app market is open to independent developers all over the world, their resource availability and technology capability become more critical.

Next is to build a app category matrix by these factors. To structurally analyze smartphone applications, the thesis proposes a matrix composed of external competitive environment and internal core strength. Games and photo apps face relatively intense competitive environment due to their nature while productivity and communication apps face less competition because of their high entry barrier. On the other perspective, games and productivity apps emphasize the product innovation while photo and communication apps usually adopt proven technology.

For each app category in the matrix, one popular app is selected out for further studying. There are four app cases introduced below. *Angry Birds* is an addictive game app with outstanding user experience. *Instagram* is a photo sharing app which allows users to take a photo, add special effect on it, and then share it over social network. *LINE* is a communication app and provides cartoon stickers for users to express their emotion in an interesting way. *Evernote* is a productivity app that helps users remember everything by storing and organizing their ideas.

Based on the above case studies, it is time to start analyzing external market environment, internal product strength, and comparative competitor impact. After analyzing these app cases thoroughly, some relation among different perspectives could be identified. Finally, a strategy matrix for app development is established. In the matrix, there are four strategic roles: warrior, coordinator, landlord, and educator. Any app could be easily classified into one of the four strategic roles according to its located environment and possessive strength. To wrap up, the last part is the overview of lean development strategy.

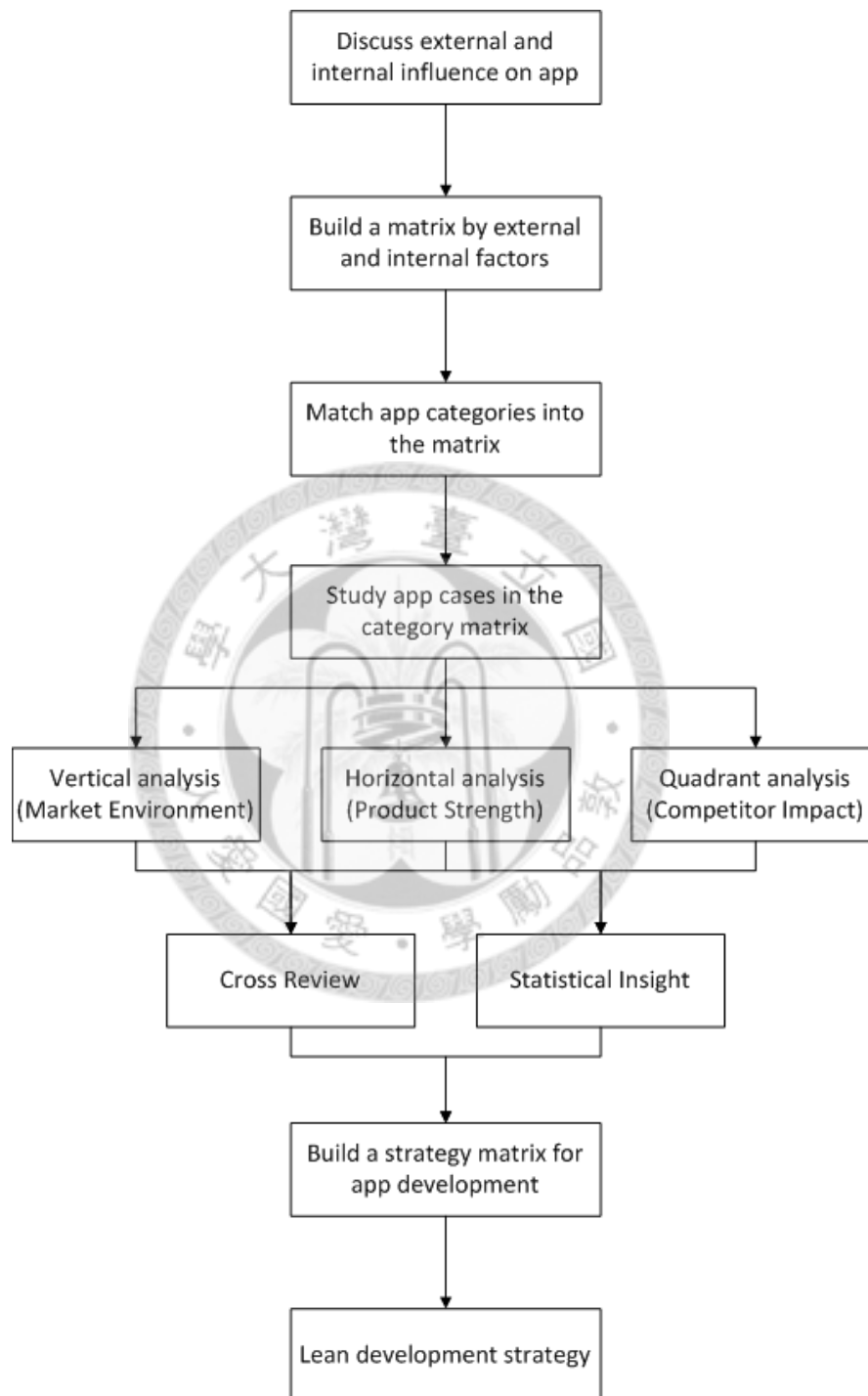


FIGURE 1.2: Study Process

Chapter 2

Literature Review

2.1 Lean Startup

Lean Startup [3] is about how entrepreneurs apply lean thinking to the process of innovation. Eric Ries developed the theory with the hope to prevent startups from building products nobody wants. Entrepreneurs are people who work in startups designed to create new products and services under extremely uncertain conditions. Traditional management practices fail in such experimental environment. Therefore, specific management is required to handle context of extreme uncertainty. In Figure 2.1, *Lean Startup* combines customer development and agile development to produce low-burning, fast-releasing, iterative product development. Entrepreneurs can then solve unknown problem with unknown solution through the process of experiments and feedback.

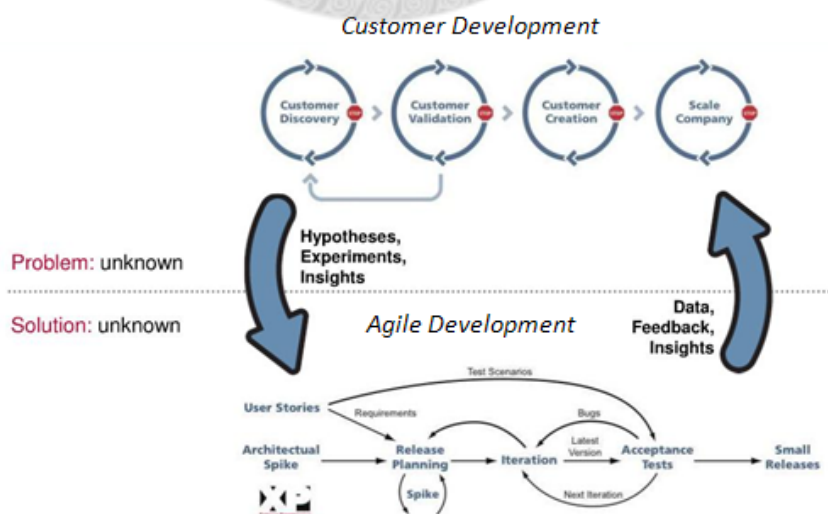


FIGURE 2.1: Lean Startup

2.1.1 Validated Learning

The progress unit of *Lean Startup* is validated learning. Entrepreneurs learn how to build a sustainable business by running frequent experiments to test each element of their vision. Validated learning is a rigorous method to demonstrate progress under extreme uncertainty. While figuring out what customers want and will pay for, entrepreneurs can adjust their plans accordingly. Since most aggregate measures like total revenue are not very useful, validated learning could tell how existing customers respond to the product over time.

2.1.2 Build–Measure–Learn

The fundamental activity of a startup is to turn ideas into products, measure how customers respond, and learn whether to pivot or persevere. By accelerating the feedback loop of build–measure–learn, entrepreneurs could build highly effective startups that are quick learners and are capable of reducing wasted effort. In Figure 2.2, the three-step process helps entrepreneurs test their vision against reality and know when to pivot by making a sharp turn or persevere on the current path. It is also the core process of *Lean Startup* and focuses on minimizing the total time through the loop.

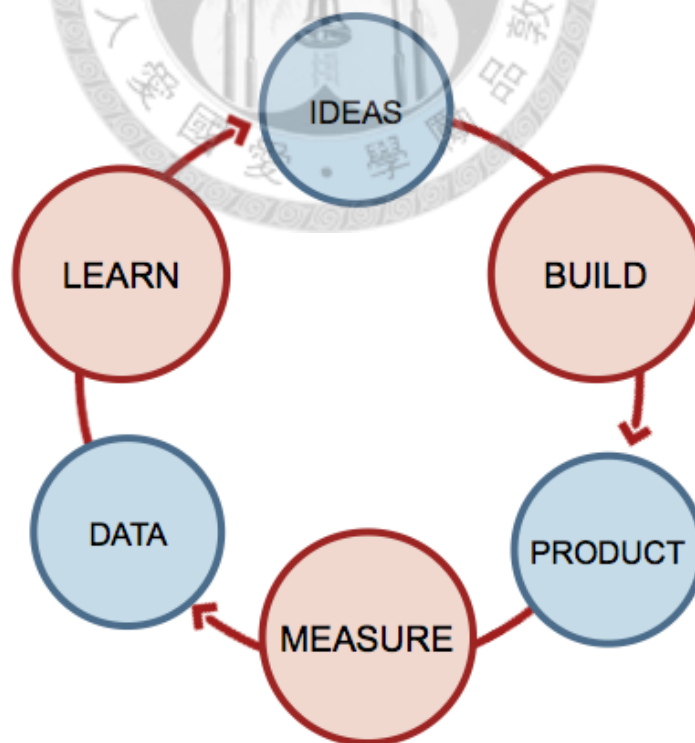


FIGURE 2.2: Build–Measure–Learn

2.1.3 Innovation Accounting

Since standard accounting practices are not helpful in measuring the dynamic situation of early-stage companies, startups require more creative metrics to measure their customer engagement. To improve entrepreneurial outcomes and hold innovators accountable, there is a need to know how to measure progress, how to set up milestones, and how to prioritize work. Innovation accounting is a quantitative approach designed for startups to see if their effort works. There are three related learning milestones introduced below.

2.1.3.1 Establish The Baseline

To acquire real data on where the company is right now, entrepreneurs establish a minimum viable product (MVP) which helps achieve a big vision in small increments without going in circles. The minimum set of features comes from early adopters so that entrepreneurs could avoid building products that nobody wants. Learning from customers is hugely important by iteratively testing products in real market and adjusting based on customer feedback. Through this way, entrepreneurs can improve upon previous work, produce a better solution, and grow to dominate the market.

2.1.3.2 Tune The Engine

Once MVP is established, startups can keep experimenting to tune the engine from the baseline towards the ideal. It is more possible for them to work effectively and achieve lasting results through testing on the original hypothesis. This includes actionable metrics that can demonstrate cause and effect question. In addition, every product development should improve one of the growing drivers and change customer behavior for the better. After the startup has made all the micro changes and has optimized product features, it reaches a decision point to see if any modification is necessary to the current strategy.

2.1.3.3 Pivot or Persevere

When experiments reach diminishing returns, it is time to change directions but stay grounded in what entrepreneurs have learned. Since entrepreneurs are usually emotionally attached to their product ideas, they tend to hang in there too long. As a result, this blind insistence wastes valuable time and money. No matter to persevere or not, entrepreneurs could make a non-emotional decision about whether to make a change or

keep going with the same idea. In addition, the sign of a successful pivot is that these engine-tuning activities are more productive than before.

2.2 Generic Strategies

Michael Porter argued that a firm's strengths ultimately fall into cost advantage or differentiation. By applying these strengths in either a broad or narrow scope, there are three generic strategies that a company can adopt: cost leadership, differentiation, and focus. To achieve sustainable competitive advantage, a firm can position itself by leveraging its strengths. Generic strategies can be applied to products or services in all industries, and to organizations of all sizes. In Figure 2.3, each of the three generic strategy options is considered within the context of two aspects: competitive advantage and competitive scope.

