APPLICATION STORE STRATEGIC ANALYSIS FOR TAIWAN’S MOBILE OPERATORS

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ABSTRACT

Due to subscriber growth saturation and voice tariff competition, many mobile operators have been experiencing declining average revenue per user in the past few years. Therefore, they have begun innovation to provide value-added services for consumers and thus derive continued revenue growth. However, finding a successful strategy in an increasingly competitive mobile application market remains a challenge. This research considers the mobile application service as a value network, where different network actors must work together to co-produce value. This research aims to explore how to increase the adoption of customers and app developers by different strategies from the perspective of Taiwanese mobile operators. Based on the two-sided market theory, we show that the growth in the adoption population of customers and application developers can be enhanced via network effects. System dynamics is used to capture the structure of the mobile application ecosystem. The expert interview was also conducted to verify the proposed system structure and dynamic forces that may influence the performance of the application store. Based on the developed system dynamics model, several strategies can be generated for mobile operators. The research findings can provide useful suggestions to help mobile operators improve their business models for sustainable growth.

Keyword: Application stores, System dynamics, Mobile application services, two-sided market, service science

INTRODUCTION

Before Apple Inc. launched its App Store on July, 2007, customers only could use mobile content services or mobile value-added services (VAS) from mobile operators. During that time, mobile operators almost dominated the whole market and had huge profits. Later, the whole mobile application ecosystem has greatly been changed after the launch of App Store. Apple’s App Store not only created a new and
innovative business model but also brought enormous profitable opportunities. Though mobile operators are supporting this trend by providing the connectivity for subscribers to download and access applications, operators are not deriving increased revenue for their efforts. Therefore, mobile operators have started adopting the application store business model themselves to enhance their revenue and subscriber base. However, mobile operators do not retain their dominant positions and competitive advantages in the mobile application industry as before. The challenge remains for them to find a successful strategy and provide meaningful differentiation in an increasingly competitive mobile application store market.

This research considers the application store as a two-sided market, which has two distinct user groups (end-users and developers) that provide each other with network benefits. The aim is to develop a system dynamics (SD) methodology to analyze the dynamic forces that influence the structure and development of the mobile application service value network. Application store creates value primarily by enabling direct interactions between two distinct types of affiliated customers. The proposed SD model will analyze interactions among them in order to help decision makers understand the dynamic behavior of mobile application services and determine appropriate business strategies for a mobile operator to improve its business model for sustain growth. Taiwan’s application stores developed by mobile operators are used as the study subjects. The expert interview was also conducted to verify the proposed system structure and dynamic forces that may influence the performance of the application store. Since the application store is an emerging business model in the digital economy, few studies have investigated the dynamic behaviors of mobile application services (Pagani & Otto; Pagani & Fine, 2008; Pagani & Otto, 2013). Most research in mobile application services focused on business model analysis, key success factors, and user adoption behaviors. This current study is intended to fill this gap in the literature.

This paper is organized as follows. Section 2 reviews the literature on mobile content and application store services. Section 3 introduces Taiwan’s mobile application service industry. Section 4 presents the developed system dynamics model. The market growth strategies are discussed in section 5. Finally, section 6 concludes the paper.

**Literature Review**

Since the mobile application service is in a mobile telecommunication ecosystem that involves a large amount of literature, this paper focuses only on studies of mobile content and application services. Due to the increasing fragmentation and deconstruction of mobile telecommunication industry from value chains to value
networks, mobile operators have been pursuing innovation for providing value-added services (Li & Whalley, 2002; Peppard & Rylander, 2006). Based on the degree of control and restriction of convenient access to content or applications on mobile devices, several mobile content service business models have been developed, such as the full walled-garden configuration, intermediated content delivery configuration, full open garden configuration, etc. (Feijóo, Maghiros, Abadie, & Gómez-Barroso, 2009; Ghezzi, Renga, & Cortimiglia, 2009). Pagani and Fine (2008) utilized the causal-loop diagram to analyze the dynamic forces that influence the structure and development of 3G mobile communication value networks and developed several possible scenarios. Chen and Cheng (2010) developed an evaluation framework based on analytic network process to analyze the strategy of mobile service providers for delivering value-added services. The open garden business model was selected as the best market entry strategy.

Before the launch of Apple’s App Store, mobile network operators (MNOs) dominated the distribution of mobile content and services. The new application store business model has caused significant structural changes in the mobile service market. Kimbler (2010) summarized success factors for the Apple App Store and identified possible application store strategies for mobile operators. Similarly, Gonçalves (2010) also identified advantages and disadvantages of different platform types that an operator can adopt and listed some core competences an operator should have, or develop to successfully adopt a certain platform type. Several strategies were recommended to attract users and developers for application store service adoption, such as: attractive revenue-sharing for developers, competitive pricing and enriched experience for users, enhanced infrastructures and services, etc. Since content providers and application developers are important players in the mobile service eco-system, Holzer and Ondrus (2010) analyzed six major official mobile application markets and trends and then summarized eight implications for developers to improve their business models. However, since the mobile application market is quite dynamic, some information stated in their paper is no longer valid. For example, Microsoft is heading toward the full integration model, after launching its own branded tablet PC, the Surface on June 2012.