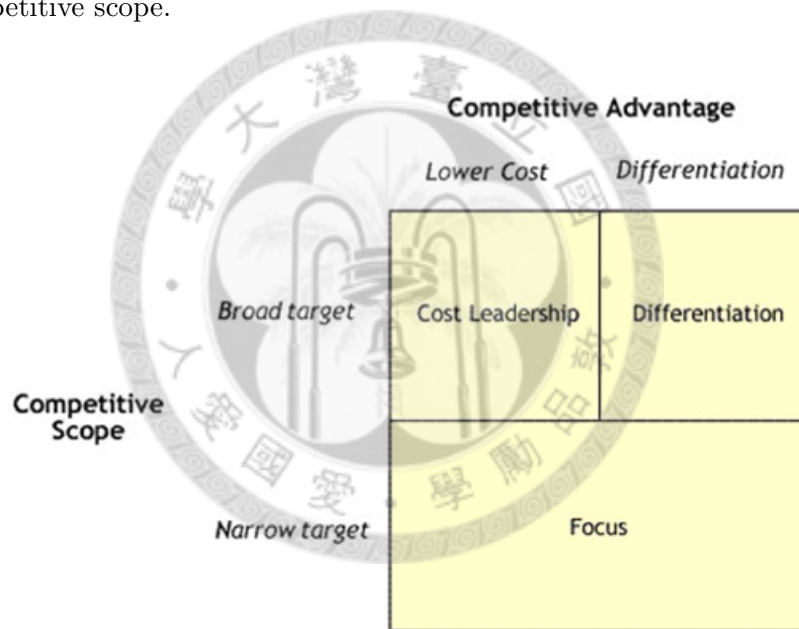


FIGURE 2.3: Generic Strategies

2.2.1 Cost Leadership

Cost Leadership strategy is about delivering the lowest possible costs of production to gain competitive advantage. When competing products are essentially undifferentiated and selling at a standard market price, the company with the lowest costs would earn the highest profit. Companies following the strategy place emphasis on cost reduction in every activity in the value chain. However, low cost does not necessarily imply low price. While charging industry-average prices, companies could increase profits by reducing

costs. Companies that are successful in achieving cost leadership strategy usually have access to the capital required to invest in technology that will bring costs down. Efficient logistics also reduce the total operating cost. The greatest risk in pursuing such a strategy is that these sources of cost reduction are not unique. Therefore, it is important to continuously find ways of reducing every cost.

2.2.2 Differentiation

Differentiation strategy involves making the products or services more attractive than those of competitors. When companies create uniquely desirable products, they are able to charge a premium price and get a better margin. In addition, there would be extra costs like advertising spending to promote a differentiated brand image for the product. To succeed with differentiation strategy, organizations should have the ability to deliver high-quality products and well communicate the perceived strengths with customers. However, it is difficult to estimate if the extra costs entailed in differentiation can actually be recovered from the customer through premium pricing. There are also some risks associated with differentiation strategy including competitor imitation and customer taste change.

2.2.3 Focus

Focus strategy often used by smaller firms concentrates on a narrow market and attempts to achieve either a cost advantage or differentiation. By focusing on the unique customer needs, organizations can develop low cost or well-specified products in the segment. The premise is that the needs of certain group can be better serviced by focusing entirely on it. Since the strategy serves customers in their market uniquely well, strong brand loyalty is built among their customers. This makes their particular market segment less attractive to competitors and discourages other firms from competing directly. With a cost focus a firm aims at being the lowest cost producer in that segment. With a differentiation focus a firm creates competitive advantage through differentiation within the segment. Some risks of focus strategy include imitation and changes in the target segment. Furthermore, it may be fairly easy for a broad-market cost leader to adapt its product in order to compete directly.

Chapter 3

Influential Factors on App Development

3.1 Category Matrix

Based on historical app ranking, external environment and internal strength play important roles in the process of app development. As developers look for target market, potential revenue in the segment is usually taken into consideration. The technology trends at that time also reveals whether it's a good timing to enter the market. Therefore, the degree of competitive environment is affected by market attractiveness and potential substitutes. While the smartphone app market is open to independent developers all over the world, their limited resource needs to be allocated well in the initial product planning. And their experience in other fields is closely related to the key feature of most popular apps. Hence, the level of core strength is determined by resource availability and technology capability.

To analyze smartphone application structurally, Figure 3.1 shows a matrix composed of internal core strength and external competitive environment. Each quadrant of the matrix represents one specific property in the app market. For complete study, we select out four app categories that match different quadrants respectively. Game and productivity apps emphasize the product innovation while photo and communication apps usually adopt proven technology. On the other perspective, games and photo apps face relatively intense competitive environment. The high entry barrier in productivity and communication apps result in less competitors in the market segment. For each app category mentioned in Figure 3.1, we would choose one popular app in that field and analyze it from various perspectives.

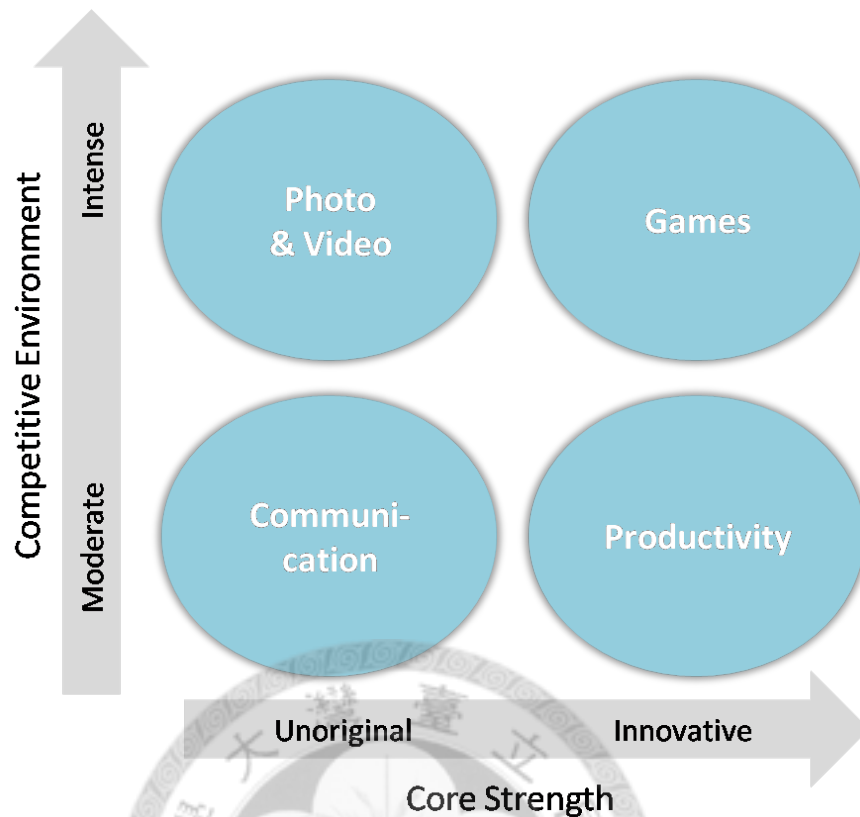


FIGURE 3.1: App Category Matrix

3.2 Case 1 – Angry Birds

The overnight success of *Angry Birds* in Figure 3.2 took Rovio, the Finnish entertainment company, eight years. *Angry Birds* is an interesting Arcade and Action game, where players need to destroy the fortresses of pigs who stole the eggs of these angry birds. The additive game is physics-based – the birds are launched by the slingshot with adjustable trajectory and power. It has been the number-one paid app on iTunes in 68 countries. There is even talks of a movie being produced featuring *Angry Birds*, not to mention stuffed birds and pigs everywhere.

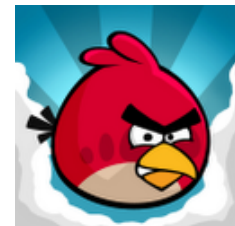


FIGURE 3.2: Angry Birds

3.2.1 Market Attractiveness

A survey of worldwide app sessions, between January and February 2012, shows that game apps make up 52% of the all app sessions by iOS and Android devices users. Due to the popularity of smartphone gaming, the established game companies that already developed games started extending their products to the smartphone platforms.

In Figure 3.3 [4], a comparison of independent iOS & Android game developers and established game companies demonstrates the intense competition. In Q1 2010, games created by independent game developers made up 60% for global game app sessions, but dropped to 56% in Q1 2011 because of a surge from established game companies entering the market. However, in Q1 2012, independent companies overwhelmed established companies once again, pushing independent game session share to 68%. Given that entry barriers are low to enterprise game giants like Electronic Arts [5] and potential revenue is high in the mobile game market, the threat of new entrants is reaching new heights in the game app category.

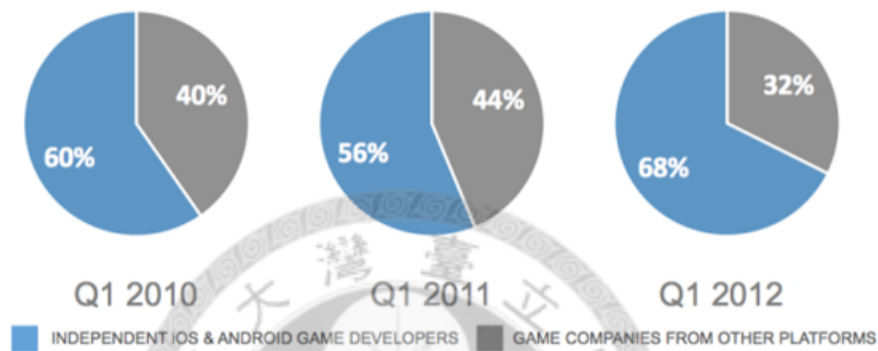


FIGURE 3.3: Independent vs. Established Games, Worldwide Sessions

3.2.2 Potential Substitutes

Recent study in Figure 3.4 [6] shows that people tend to spend more time in social networking apps than in games apps. In April 2012, the ad revenue generated by social networking apps first surpassed what games apps generated. These phenomena signal the end of gaming dominance within mobile apps. As game demand is hitting the saturation point, game companies face the issue of fighting over a finite consumer group to grow their businesses. Even with an influx of new consumers, the expected casual gamers will be easily attracted by compelling social networking apps.

3.2.3 Resource Availability

Angry Birds was made by a team of four experts with more than five years of game making experience and took eight months to finish [7]. Since it had a low priority for the company at that time, the team worked on it as a hobby project. During the same period, they also produced another four games for other companies. The game finally cost around €100,000 to build and update.

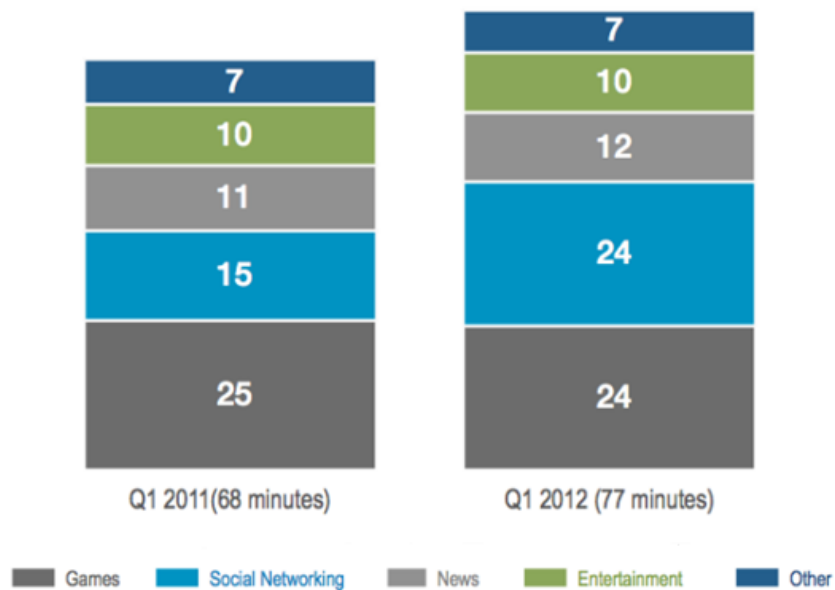


FIGURE 3.4: Daily Smartphone App Consumption, Minutes per Category, Worldwide

3.2.4 Technology Capability

Angry Birds is a truly winning user experience and it fits extremely well in helping users develop a mental model of what the game should be. Not only the bird-tossing physics make the realistic interactions easily, but also the bite-sized levels play into human short-term memory [8] quickly. For example, developers of *Angry Birds* managed the flight of the birds in a way that goes far beyond "faster is better." They slowed down the response time combined with a carefully crafted trajectory to solve one huge problem for all user interfaces – error correction, which is about how users can be taught by experience with the system to improve their performance.

3.2.5 Development Process

Rovio's vision was to develop an app with universal appeal and extend it to build an entertainment empire like Disney 2.0 [9]. Given that iPhone was a hyper-competitive environment, successful app over there can be easily ported to other platforms. So they decided to first conquer the App Store. They also came up with some criteria, such as physics-based game, no tutorial, and minimal loading time. Due to Rovio's financial crisis at the beginning of 2009, they set out to minimize the amount of luck needed. For instance, they had developed 51 titles until getting the right one, *Angry Birds*.