Several studies have conducted empirical studies to understand user adoption and continuance behavior on the services of mobile content or applications based on the theory of planned behavior (Hong, Thong, Moon, & Tam, 2008; Kim, 2012). For example, Hong et al. (2008) found that attitude, social influence, media influence, perceived mobility, and perceived monetary value influence consumers’ intention to continue using mobile content services. In addition, perceived ease of use, perceived usefulness, and perceived enjoyment influence the attitude toward continued usage of
mobile data services. Similar to most TAM’s research, their result shows usefulness and ease of use to be determinants of behavioral intention and ease of use to have an effect on usefulness. In addition, Kim (2012) also indicated that both habit and continuance intention are important to the actual adoption of mobile data and application services and that the perceived monetary value, user satisfaction, and variety of use are significant to habit. In addition to the theory of planned behavior, other methodologies, such as diffusion of innovation (Chu & Pan, 2008) and discrete-choice models have been used to study users’ adoption pattern or behavior.

In summary, since the application store business model is still in its infancy, there have been few research studies on the dynamic behaviors of mobile application services. This research intends to fill this research gap by improving the application store business model from the mobile operator perspective.

**Taiwan’s Mobile Application Market**

Due to subscriber growth saturation and voice tariff competition, Taiwan’s mobile operators have had declining average revenue per user (ARPU) in the past few years. Therefore, mobile operators began to innovate with value-added services (VAS) that were expected to create value for end-consumers and thus lead to continued growth. Several mobile operators have launched their own content services based on the operator-centric model since 2005. However, due to lack of attractive content and software integration support, revenue from the mobile content value-added services was less than 10% of ARPU in 2008 (Chen & Cheng, 2010).

Since its launch 2008, Apple's App Store has redefined the way consumers are using the Internet. Taiwan's three major mobile operators, Far EasTone Telecom, Chunghwa Telecom, and Taiwan Mobile, began copying the App Store model by building their own online marketplaces, namely: S Marketplace, Hami Apps, and Match Market, respectively. Far EasTone’s S Marketplace began to provide services in late 2009, and the other two in mid 2010 (see Table 1). According to the 2011 survey from the Institute of Information Industry (III, 2011), 32% of Taiwan’s mobile internet users have downloaded applications, and 86% of these have downloaded in the past month. Nearly 60% of the consumers downloaded free software. Compared to other Asian countries, Taiwan mobile internet users are more willing to pay for mobile applications from application stores. However, the average payment amount is the lowest in all of Asia, only US $1.67.

The industrial survey also found that Taiwan smartphone users increased by 112% in 2011 over 2010 (approximately 290 million). In addition to the future growth potential of new users, 48% of smartphone users will use more applications. This shows that Taiwan mobile internet users have gradually adopted mobile application
services. It is expected that this market will continue to increase in the future and will become an important source of revenue for the three mobile operators. However, the challenge still remains for mobile operators to develop an appropriate strategy or business model to increase their application stores’ market share and achieve revenue growth. This research proposes a solution approach for resolving this challenge.

TABLE 1  THE STATUS OF TAIWAN’S MOBILE APPLICATION STORES BY MOBILE OPERATORS

<table>
<thead>
<tr>
<th>Name</th>
<th>Launch date</th>
<th>App size/Number of downloads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hami Apps</td>
<td>May 2010</td>
<td>6000-6500 / 330M (Nov 2012)</td>
</tr>
<tr>
<td>S Marketplace</td>
<td>Oct 2009</td>
<td>4000-4500 / 450M (Dec 2012)</td>
</tr>
<tr>
<td>Match Market</td>
<td>Apr 2010</td>
<td>About 2000 / unknown (Dec 2011)</td>
</tr>
</tbody>
</table>

A System Dynamic Model for Taiwan’s Mobile Application Services

System dynamics is a methodology for understanding complex problems where there is an underlying dynamic behavior affected by a certain set of feedback mechanisms. These methods have been used for over 30 years for various application domains, including: production management, project management, marketing, strategic management, education, energy and environmental planning, and public policy (Sterman, 2000; Forrester, 2007; Richardson & Otto, 2008). Much of the art of system dynamics modeling (such as casual-loop diagram, stock-flow diagram and simulation model) lies in discovering and representing the feedback processes and other elements of complexity that determine the dynamics of a system. Two SD modeling tools, the causal loop diagram and the stock and flow diagram, are used in this study and are introduced below.

The data used for constructing the SD models were collected from interviews with industrial experts, literature review, and second-hand data. Since attracting users to the application stores developed by mobile operators rather than manufacturers (e.g., Apple) is the main issue for Taiwan’s mobile operators, semi-structured interviews were conducted.