3.3 Case 2 – Instagram

Instagram in Figure 3.5 is a photo sharing app that allows users to take a photo, apply a digital filter, and then share it with friends on social networks including Facebook and Twitter. The app was launched in the App Store on October 6, 2010 and crossed 25,000 users on the first day. On April 9, 2012, the 2-year-old *Instagram* with 30 million users and zero revenue, was bought by Facebook for \$1 billion.



FIGURE 3.5: Instagram

3.3.1 Market Attractiveness

Instagram's success paved way for photo app growth and generated plenty of copy cats. New apps could capitalize on aspects underserved in the mobile photo market. In Figure 3.6 [10], from October 2011 to March 2012, the top five app categories are displayed based on growth in minutes spent per active user and the Photo & Video category has grown the most by 89%. Through seeing where consumers are spending an increasing amount of time in apps, the next hot app category is emerging. Since handsets now come with build-in HD cameras and faster processors, they can better handle image processing for high resolution photos. As a result of the software and hardware impacts, the threat of new entrants in the Photo & Video category is of high level.

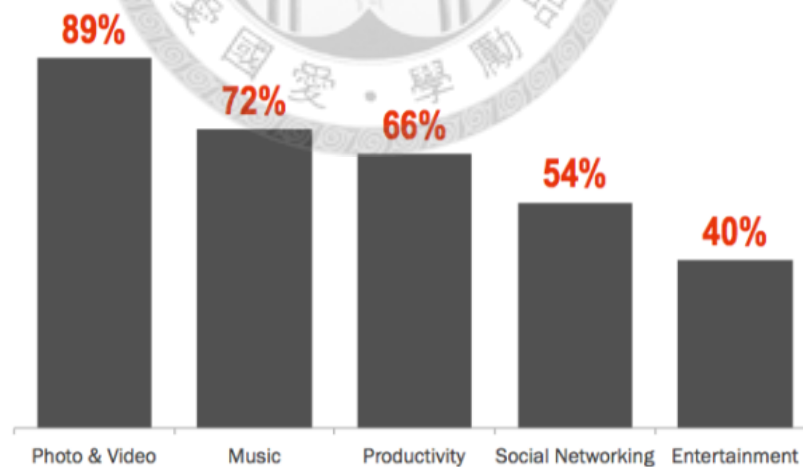


FIGURE 3.6: Fastest Growing App Categories, Time per Active User

3.3.2 Potential Substitutes

Instagram is known for producing retro-looking images digitally. But it's not the only app that can rewind photos. There are several *Instagram* alternatives which are free and

available on both Android and iPhone, such as *Streamzoo* and *Camera360*. Many of the apps even allow users to share their photo on *Instagram*. Since photos are not the only sharing medium, substitute apps can further make strides in video, sound, and text to differentiate themselves. For instance, *Via.me* offers a compelling benefit to consumers, allowing them to edit and share multi-media with an intuitive user interface. Till now it works well and has 13.5 million plus registered users.

3.3.3 Resource Availability

Instagram was created by two Stanford graduates, Kevin Systrom and Mike Krieger. Systrom was a largely self-taught programmer and built an app that allowed location-aware photo and note-sharing, called *Burbn* [11]. Mike, an enthusiastic early *Burbn* user, had background in human-computer interaction and user experience. The pairs took barely eight weeks to strip down *Burbn* to *Instagram*. To set up a company, the initial financing in *Instagram* was \$500 million. Till the acquisition by Facebook, the firm was only 15-month old and had just 13 employees.

3.3.4 Technology Capability

Dozens of technologies power *Instagram*. This shows how a startup with a small engineering team can scale to 14 million users in just over a year. The instant success was done with only 3 engineers. Given the limited resource, the team went with proven and solid technologies. For example, Amazon services [12] were highly leveraged rather than building their own. To keep the system simple, data was stored in-memory and in the cloud. Moreover, following the principle of not reinventing the wheel, they used a ton of open source projects. Such a modern architecture was what Facebook bought for a cool billion dollars.

3.3.5 Development Process

The founders thought that there was a sweet spot in between photography and social apps, and that's precisely where *Instagram* landed. So, they set out the vision to improve the way the world communicates and shares [13]. To perfect the product and get it launched as quickly as possible, they kept testing the prototype with a small group of users. When the app got popular, the founders still focused on the core features and refused to add premiums to generate revenue. Even as the company scaled with better financing, they had the company super-lean.

3.4 Case 3 – LINE

As a smartphone app used in over 230 countries worldwide, *LINE* in Figure 3.7 allows users to enjoy free calls and messages to one another regardless of which mobile network provider they are using. The communication app made by NHN Japan hits 20 million users after just 8 months. Once the app is installed, it's easy to find out friends. *LINE* would simply pull the numbers from the phone's address book and cross-check them with registered users. The app also makes group communication possible and provides virtual stickers, amusing cartoons or icons, for users to express their emotion in an interesting way.



FIGURE 3.7: LINE

3.4.1 Market Attractiveness

Given that social networking giants like Facebook and the carriers have not yet dominated smartphone communication, the global messaging market remains fragmented with several independent players, such as WhatsApp and WeChat. Since the profit potential in the communication app category depends on the user base, existing competitors tend to focus on attracting users first and worrying about the profit later. Part of their success also comes from the aggressive advertising campaign. Although *LINE*'s current numbers and ambitions prompted various competitors to respond, new entrants are still deterred by the high financial requirement to provide long-term free services in the communication app market.

3.4.2 Potential Substitutes

In Figure 3.8 [14], communication apps are located in quadrant I indicating higher user retention and intense usage frequency. User retention is the number of customers returned to use a downloaded application within 90-day period. This mapping gives insights into the subscription and advertising-supported models in the categories with strong loyalty. Since communication apps help bridge up the gap between people and express various emotions in an indirect way, they provide better satisfaction and deliver enduring value to consumers. Once enough user bases are built, there is less chance for substitute products to cut into the communication app market.

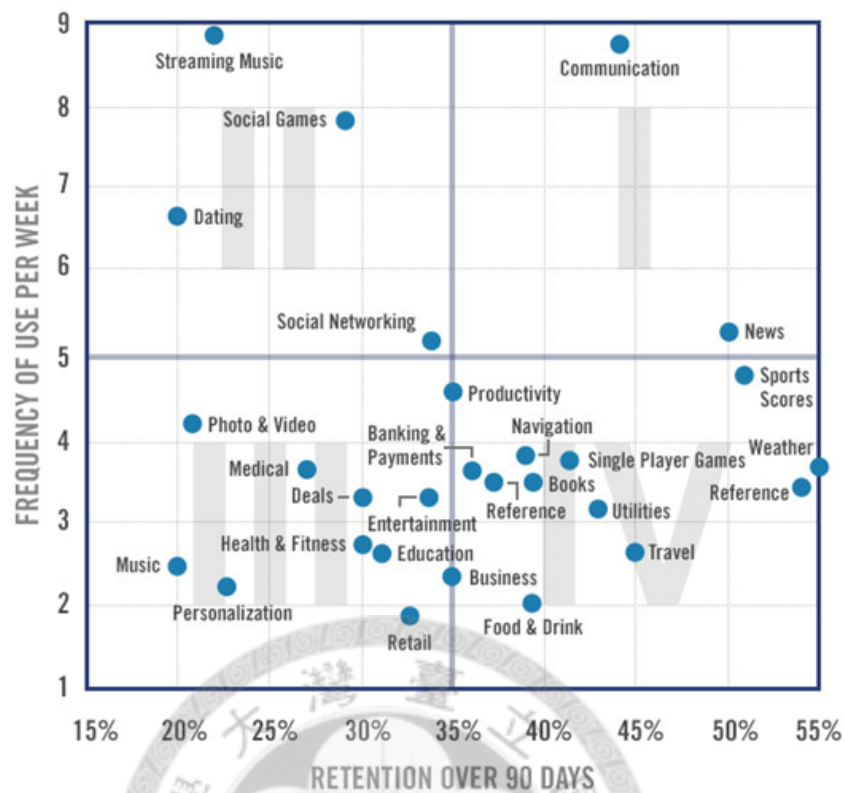


FIGURE 3.8: Loyalty by Application Category

3.4.3 Resource Availability

During Japan's devastating earthquake in 2011, communication was disrupted and data worked better than voice. The impetus made NHN Japan, a Japanese subsidiary of South Korean internet company NHN, start to design an app which would work on data network and provide free instant messaging and calling service. *LINE* was developed by a dozen of engineers and just after two months [15] of the disaster it was launched for iOS and Android smartphones. Under the strong support from its parent firm, the app not only gets major funding for attracting local talents and participating in advertising campaign, but also has shared experience in launching various online services from the people at the NHN group.

3.4.4 Technology Capability

LINE provides users free calling and messaging on smartphones over cellular network and Wi-Fi. Initially it is available on leading mobile platforms and feature phones, and then expanded to tablet and desktop. To bridge the language gap between users in different countries, *LINE* offers a text translation service in the chat room. The app also allows

group chatting with up to 100 people at once, and the sharing of media information such as photo, video and location. When experiencing extreme load due to the exponential growth worldwide, *LINE* developers design a flexible storage architecture [16] to achieve high scalability and availability at a relatively less cost.

3.4.5 Development Process

While Skype, the existing free voice and video call service, is popular among computer users, *LINE* specifically caters to smartphone users. When the smartphone market rises, the company invented the text-messaging service with intuitive and finger-based input [17]. Few months later, some new features like free voice calls and fun stickers were launched and won over smartphone users especially the young people. To ease sign-ups for new users and emphasize real identities, the app only covers the closed friend circle listed in the smartphone's contact list and thereby wins more users. In NHN Japan, each project runs only for one month and one specific task. This way helps developers identify and focus on the highest priority under a short deadline. To build product best suited for user response and rival moves, the company works on the plan-do-check-adjust cycle by delivering fast result, checking user feedbacks, and scrapping unfavorable service.

3.5 Case 4 – Evernote

Evernote in Figure 3.9 is far more than a note-taking app and wants to be an external brain for everyone. It helps users remember everything by storing and organizing notes in different formats such as audio, photos, or to-do lists. Through connecting all the computers and mobiles, the app provides a way to capture thoughts and ideas, and access them from anywhere. Also, online synchronization and backup are offered as reliable services. *Evernote* is now valued at \$1 billion and has over ten million users worldwide.



FIGURE 3.9: Evernote

3.5.1 Market Attractiveness

Productivity apps like *Evernote* are not frequently used as shown in Figure 3.10 [18]. Only 1% of time spent belongs to the productivity category on tablets but fewer on smartphones. It's because the market for personal productivity apps is limited to the screen size of portable devices. The productivity bucket didn't positively explode until

the iPad release in 2010. Such low potential for productivity app revenue resulted in little incentive to new entrants. In addition, tablet users are more workforce-oriented than smartphone ones because of the usage difference between the two devices. To meet the practical demand in productivity improvement, the entry level in that category is relatively high.

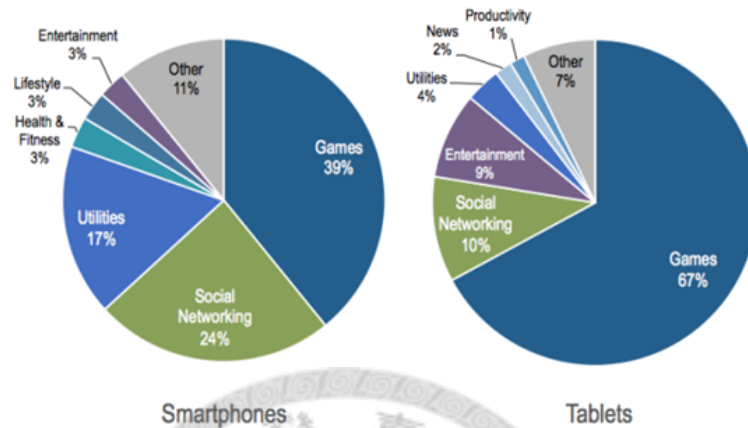


FIGURE 3.10: Time Spent per Category, Smartphones versus Tablets

3.5.2 Potential Substitutes

Productivity apps help people stay organized and informed, such as project management and note taking. In that category, cloud-based apps have gone mainstream and mostly come with freemium model. The more information users store, the more loyal they become. To meet demand on various devices, cross-platform support has become a fundamental feature to improve productivity. This results in significant investments in hardware and software. Therefore, few product from another industry can offer similar benefits to consumers as what productivity apps do.

3.5.3 Resource Availability

The initial technologies around *Evernote* emerged in 2005 from a team of mostly Russian researchers led by Stepan Pachikov [19]. Since there wasn't really a product at that time, Phil Libin joined the team as CEO in 2007 and had obviously influenced the overall product roadmap. At the same sort of time Dave Engberg joined the company as CTO and had input into the high level view of the design. Just one year after the combination, the *Evernote* service was publicly launched in 2008. To date, *Evernote* has raised almost \$100 million funding in total at a \$1 billion valuation.

3.5.4 Technology Capability

Here are some technology features that make people addicted to *Evernote*. By downloading a *Web Clipper* browser plugin, users can mark and save webpage sections including text, links and images. Under some situations, text in captured images can be transformed into searchable and editable one through *Handwriting Recognition*. *Tagging* is another great feature which helps group related notes and allows quick search later. Most importantly all these services are *Everywhere* that users can store information across devices and platforms, even by forwarding emails to *Evernote*.

3.5.5 Development Process

Building products they want to use is always the main focus for *Evernote* developers. If the product is not getting attraction, it's time to go back to the product. Instead of advertisement, they reach a broad audience by using the freemium model – offering a free service with the option to paid upgrade. It's because productivity apps like *Evernote* have a long-term retention rate and increase in value over time. To move from an app into a platform, *Evernote* lures third-party developers with a dedicated developer site and an application store called *Evernote Trunk* [20].

3.6 Matrix Analysis

The above cases in the smartphone app market respectively come from different categories, such as games and communication. These apps are ever or still popular over smartphone users worldwide. To find out their success factors, each case is analyzed from the viewpoints of external environment and internal strength. In Figure 3.11, four app cases are located in specific quadrants of the analytic matrix. The vertical dimension evaluates the intensity of the competitive environment. Usually intense competition results in more divergent products in that app category. The horizontal dimension shows the level of core strength in the early stage of app development. With superior strength, it's more applicable to offer an innovative service.

3.6.1 Competitive Environment

Base on the analysis of the threat of new entrants and substitute products, the two app categories, games and photo & video, face high competitiveness in the app market. The nature of these app categories make them easier to get popular. And the maturity

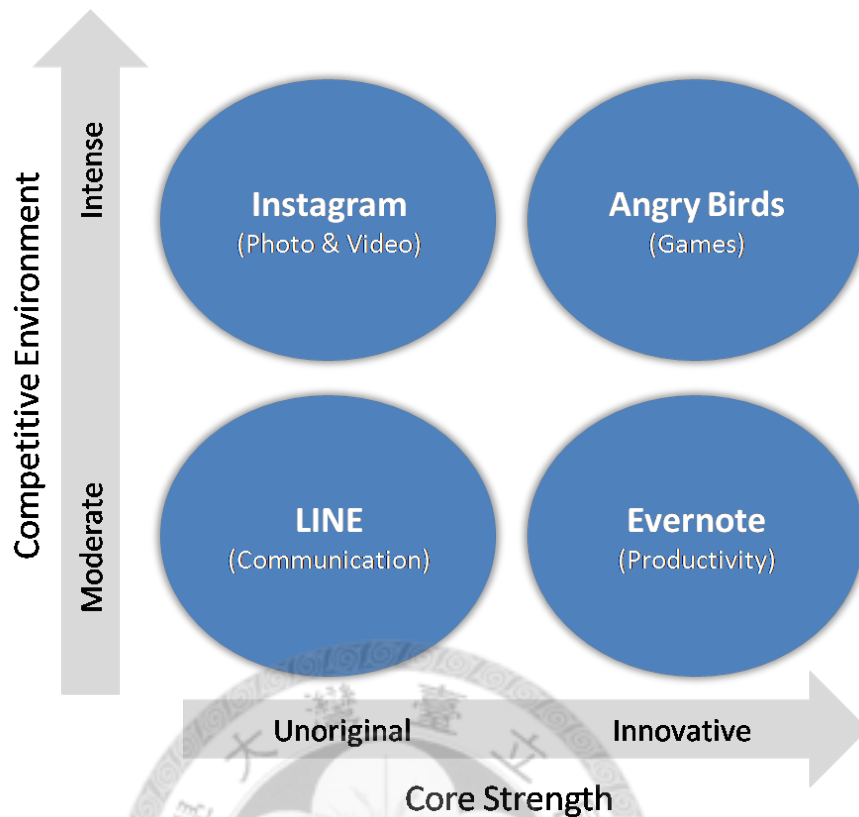


FIGURE 3.11: Case Study Matrix

of their complementary technology leads to the growth of user session. Therefore, the following potential revenue is high and attracts more new entrants in another field or in the same field but on different platform. While satisfying human potential need for relationship, some substitute products like social networking apps are going to mitigate the predominance of games apps. They could also cut into the market by making a variation or extension on the original function.

On the contrary, the other categories have relatively low environmental competitiveness. For productivity apps, the market is limited to a specific group of people and performance requirements are demanding. Once users accumulate rich information in the cloud storage, the switching cost in data migration would reduce their desire on substitute products. Even if the communication market has high potential revenue, new entrants are still stopped by the initial investment in acquiring enough user base. The friend group in the contact list also keeps users' strong loyalty on the existent app.

3.6.2 Core Strength

Core strength is the key feature that makes users unconsciously addicted to an app. As a game app, it's difficult to determine the intuitive interaction model and seamless

learning cycle for users worldwide. Based on previous game development experience, *Angry Birds* successfully designed an engaging user interface that users cannot stop interacting with it. To provide a structured repository of all the thoughts and memories, *Evernote* rethought its service and invented an external brain for everyone. With the utility app, users possess intelligence around important things by cross platform capture and retrieval over their miscellaneous information.

Under limited resource and tight schedule, *Instagram* and *LINE* fully reuse available open projects to build their software architecture. What they lure users are not the state-of-the-art technology but the minor value-added service. For instance, *Instagram*'s users do appreciate its aesthetically pleasing photography while *LINE*'s really love these cute emoticons used in instant messaging chat with friends. As a result, despite the fact that the core strength of the two apps is not outstanding, they still won over customers by making the key feature even better.



Chapter 4

Integrated Analysis of App Cases

4.1 Market Environment

With the four app categories mentioned in the previous chapter of case analysis, it's time to analyze the characteristics of these categories from the market viewpoint. In Table 4.1, there are various aspects under consumer behavior, competitive impact, technical and financial requirement. The result table clearly shows the positioning of each category in the app market and helps new entrants quickly decide whether to enter the market segment or not according to their handy resource.

<i>Category</i>	Games	Photo & Video	Communication	Productivity
Strong User Loyalty			V	V
High Product Diversity	V	V		
Professional Demand		V		V
Large-Scale Investment			V	

TABLE 4.1: Market Environment

4.1.1 User Loyalty

The level of user loyalty mostly depends on social relationship and demand satisfaction. For communication apps, users care more about their friends in the communication platform rather than the app function itself. On the contrary, productivity app users

are practical and look for the app best suited their need. Once they find the desired one, few would spend time trying another similar products. So, the app categories with strong user loyalty could provide value-added service to encourage users to invite more friends, or focus on the underserved population with satisfactory features.

4.1.2 Product Diversity

Since competitive process reflects the market force of demand and supply, it ultimately encourages product diversity and thus is of benefit to the public. To allocate scarce resources efficiently in the mature app categories like games and photo & video, developers are prone to make a little variation on most recent app. They could soon cut into the market segment and increase revenue generating opportunities by providing similar apps. Under such intense competitive environment, cross-category integration is one way to stand out in the app store. For example, *Draw Something*, a social gaming app, succeeds using social cooperation rather than game competition.

4.1.3 Professional Demand

Some app categories are utility oriented, such as productivity and photo & video. Their target customers are hard to please but show willingness to paid apps. Developers could look into customers' needs with a view to make the key feature best in the field. Since mobile users always care about the convenience, the app design cannot deviate from the principles of simplicity and speed. These functional apps usually have relatively small market size and thus low potential revenue. While few enterprises would target the app categories, there is a chance for independent developers to prosper with their own innovative ideas.

4.1.4 Investment Scale

For communication apps, market share is built on the amount of user base. As more users rely on the communication media, more extensible services could be implemented on it. Since the market entrants usually take aim at a long-term platform strategy, they would plan the large-scale architecture at the start and invest a lot in the fundamental construction, such as servers, database, and network bandwidth. Therefore, only the enterprise with sufficient funding would like to challenge such scale economies in the market at a low marginal cost.

4.2 Product Strength

Each successful app in Table 4.2 does gain competitive advantage from certain product attributes. These features are closely related to the specific demand of different app category. For instance, a well-designed gaming app needs no tutorial and its loading time is minimal so that customers could enjoy playing for little pockets of time. While finding out the critical success factors and what's important to target customers, developers can make the best use of their limited resource on the product core value.

<i>App</i>	Angry Birds	Instagram	LINE	Evernote
Increasing Perceived Value				V
Satisfaction of Emotional Need		V	V	
Engaging User Experience	V			
Cross-Platform Support			V	V

TABLE 4.2: Product Strength

4.2.1 Perceived Value

The perceived value of product is determined by the nature of its function. Since mobile apps mostly emphasize the level of convenience, users prefer the app which well integrates cloud-based storage and services. And the subscription model encourages users to accumulate their invaluable personal information over the cloud space and thus allows developers to charge fee for additional functionality. By turning mass information into structured handy one, *Evernote* hits the point where it can be described as an external brain of people. Through these ways, the app successfully builds a long-term relationship with customers and leads to an increasing perceived value in their mind.

4.2.2 Emotional Need

Social networking is the key to satisfy human emotional need. Both *Instagram* and *LINE* kind of catch customers' potential desire for sharing and concern. No matter how excellent *Instagram*'s photo effect filters are, people aren't addicted to it without the photo sharing feature. With the introduction of smartphones having improved cameras,

photos are becoming a popular way to start a conversation online. Besides, communication is always the best path to emotional exchange but how to faithfully express inner thinking is another lesson. To comfort emotional distress during Japan's disasters, *LINE* allows users to communicate via the Internet instead of the disrupted phone lines.

4.2.3 User Experience

User interface is like a web portal such as *Yahoo!* that brings diverse information in a unified web page. In the app gaming market, users' reaction is immediate and direct because their purpose is for fun and entertainment. They won't spend time in understanding how to play the gaming app given that there are a lot of free ones available online. To hook users at the first glance and keep their interest on the game, an engaging user experience plays an important role in *Angry Birds*' success. The app strikes a balance between intuitive user interaction and challenging gaming content. Through its well designed learning model, there is even no need of local guidelines for different languages.

4.2.4 Cross-Platform Support

If the app function is not closely combined with the smartphone device, cross-platform support would be the next must-have in the product feature list. Here comes a relative question. What's customers' preferred technical device as they are at home? Computers might be the answer because of larger screen and better input experience. By expanding *LINE* from smartphones to personal computers, static users on Windows and Mac operating system can conveniently send a message to mobile users. This feature not only links the communication between outdoor and indoor users, but also acquires the market share of traditional instant messengers like *MSN*.

4.3 Competitor Impact

Knowing all about the competitors is as important as having specific product knowledge. Market entrants need to identify and assimilate existent rivals' strategies before they make business-critical decisions. In concentrated industries such as app market, competitor analysis becomes a vital part of strategic planning. The goal is to understand competitors' strengths and weaknesses, and further assess how they might react to new products. In the following, each app case mentioned before would be compared with one major competitor in the same category. General statistics [21] are based on public data of Google Play on December 2012. By using the five-star rating system, total ratings measure the total number of active users rated for the app on the app store.

4.3.1 Fruit Ninja vs. Angry Birds

Fruit Ninja developed by Halfbrick Studios in Australia is a popular fruit slicing game that offers the sensory satisfaction of touch screen fruit destroying. Users can swipe their finger across the screen to deliciously slash fruit in half like a true ninja warrior. Extra points are awarded by slicing multiple fruits at one time and using additional fingers to make multiple slices simultaneously. The game has seen over 300 million downloads by packing a simple one-screen concept – slice the fruit and avoid the bombs.



FIGURE 4.1: Fruit Ninja

4.3.1.1 Overall Comparison

Rank	Title	Market icon	Total ratings	Installs	Average rating
1.	DragonFlight for Kakao		2696116	10 M	4.63
2.	Angry Birds		1501375	100 M	4.61
3.	Temple Run		1102411	50 M	4.62
4.	Angry Birds Seasons		675468	50 M	4.54
5.	Paradise Island		641534	5 M	4.64
6.	Angry Birds Rio		588986	50 M	4.65
7.	Angry Birds Space		519323	50 M	4.58
8.	101-in-1 Games		448013	5 M	4.49
9.	Fruit Ninja Free		435784	50 M	4.57
10.	FRONTLINE COMMANDO		425839	10 M	4.60

FIGURE 4.2: Android App Ranking in Category Arcade Game, by Total Ratings

In Figure 4.2, there are ten top gaming apps by total ratings. As the number of app installation reaches a meaningful amount, average rating is more positively related to total ratings. Since digital distribution gets a game into consumers' hands quickly, sequels of popular gaming apps usually fall flat. In addition, smartphone gaming needs merely a handful of minutes whereby one can play it during commute or waiting. To make people accustomed to the game, both *Angry Birds* and *Fruit Ninja* adopt iterative processes as another kind of sequel. *Angry Birds* is also the only game that has over 100 million number of installation. It's difficult for a gaming app to keep such strong momentum after accumulating so many users.

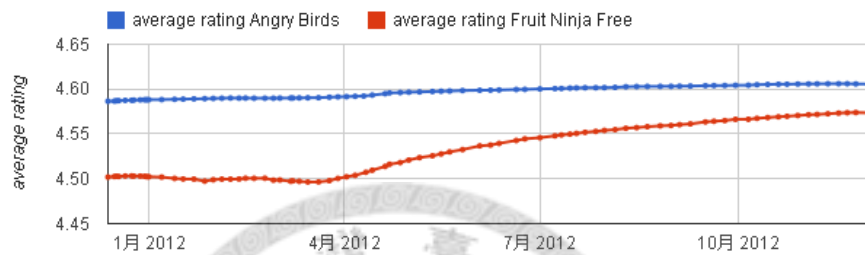


FIGURE 4.3: Average Rating of Angry Birds vs. Fruit Ninja

As shown in Figure 4.3, the average rating of *Fruit Ninja* is always behind *Angry Birds*' in the App store. The rating represents customer satisfaction about the app. The higher the rating the better satisfaction on the app. The two curves are finally parallel so that there is a persistent gap between them. In the smartphone gaming realm, less is more and thus all popular games are so simple to play. However, oversimplification might reduce the fun of playing game. For example, slashing the fruit is the only way to play *Fruit Ninja* without need for adjustment of angle and speed. The leading role, fruit, also limits the possibility of variation in the game.

4.3.1.2 Special Finding

In Figure 4.4 [22], interest for *Angry Birds* grows with age while the level for *Fruit Ninja* reduces. Furthermore, the age groups that are above 15 prefer *Angry Birds*. Only people under 15 years old are more interested in *Fruit Ninja*. It shows that the game complexity of *Angry Birds* is more suitable to adults. Even though both games are low maturity in the app store, there is still significant difference in their design and story. Another survey asks if users are willing to recommend the app to their friends. Once again, more respondents would recommend *Angry Birds* rather than *Fruit Ninja* to friends. After initial marketing of the app, word of mouth which truly reflects the app quality plays the key role to popularize the app.

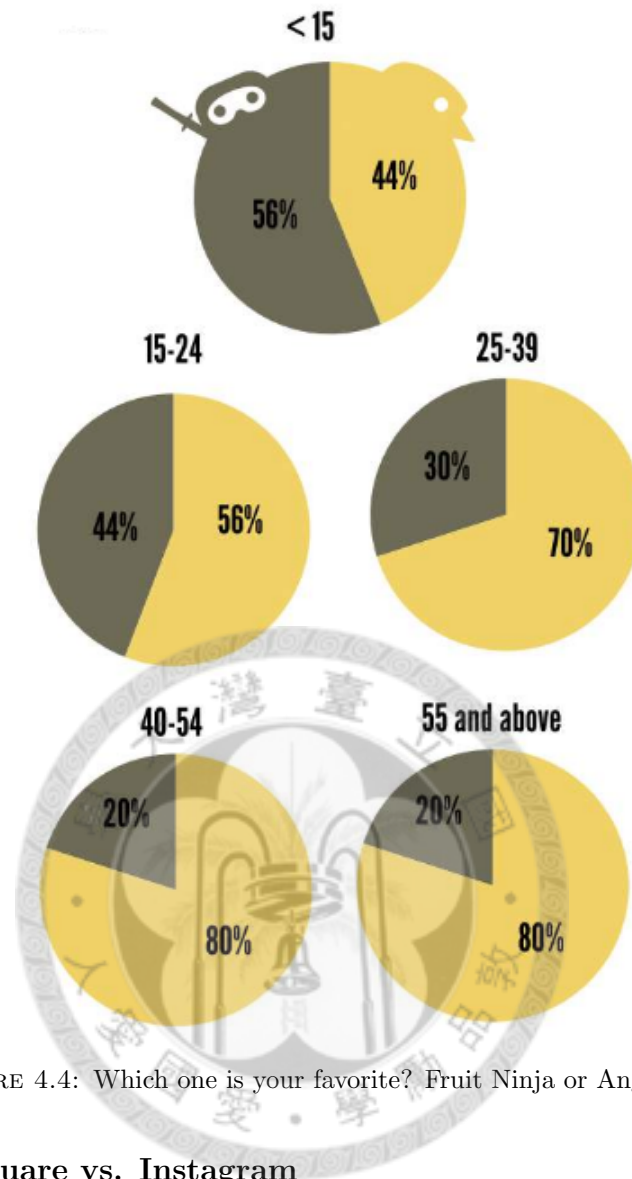


FIGURE 4.4: Which one is your favorite? Fruit Ninja or Angry Birds.

4.3.2 Foursquare vs. Instagram

Foursquare in Figure 4.5 is location-based social networking platform that is rapidly gaining popularity on smartphones. Users can check in to locations which are then published to social network like Twitter and Facebook, and see if their friends are at nearby places. Users can earn some badges as they visit enough locations or the same spot several times. By updating status at a location enough times, they could further become a mayor of that spot. The service also allows users to submit tips and notes about locations through its review system.



FIGURE 4.5: Foursquare

4.3.2.1 Overall Comparison

Both *Instagram* and *Foursquare* were created as mobile apps first and hit the trend of the largest mobile social network where the majority of user activity is from mobile devices. As *Instagram* in the beginning only exists on iPhone, *Foursquare* is a year older and is available on every major mobile platform. However, Figure 4.6 shows that the total ratings of *Foursquare* is far behind that of *Instagram*. While *Instagram* is adding 10 million users in 10 days and smartphones have become even more common, *Foursquare* hasn't proven its ability to rocket the user count. Even though *Foursquare* is one of the rare social network services that has an actual business model, the app has few threat to its competitors.















Rank	Title	Market icon	Total ratings	Installs	Average rating
1.	Facebook		5628368	100 M	3.63
2.	Instagram		2702439	50 M	4.62
3.	Twitter		659344	100 M	4.00
4.	TweetCaster for Twitter		398335	5 M	4.40
5.	Tango Text, Voice, Video Calls		394800	10 M	4.32
6.	Badoo - Meet New People		335950	5 M	4.47
7.	Google+		264026	50 M	4.16
8.	MeetMe - Meet New People		216976	5 M	4.24
9.	Pinterest		211711	5 M	4.73
10.	Tagged - Meet New People		200549	1 M	4.16
11.	Vkontakte		155232	5 M	4.34
12.	Seismic (Facebook, Twitter)		153916	1 M	4.27
13.	TIKL Touch Talk Walkie Talkie		146867	10 M	4.33
14.	Foursquare		146174	10 M	4.22

FIGURE 4.6: Android App Ranking in Category Social, by Total Ratings

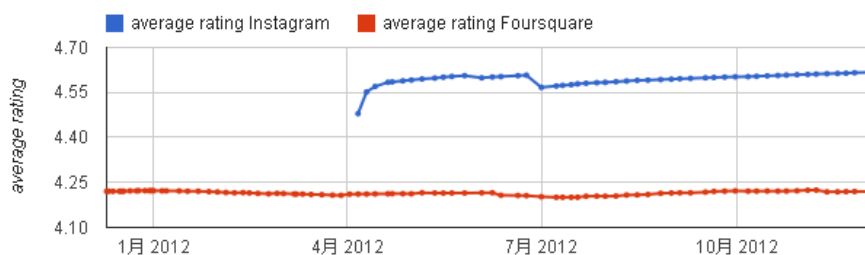


FIGURE 4.7: Average Rating of Instagram vs. Foursquare

Instagram released the Android version in April 2012 as shown in Figure 4.7. Based on its beloved iPhone version, the average rating of *Instagram* Android starts with higher value than *Foursquare*'s. The result reflects that by focusing on photo-sharing feature, *Instagram*'s success on certain mobile platform could be replicated into another competitive one. From a long-term point of view *Foursquare* would have a vast amount

of historical data that is more valuable than anything *Instagram* can come up with. When these data is put together, it can tell the story why a location is popular and what people think about the place. But the biggest problem for Foursquare is that not so many people seem to use it. According to AppData, 3 million people share *Foursquare* data into Facebook every month while the number is 11.5 million for *Instagram*.

4.3.2.2 Special Finding

Figure 4.8 displays the worldwide web search interest of *Instagram* and *Foursquare* from January 2011 to December 2012 [23]. Numbers on y-axis represent search volume relative to the highest one which is always 100. The two apps start acquiring similar level of attention in the latter half of 2012. After *Instagram* confirms plans for Android app at point G in the end of 2011, the search volume difference between them becomes larger over time. Point E represents the peak search volume at the time that Facebook buys *Instagram* for one billion dollar. Since social app is built on user base, the more people are curious about it the more smartphone users would give it a try.

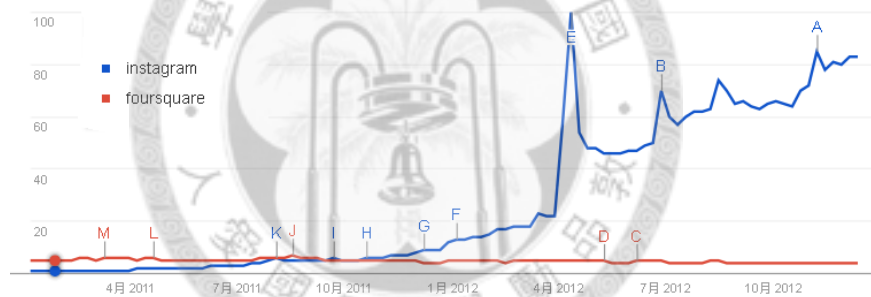


FIGURE 4.8: Web Search Interest Worldwide 2011-2012, Instagram vs. Foursquare

4.3.3 WhatsApp vs. LINE

As a multi-platform instant messaging app shown in Figure 4.9, *WhatsApp* has enjoyed tremendous popularity among youngsters. It's because *WhatsApp* offers faster and cheaper messaging compared to Simple Message Service (SMS) to SMS-addicted teens. With the introduction of group chatting, it also provides real-time social interaction. *WhatsApp* is now delivering more than one billion messages a day on six different mobile platforms. While competitors go free for broader distribution, *WhatsApp* still charges and becomes the number one paid social networking app in the Apple App Store.



FIGURE 4.9: WhatsApp

4.3.3.1 Overall Comparison

In Figure 4.10, *WhatsApp* is the top app that has around 100 million installs and still maintains impressive reputation. On the other hand, *LINE* is catching up through its value added services like voice calls over the Internet and attractive stickers. Since the ranking is based on Android mobile devices, the installation number on other devices is not taken into account. While *WhatsApp* is available only for smartphones, *LINE* further expands its capabilities and scope by offering application for Windows and Mac desktop. *LINE* users can then continue their conversation on the computer without having to touch the smartphone and synchronize with it. Even though *WhatsApp* is the most popular app to date, the potential of *LINE* should not be ignored.










Rank	Title	Market icon	Total ratings	Installs	Average rating
1.	WhatsApp Messenger		1881524	100 M	4.57
2.	KakaoTalk Free Calls & Text		1039420	50 M	4.48
3.	Dolphin Browser		905325	10 M	4.66
4.	Skype - free IM & video calls		842797	100 M	3.99
5.	Viber : Free Calls & Messages		584246	50 M	4.37
6.	Opera Mini web browser		543913	10 M	4.47
7.	Gmail		483270	100 M	4.31
8.	GO SMS Pro		470332	10 M	4.45
9.	Handcent SMS		466652	10 M	4.46
10.	Facebook Messenger		462362	50 M	4.38
11.	LINE		414311	10 M	4.09

FIGURE 4.10: Android App Ranking in Category Communication, by Total Ratings

The average rating in Figure 4.11 shows customers' level of satisfaction on the app over time. Given the steady and high quality of *WhatsApp*, the app has been able to charge because of its clean and focused feature. Although the target of both apps is young people, users found that *LINE* is more interesting by providing some other complementary applications, such as *LINE camera* to decorate photos with cute and hilarious designs. In addition, some security features are not easily perceived by customers. When receiving a message from a stranger, a simple question asking if users want to add or block that person is important. For this part, *LINE* has more protection than *WhatsApp*.

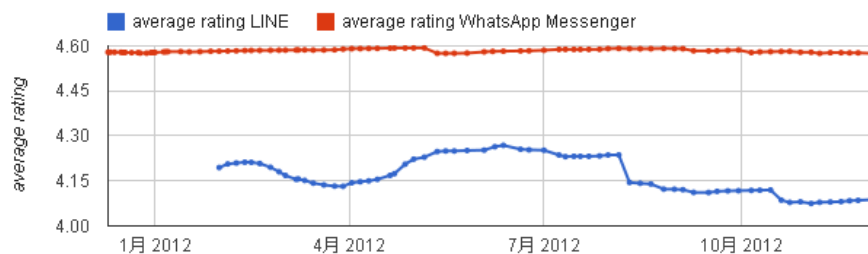


FIGURE 4.11: Average Rating of LINE vs. Whatsapp

4.3.3.2 Special Finding

As a great example of carrier innovation, texting turned 20 years old in 2012. Text messaging has become incredibly popular around the world, but it's not alone in the short message service (SMS). Cross-platform mobile messaging apps allow users to exchange messages without paying for SMS. Under such competition, carriers' high-margin texting revenue keeps dropping. Figure 4.12 shows that the percentage of active iPhone users on different messaging apps in every country [24]. As seen in the chart, *Whatsapp* has dominant marketshare in most European countries while *LINE* is actively used by 44 percent of iPhones in Japan. As a whole, *WhatsApp* is clearly the biggest messaging app on iPhones.

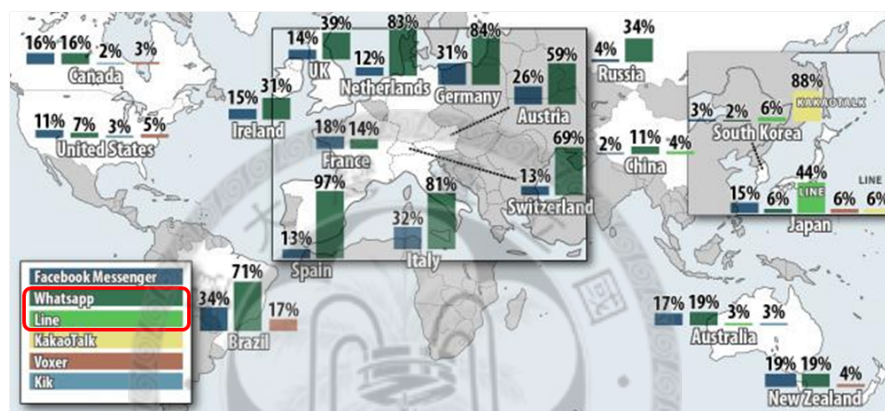


FIGURE 4.12: Global Messaging App Market

4.3.4 Dropbox vs. Evernote

Dropbox provides services for syncing files, backups, and storages. By synchronizing with *Dropbox* server, it keeps one folder on computers, smartphones, and website. With the *Dropbox* app in Figure 4.13, users are able to access handy files no matter where they are. All the photos and videos made by smartpones could be easily uploaded to *Dropbox* and then edited from the phone. Customers could further share these files freely with family and friends. To be online photo repository, *Dropbox* app offers the feature that automatically uploads full-size copies of photos to extra cloud storage space over Wi-Fi or data connection.



FIGURE 4.13: Dropbox

4.3.4.1 Overall Comparison

Both *Evernote* and *Dropbox* specialize in keeping data in sync across multiple digital devices over the Internet. They seem to offer the same sort of basic features and thus cause confusion as to which one is better for productivity improvement. In Figure 4.14, the two services have similar installs but *Evernote* has superior performance than the other according to the total ratings and average rating. While *Dropbox* focuses on file storing and sharing, *Evernote* deals primarily with information content and allows users to take notes in several ways like recording and web clipping. The latter further supports reliable optical character recognition (OCR) to translate handwriting or text in pictures into searchable notes. With additional powerful features, there is no doubt that customers are more satisfied with *Evernote*.











Rank	Title	Market icon	Total ratings	Installs	Average rating
1.	Evernote		479279	10 M	4.68
2.	Advanced Task Killer		415851	50 M	4.53
3.	MyCalendar		379816	10 M	4.56
4.	ASTRO File Manager / Browser		332393	10 M	4.47
5.	Adobe Reader		285784	50 M	4.45
6.	ES File Explorer File Manager		223057	10 M	4.70
7.	Dropbox		207684	10 M	4.63
8.	Skyvi (Siri for Android)		190811	1 M	4.54
9.	JuiceDefender - battery saver		187142	10 M	4.47
10.	GO Locker		167951	10 M	4.38

FIGURE 4.14: Android App Ranking in Category Productivity, by Total Ratings

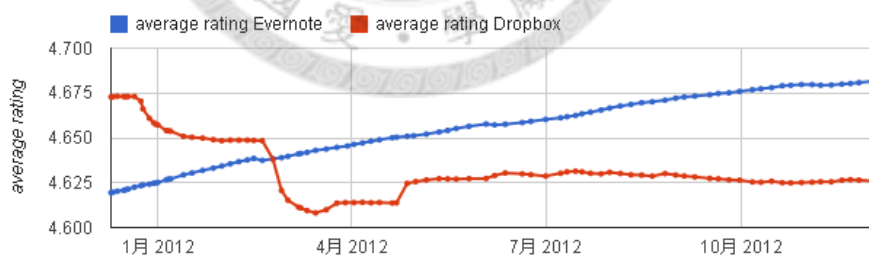


FIGURE 4.15: Average Rating of Evernote vs. Dropbox

In Figure 4.15, there is a critical cross point made by the average rating of *Evernote* and *Dropbox* on February 24th 2012. It's because *Dropbox* v2.1 is available in the Android Market on that day. To solve one of so-called hidden problems people have with technology, *Dropbox* wants to help customers keep all their photos from different devices in one place. The official release would automatically uploads photos and videos in the background using Wi-Fi or data plan. Since the new feature will consume a large amount of limited cloud storage space, *Dropbox* gradually adds up to 3 GB of free space for uploading photos automatically. However, other products like iCloud already provide

the same service and *Dropbox* doesn't offer related tools to manage or edit these photos. Compared to *Evernote's* growing average rating, this half-baked functionality results in the dropping and unstable average rating of *Dropbox*.

4.3.4.2 Special Finding

According to the Cartmer research, free apps account for 89% of all downloads in 2012 and the pricing trend will only become stronger. That is why freemium, the combination of a free product with paid premium features, comes out as another practical revenue strategy for app developers. In the competitive app market, the model is appropriate for the productivity app whose users tend to put more personal information into it. In Figure 4.16 [25], there are three different types of products. The left graph shows that food products have expiry date so that their value decreases over time. In the center graph, products like newspaper could maintain value over time by providing latest news every day. If products support growing content and keep improving features such as *Dropbox* and *Evernote*, their value would increase over time as shown in the right graph.

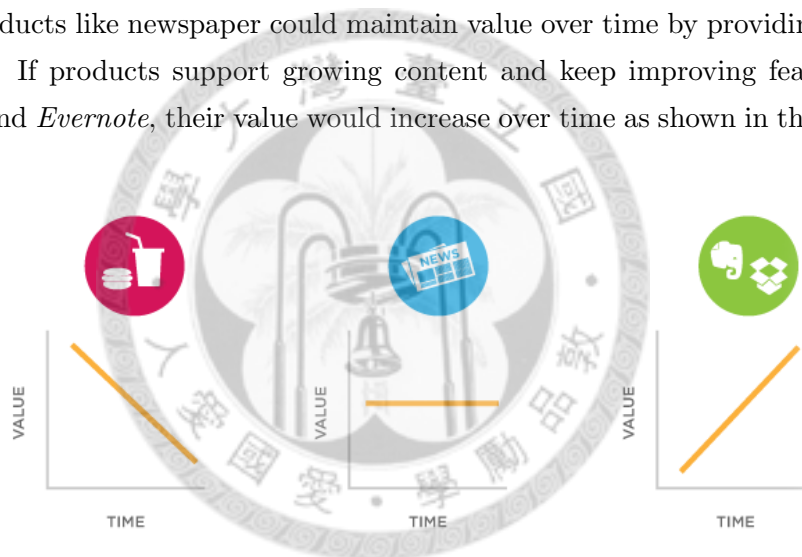


FIGURE 4.16: Product Value over Time

4.4 Key Success Factors

According to the above four cases, there are three key factors leading to their success as shown in Figure 4.17. Initially the vision is set up to figure out what kinds of services to offer and what types of customers to serve. The product vision plays an vital role in guiding everyone involved in the development effort. To capture the essence of the product, the specific market area should be clearly identified to test out whether the solution works for these potential customers over there. It's also important to target the unique competitive position where there is a chance for new entrants. While creating a new service under conditions of extreme uncertainty, focusing on the most valuable feature to customers is how to meet their needs. The team could do one thing really well in the beginning and then slowly add features over time without distracting from its original vision.

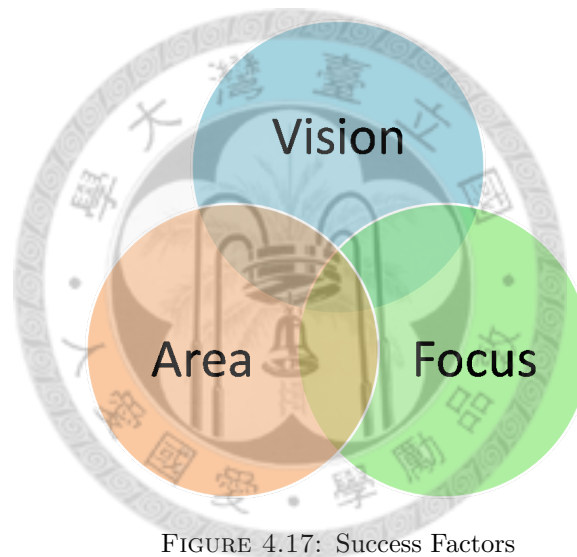


FIGURE 4.17: Success Factors

Chapter 5

Lean Development Strategy

The ideas of lean development strategy would be thoroughly introduced in this chapter. By reviewing the four app cases together, some interesting findings across app categories stand out. In addition, the related statistical data on Google Play provides another insight on app performance. Based on previous analytical result, a strategy matrix comes out along with its property summary. The following is to explain the four lean strategic roles and their development strategy.

5.1 Cross Review

The content in Table 5.1 shows the combined external and internal analysis of the four cases studied above. In the summary table, the common properties across app categories are identified and circled with different color. This cross review helps find out some similar behavior among different app categories and further derives the relation between market environment and product features.

The purple circle shows that intense competitive environment usually results in high product diversity. Since most independent developers prefer entering the app market in games and photo, their product difference needs to be apparent and unique enough to stand out in the mass of apps. These differential apps have more chance to accumulate considerable user base through word of mouth. For instance, *Angry Birds*' popularity is mainly due to its attractive user interface and addictive interactive model. While lots of photo editing apps are available in the market, *Instagram* not only enables users to make beautiful photos but also supports fast photo sharing on social network.

As human being, it's nature to pursue emotional satisfaction. The green circle proves that both photos and virtual stickers are powerful media to have an emotional communication with the others. For example, *Instagram* cleverly integrates photo sharing into the app so that people could easily post their work on social network such as Facebook and Twitter. Their friends might further comment on the posting and indirectly meet people's desire for attention. In the other case, *LINE* redefines short message service by carrying forward Japanese emoticon. People love these cute stickers and use them frequently in chat.

App (Category)	Angry Birds (Games)	Instagram (Photo & Video)	LINE (Communication)	Evernote (Productivity)
External				
Strong User Loyalty			v	v
High Product Diversity	v	v		
Professional Demand		v		v
Large-Scale Investment			v	
Internal				
Increasing Perceived Value				v
Satisfaction of Emotional Need		v	v	
Engaging User Experience	v			
Cross-Platform Support			v	v

TABLE 5.1: Cross Review

The two red circles demonstrate a close relation between the external market and internal product features. Since both communication and productivity apps are utilities to facilitate day-to-day happenings, their success mainly relies on the level of user loyalty. As a result, cross-platform support becomes critical in the product advantage. No matter where users are, they can access these online services through any handy device. For example, *LINE* launched as a smartphone application and then provided desktop version to maintain users' experience from outside to inside. Conversely, *Evernote* first released its web service and was later available on desktop and mobile.

5.2 Statistical Insight

According to the statistical summary in Table 5.2, some meaningful insight could be identified for further discussion. One finding is that total ratings don't necessarily grow with downloads. It is because each app category has different target customer. For example, game apps target the public rather than specific users for productivity apps. Even though *Angry Birds*' downloads is two fold of *Instagram*'s, the latter has the highest total ratings in the table and ranked as number two in all app list. Also, downloads and average rating are not positively related. The app with high downloads might not perform well after customers give it a try. While *LINE* and *Evernote* have similar amount of downloads, only *Evernote* receives excellent evaluation with 4.68 average rating. It shows that *Evernote* does a great job in app performance.

App (Category)	Angry Birds (Games)	Instagram (Photo & Video)	LINE (Communication)	Evernote (Productivity)
Downloads	100 M	50 M	10 M	10 M
Average Rating	4.60	4.61	4.08	4.68
Total Ratings	1,515,962	2,800,466	434,210	489,260
Size Rank	7	2	47	37

TABLE 5.2: Statistical Summary

5.3 Strategy Matrix

Based on previous analysis, we develop a strategy matrix for smartphone application. In Figure 5.1, there are four kinds of app characters belonging to different quadrants. Here come the warrior, coordinator, landlord, and educator in the app market. Each app could be easily classified into any character depending on its located market environment and possessive core value. For respective app role, we would first describe its general features and then provide best suited development strategy.

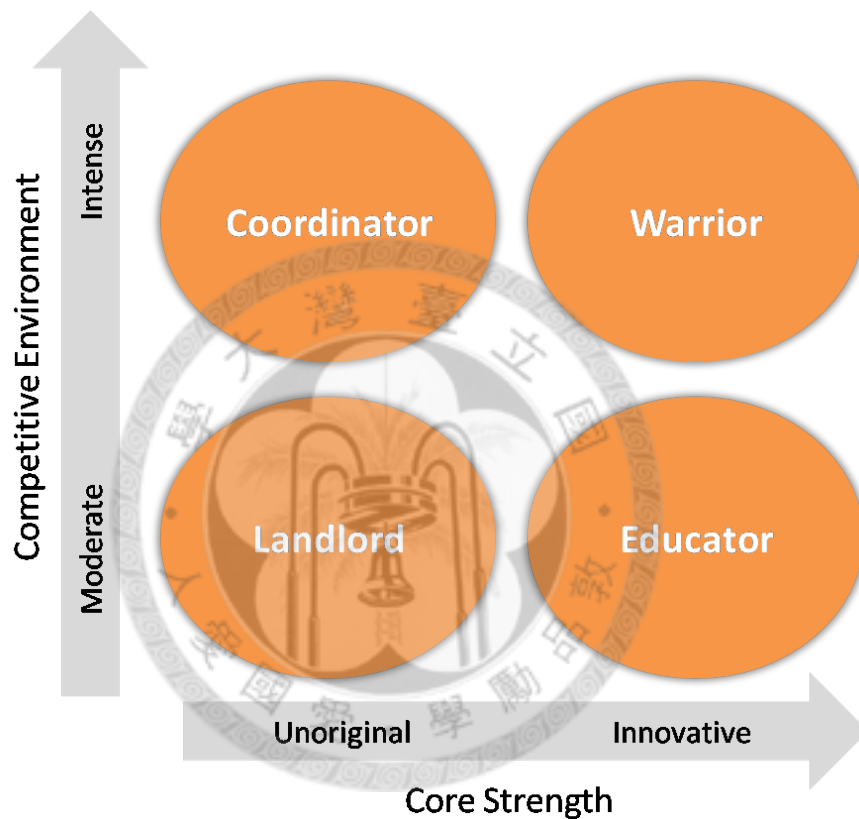


FIGURE 5.1: Strategy Matrix

5.3.1 Property Summary of Strategic Roles

Before getting into strategic roles, their property summary in Table 5.3 clearly shows the research result. This table involves external, internal, and comparative analysis. The external analysis focuses on the influential factors in market environment, such as user loyalty, product diversity, professional demand, and investment scale. The internal analysis emphasizes on some app features in product strength. There are perceived value, emotional need, user experience, and cross-platform support. The comparative analysis is closely related to competitor impact coming from overall comparison and special finding.

App Strategy	Warrior	Coordinator	Landlord	Educator
Market Environment				
User Loyalty	Weak	Weak	Strong	Strong
Product Diversity	High	High	Low	Low
Professional Demand	Low	High	Low	High
Investment Scale	Small	Small	Large	Small
Product Strength				
Perceived Value	Decreasing	Same	Same	Increasing
Emotional Need	Unsatisfied	Satisfied	Satisfied	Unsatisfied
User Experience	Engaging	General	General	General
Cross-Platform Support	Unnecessary	Unnecessary	Necessary	Necessary
Competitor Impact				
Overall Comparison	Balance simplification and challenge	Make simple feature best	Value added service works	Plan additional feature well
Special Finding	User age distribution affects app popularity	Web search interest affects the size of user base	Geographic location affects app distribution	Freemium model works for cloud service

TABLE 5.3: Property Summary of Strategic Roles

5.4 Lean Strategic Role – Warrior

5.4.1 General Profile

Warrior apps face intense competitive environment and possess innovative features in certain app category like games. Since people tend to spend more time in their target market, the potential revenue is relatively high compared to the other app categories. As a result, there are bunch of competitors pursuing limited market share and these kind of apps need to fight like a warrior. To stand out in the app store, their weapon must be good enough to win customers' heart within few seconds. Furthermore, the longer time users stay on the warrior apps the more successful they are. For example, *Angry Birds* delivers truly great user interfaces by adding more detail to users' mental model at just the right time.

5.4.2 Development Strategy

The external competition is so strong that developers should build a flagship product based on their previous advantage. Through this way, they could effectively integrate the know-how learned from other platforms into specific app products. Since the innovative app feature is unclear, validated learning becomes more important in product development. To well understand consumer demand and preference, they need to constantly experiment with new product features. Furthermore, establishing a minimum viable product (MVP) helps speed up the learning process and gather meaningful feedback for instant improvement. Figure 5.2 shows that warrior apps could follow the diagram to make best use of their experience in developing next-generation killer app. In the flow chart, the stages of validated learning and minimum viable product form a small loop to examine which innovative app feature works or not. After several rounds of validation testing, developers could confidently determine the final feature set that best meets the market requirements.

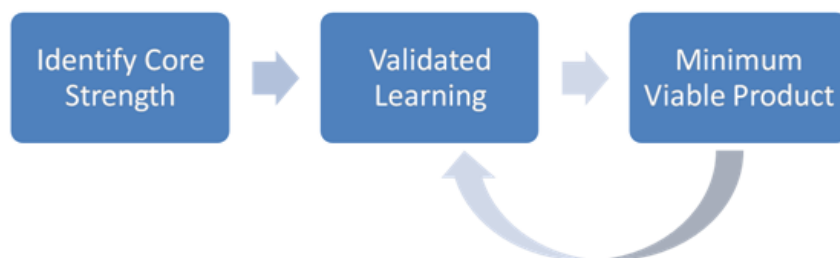


FIGURE 5.2: Development Flow Chart of Warrior

5.5 Lean Strategic Role – Coordinator

5.5.1 General Profile

Coordinator apps are located in an intense competitive environment and have no original core strength. Since in their target market the required functionality is mature, there is no need for these apps to develop state-of-the-art technology. To enhance app differentiation among lots of similar products, developers tend to refer to the features in other app categories and cleverly integrate them into existing app functionality. Consequently, coordinator apps coordinate product features between different app categories and then reinvent a whole new product that better improves customer convenience. For instance, *Instagram* meets the human desire for attention by integrating social sharing into photo editing app. To seamlessly combine these essentially different features, the popular app even automatically reduces the image size to speed up photo sharing onto social network, such as Facebook and Twitter.

5.5.2 Development Strategy

Since coordinator apps are built on mature technology, developers can start by analyzing existing features in the target app category and then identify potential extension on certain feature. Accordingly, they could evaluate the feasibility of combining features from different app categories. Through the re-invention process, developers kind of create another customer demand and take the first mover advantage to acquire significant market share. After determining the product features, they should focus on providing an integrated user experience so that users could seamlessly play the coordinator apps and unconsciously become addicted to the new function. In Figure 5.3, the initial three stages form a loop to help developers find out the most potential combination of existing features. The last stage is to coordinate the feature difference as best as possible.

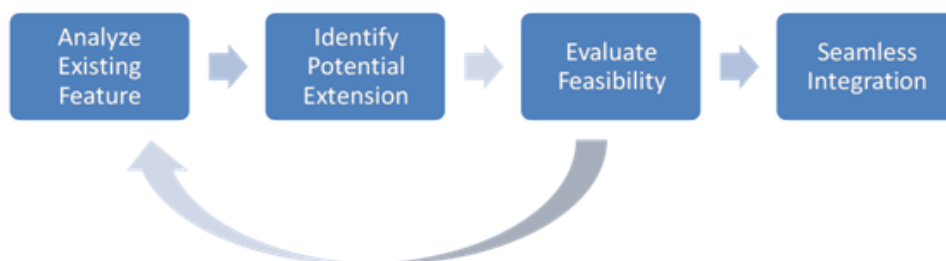


FIGURE 5.3: Development Flow Chart of Coordinator

5.6 Lean Strategic Role – Landlord

5.6.1 General Profile

Landlord apps exist in moderate competitive environment and have unoriginal core strength. To establish a long term relationship with customers, their target group is the general public and the main feature is usually for people’s daily needs. Since building a highly reliable and scalable system is the initial requirement for this kind of apps, only enterprises could afford the large scale investment in fundamental construction. Even if the core functionality of these apps is based on proven technology, there is a need to prepare for a huge amount of user data flow in the future. The goal of landlord apps is to build a platform with useful and free features. Through this way, they could attract a large enough user base and make profit by providing value added service. For example, *LINE* launched as a free calling and messaging app. The app then offered additional features surrounding its communication platform.

5.6.2 Development Strategy

In the initial stage of product development, landlord apps should determine their core feature for people’s daily use. By bringing various services into a single view, these apps would be the first place customers visit for further activity. To effectively accumulate an influential user base, they need to constantly improve the free functionality and become popular by word of mouth. When more users rely on the useful app, there is chance to turn it into a platform for other services. As a result, landlord apps could develop their business model through a whole ecosystem with abundant content on it. In Figure 5.4, the first two stages are to keep high user engagement as significantly as possible. Based on the truly active user base, landlord apps could launch additional paid service and attract more third-party support.

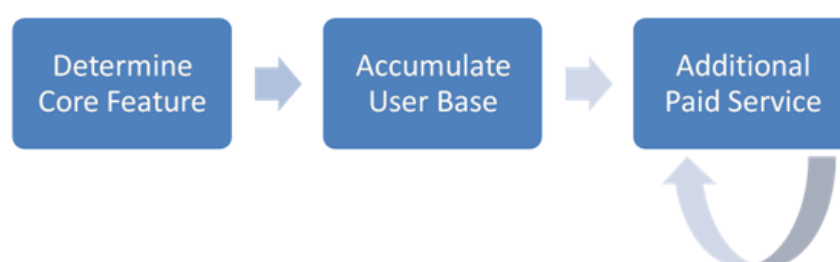


FIGURE 5.4: Development Flow Chart of Landlord

5.7 Lean Strategic Role – Educator

5.7.1 General Profile

Educator apps locate in a moderate competitive environment and usually have state-of-the-art technology. Their feature is so innovative that there is less user demand on these apps. Therefore, cross platform support and intuitive user interface play important parts in making the product convenient to potential users. It is also necessary to educate target customers about their unique benefits and value. Since educator apps are market pioneers, feature performance is the key to attract followers in the new field. For example, *Evernote* reinvents the way people remember things as being an external brain. The app helps improve productivity by saving and organizing user ideas in effective ways, such as web clipping, handwriting recognition, and audio recording.

5.7.2 Development Strategy

Since the functionality of educator apps go ahead of existing products, there is no apparent market demand and direct competitors. These apps need to know what core strength is and turn their advantage into a valuable product. Then they could educate customers how their innovative service improve user productivity. Except for useful features, convenience is the key to attract potential customers. Cross-platform support is also important for users to access this service everywhere. Through cloud integration, product value and customer stickiness would increase over time. When users store more personal data on cloud storage, they would heavily rely on the app to manage and access their massive and sensitive data. As a result, educator apps could accumulate a bunch of loyal users and gradually transfer them into premium ones. Figure 5.5 shows that the middle two stages constantly strengthen the product functionality to ensure the leading position in app features.

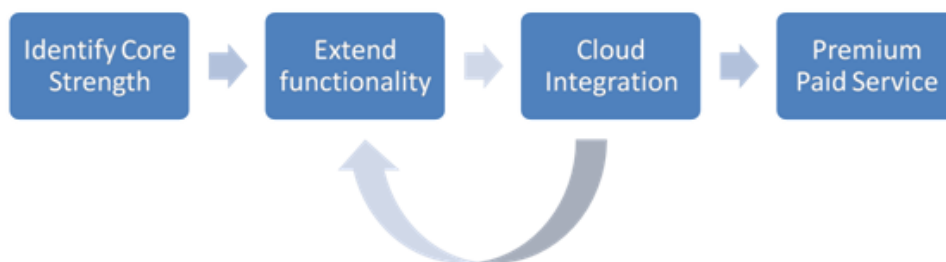


FIGURE 5.5: Development Flow Chart of Educator

Chapter 6

Conclusion

To wrap up the research, this chapter summarizes the lean perspectives based on the analytical result. The idea of lean development is then reviewed from its importance and influential factors. By viewing the matrix of lean development strategy, people could have a clear road map on how to implement a popular app. The research plays a leading role in building specific strategy for smartphone applications, and makes a contribution to thorough app analysis. Furthermore, related managerial implication is introduced as a practical guideline for the management. Possible extension of this research is finally proposed for future studying.

6.1 Research Finding

6.1.1 Lean Perspective

Based on the property summary of lean strategy matrix in Table 5.3, some critical ideas about app development are clearly pointed out. Lean perspective in Table 6.1 shows what developers should pay attention to and keep in mind during the process of app development. Since warrior apps exist in an environment with high product diversity, they need to win customers' hearth at the first glance. Their final work should precisely hit customer preference by iteratively getting customer feedback. To reach popularity, warrior apps have better aim at the general public and choose expandable topic like what *Angry Birds* did. While having general strength under intense competition, coordinator apps should find out the best feature combination to meet customer unsatisfied need. Through market research which are closely related to world trend, they can decide product features and then focus on function optimization. Since landlord apps are located in the market segment which has strong user loyalty and needs large-scale

investment, they target at supporting customer daily activity like communication. To significantly increase the user base, they provide complementary features and deliver convenient access. They also design scalable and flexible system for future possible expansion in the early stage of app development. Educator apps have to create demand for their innovative features. Since their target market has high professional demand, they should improve customer productivity and keep enhancing the functionality. In addition, they could integrate cloud services to increase customer perceived value.

Lean Strategic Role	Lean Perspective
Warrior	<ul style="list-style-type: none"> • Hit customer preference precisely • Get customer feedback iteratively • Aim at the general public • Choose expandable topic
Coordinator	<ul style="list-style-type: none"> • Meet customer unsatisfied need • Emphasize on market research • Optimize focused features • Relate closely to world trend
Landlord	<ul style="list-style-type: none"> • Support customer daily activity • Provide complementary features • Deliver convenient access • Design scalable and flexible system
Educator	<ul style="list-style-type: none"> • Create demand for innovative features • Improve customer productivity • Keep enhancing the functionality • Integrate cloud storage and management

TABLE 6.1: Lean Perspective

6.1.2 Lean Development Strategy

To help next-generation entrepreneurs succeed in app market, lean development strategy is worked out for smartphone application. Developers could make the best use of their strength based on handy resource and dynamically adjust app features to solve unknown customer demand. According to product strength and market environment, there is a matrix identifying four types of strategic roles in app development. They are warrior, coordinator, landlord, and educator. By analyzing their competitor impact respectively, the successful factors for each strategic role become more apparent under overall comparison and specific finding. Furthermore, cross review shows the correlation

among different app categories. Statistical insight also proves the relationship between app attributes and real figures. As a result, lean development strategy of the smartphone application is clearly set out in Figure 6.1.

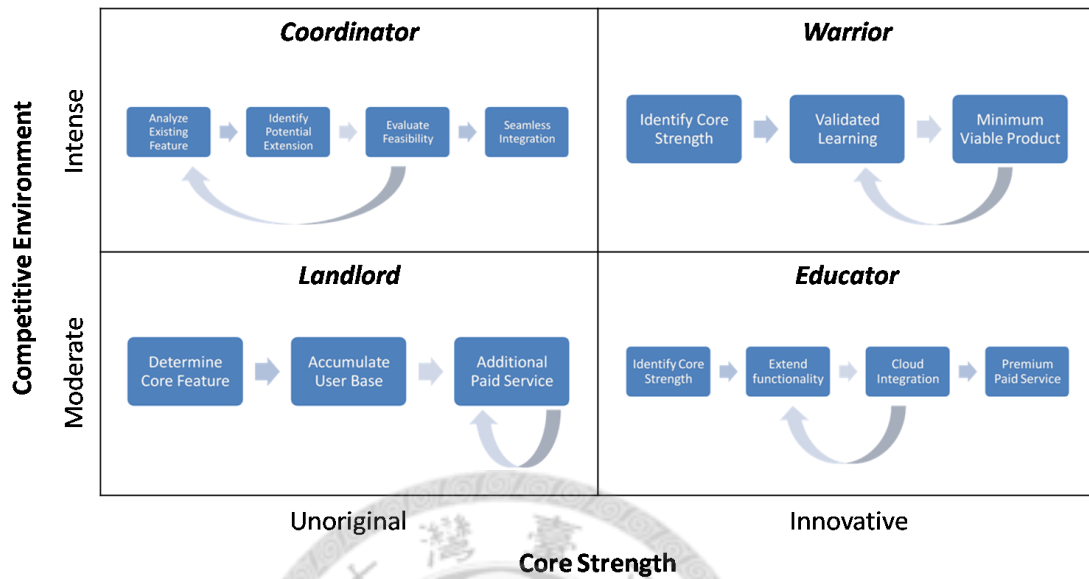


FIGURE 6.1: Lean Development Strategy

Lean development strategy supports flexibly future planning which traditional project management cannot achieve. While customer preference and technology trend change frequently, strategy must adjust over the app life cycle. For each strategic role in Figure 6.1, there is a specific development process which takes app property and market demand into consideration. While warrior apps face strong market competition, app feature portfolio becomes more critical. A feedback loop between validated learning and minimum viable product helps precisely hit customer preference. Since coordinator apps rely on proven technology, they aim at cross-category innovation by following the evaluation loop. As for landlord apps, they focus on building a mobile application ecosystem and finally form a loop to increase additional paid service on the platform. Being technology leaders like educator apps, they need to entice users to try their function and stay loyal by continuously improving cloud-based features.

6.2 Research Contribution

Since there is no specific strategy for app development, most app developers face the risk of wasting limited resource. Lean development strategy makes them capable of identifying the most appropriate position in the market according to their external environment and internal strength. The strategy further provides effective development process covering the entire application lifecycle. Developers can then confidently determine the app

portfolio, a collection of app features, and follow the corresponding development strategy based on the analytical result of eight popular app. These app cases are *Angry Birds*, *Instagram*, *LINE*, *Evernote*, *Fruit Ninja*, *Foursquare*, *WhatsApp*, and *Dropbox*. Through this way, developers could maintain a strategic fit between their capabilities and changing marketing opportunities.

6.3 Managerial Implication

The master's dissertation yields finding that has managerial insights on app development. While facing the challenges of app market, no enterprise or individual can expect to stay away from the growing business model. The management could follow lean strategy matrix to position themselves in the chaos of app market. After identifying which strategic role they belong to, the related lean perspective comes out as constructive suggestions for improving the implementation of smartphone applications. Given that some hot apps are losing their competitive advantage like *WhatsApp*, the dynamic features of lean development strategy become more valuable. The management could follow the general ideas of the proposed strategy and further adjust each development stage into their actual requirements. By applying lean development strategy to app development, the management are capable of making best use of limited resource and avoid deviating from what customers want. The managerial process using lean development strategy is shown in Figure 6.2.



FIGURE 6.2: Lean Managerial Process

6.4 Research Limitation and Future Research

Since only Google opens its statistics data of Google Play to the public via Androidrank.org, it is difficult to provide complete analysis including the other major app store, Apple App Store. To mitigate the issue, other indirect statistical data on mobile apps is taken into consideration. For example, some analysis is based on the report made by Npolls, a company that specializes in research using mobile devices. Another issue is that the same app might be classified into different app category in different app stores. For instance,

Instagram is categorized as a social app on Google Play, but as a photo & video app on Apple App Store. It is because *Instagram* integrates features from two different app categories, social and photo & video. For this kind of app, we would focus on the feature under discussion rather its app category.

It is possible for smartphone apps to transform from one lean strategic role into the others. Moreover, they might cross two lean strategic roles. By horizontally checking the lean strategy matrix in Figure 6.1, there is a chance for some apps to simultaneously possess the major features of educator and landlord apps. The reason is that in Figure 5.3 both educator and landlord apps have strong user loyalty and thus build on large user base. Even though *Evernote* is classified as an educator app, the app launched its platform called *Evernote Trunk* to support developers building more innovative applications. On the other side, most landlord apps take aim at building an app platform, such as *emphLINE Channel*. However, the main features of the two app platforms are different. *LINE Channel* focuses on entertainment usage while *Evernote Trunk* emphasizes on innovative function.



Bibliography

- [1] Apple. App store, 2012. <https://itunes.apple.com/us/genre/ios/id36?mt=8>.
- [2] Google. Google play, 2012. <https://play.google.com/store>.
- [3] Eric Ries. The lean startup, 2012. <http://theleanstartup.com>.
- [4] Flurry. Indie game makers dominate ios and android, 2012. <http://blog.flurry.com/bid/82758/Indie-Game-Makers-Dominate-iOS-and-Android>.
- [5] Ben K. Myers. Small game developers face massive competition in app stores, 2012. <http://www.openfile.ca/ottawa/story/small-game-developers-face-massive-competition-app-stores>.
- [6] Flurry. Social networking ends games 40 month mobile reign, 2012. <http://blog.flurry.com/bid/84512/Social-Networking-Ends-Games-40-Month-Mobile-Reign>.
- [7] Chetanya Rajput. The happy birds: Success story of angry birds, 2012. <http://www.mbaskool.com/business-articles/marketing/1984-the-happy-birds-success-story-of-angry-birds.html>.
- [8] Charles L. Mauro. Why angry birds is so successful and popular: a cognitive teardown of the user experience, 2012. <http://www.mauronewmedia.com/blog/why-angry-birds-is-so-successful-a-cognitive-teardown-of-the-user-experience>.
- [9] Tom Cheshire. In depth: How rovio made angry birds a winner (and what's next), 2012. <http://www.wired.co.uk/magazine/archive/2011/04/features/how-rovio-made-angry-birds-a-winner?page=all>.
- [10] Flurry. Mobile app growth led by video sharing: Youtube in the crosshairs?, 2012. <http://blog.flurry.com/bid/84831/Mobile-App-Growth-Led-by-Video-Sharing-YouTube-in-the-Crosshairs>.
- [11] Eric Markowitz. How instagram grew from foursquare knock-off to \$1 billion photo empire, 2012. <http://www.inc.com/eric-markowitz/life-and-times-of-instagram-the-complete-original-story.html>.

- [12] Instagram Engineering. What powers instagram: Hundreds of instances, dozens of technologies, 2012. <http://instagram-engineering.tumblr.com/post/13649370142/what-powers-instagram-hundreds-of-instances-dozens-of>.
- [13] Jenna Wortham. A stream of postcards, shot by phone, 2012. http://www.nytimes.com/2011/06/04/technology/04photosharing.html?pagewanted=all&_r=2&.
- [14] Flurry. App engagement: The matrix reloaded, 2012. <http://blog.flurry.com/bid/90743/App-Engagement-The-Matrix-Reloaded>.
- [15] Kim-Mai Cutler. Meet line, the messaging app that reaches about one-third of japans mobile phone users, 2012. <http://techcrunch.com/2012/11/19/nhn-line>.
- [16] Esen Sagynov. The story behind line app development, 2012. <http://www.cubrid.org/blog/dev-platform/the-story-behind-line-app-development>.
- [17] The Nikkei Asian Review. Popular line app suggests new formula for success, 2012. <http://www.facebook.com/notes/the-nikkei-asian-review/popular-line-app-suggests-new-formula-for-success/367474516671834>.
- [18] Flurry. The truth about cats and dogs: Smartphone vs tablet usage differences, 2012. <http://blog.flurry.com/bid/90987/The-Truth-About-Cats-and-Dogs-Smartphone-vs-Tablet-Usage-Differences>.
- [19] Richard MacManus. The path from apple's newton to evernote, 2010. http://readwrite.com/2010/11/10/the_path_from_apple_newton_to_evernote.
- [20] Kim-Mai Cutler. Evernote lures app developers with new developer tools, site, 2012. <http://www.digitaltrends.com/mobile/evernote-lures-app-developers-with-new-developer-tools-site>.
- [21] Google. androidrank.org, 2012. <http://www.androidrank.org>.
- [22] NPolls. Angry birds vs. fruit ninja, 2012. <http://www.npolls.com/node/162>.
- [23] Google. Google trends, 2012. <http://www.google.com/trends>.
- [24] Kim-Mai Cutler. The reality of the global messaging app market: Its really freaking fragmented, 2012. <http://techcrunch.com/2012/12/04/global-messaging-market>.
- [25] Nate Weiner. Why read it later/pocket went free, 2012. <http://blog.ideashower.com/post/21276590202/why-pocket-went-free>.