The Cross-side Network Effects Loop

One of the most important concepts of two-sided market is cross-side network effects, where an increase in the number of users on one side of the market creates values for the other side of users, prompting them to join the market. In the mobile application service market, when more application developers adopt an application store platform (e.g., Andrew Market), there will be more applications been developed.
on the platform. There will be higher chance for consumers to find applications they prefer, increasing consumers’ value. This is called the indirect network effects from the developer side, which will increase user adoption rate on the platform. Increased user population on the platform also has a higher chance for developers to have their applications been downloaded and purchased by consumers, increasing value to developers. This is called indirect network effects from the consumer side. This forms a reinforcing feedback loop as shown in Figure 1.

![Figure 1 The Cross-Side Network Effects Loop (R1)](image)

**The Word-of-Mouth Effect Loops**

Word of mouth (WOM) is the communication between consumers about a product, service, or a company in which the sources are considered independent of commercial influence (Hawkins, Best, & Coney, 2004). Positive WOM communication may stimulate consumers to adopt a product or service and increases the adopter population, which will reinforce the WOM effect. In addition, WOM can be considered as the same-side network effects. On the developer side,

In this study, the WOM effects are present in both groups, respectively. In terms of program development by the end, if there is more developers, the greater the WOM effect it generates, thus stimulates other developers to adopt the platform, and increases the number of developers, forming reinforcing loop R1 (Figure 5(2)). Similarly, a WOM reinforcement loop R2’ is formed in the consumer side (Figure 5(1)).

**The Revenue Reinforcement Loop**

As the store has more consumers using services, it is expected that the overall number of application downloads will increase, and therefore generate more revenues from application sales. Currently, most application sores all over the world have the same revenue sharing ratio 7:3. In other words, developers can obtain 70% of every application fees paid, while 30% of it must be paid to the app store. Therefore, if the
application stores can generate more sales, then based on the existing revenue sharing ratio, developers can obtain more revenue and then will have more incentives to adopt this platform, increasing the developer population on the platform. Once again through the cross-side effects, more consumers will be attracted to adopt the platform, forming a reinforcing feedback loop R3 (Figure 3).

The revenue sharing ratio has a direct impact on the adoption rate of developers, because it can increase their total sales (Buvat, 2010).

(1) The consumer side

(2) The developer side

Figure 2 WOM Loops on Consumers and Developers: R2 and R2’

Figure 3 Revenue Reinforcement Loop (R3)

The App Development Environment Investment Loop

The Software Development Kit (SDK) is the most essential element for developers to create applications for the platform. An excellent SDK will be able to effectively reduce application development time and costs for developers. Therefore, an operator can increase the investment on improving the application development environment, such as more friendly SDK and better technical supports, to help developers save time and costs on application development for the platform. This will increase the adoption rate of developers and, through the cross-side network effects,
more consumers will be attracted to the application store and download more applications which increase application store’s revenue and profit, forming reinforcing loop R4 (Figure 4).

**Figure 4**  The App Development Environment Investment Loop (R4)

**The Investment on Innovative Services Loops**

Innovation can be classified different categories, for example, imitative innovation and incremental innovation and radical innovation (Garcia & Calantone, 2002). Imitative innovation is frequently new to the firm, but not new to the market. Thus, imitative innovations usually have low technological innovativeness and low market innovativeness. However, imitative innovation should not be underrated, because it is still possible to change the structure of the market or make the companies eventually having a high market share (Dickson, 1992). The previous feedback loop on improving the application development environment is belonging to imitative innovation, because the SDKs developed by Taiwan’s mobile operators still have rooms for improvement, comparing to SDKs developed by the current market leaders.

Incremental innovation is defined as products that provide new features, benefits, or improvements to the existing technology in the existing market (Song and Montoya-Weiss, 1998). Taiwan’s mobile operators can provide incremental service innovation, which is not yet provided by other application stores, on technical supports and store service quality for developers and users, respectively. This may attract more developers and users to adopt the application store services and, through cross-side...
network effects, it will increase application store’s revenue, forming reinforcing loops R5 and R5’, respectively (see Figure 5).

![Figure 5](image-url)  The Investment on Innovative Services Loops (R5 and R5’)

**The Market Maturity Loops**

As the potential developers or customers approach its maximal level, the adoption rate will be gradually diminished. This forms balancing feedback loops on the user side (B1) and developer side (B1’), respectively (Figure 6).

![Figure 6](image-url)  The Market Maturity Loops (B1 and B1’)

**The Competition between Developers Loop**

Though the positive word-of-mouth effect may attract more developers to adopt an application store service, too many developers producing apps for the application
store will dilute each developer's profit opportunities, leading to intense competition among them.

With Google Play and App Store reporting over 800 thousand listed apps, only developers who produce popular apps can win expected profits. Therefore the growing number of developers on the application store will increase the competition between developers. This will reduce the incentive of developers adopting the application store, forming balancing feedback loop B2 (Figure 7).

![Figure 7  Competition between Developers Loop (B2)](image)

**The Profit Investment Loop**

When mobile operators earn more profit from application sales, they will increase investment on improving quality on services and technical support for enhancing their competitiveness. Additional investment increases the costs and eventually reduces the profitability of app store, forming balancing feedback loop B3 (Figure 8).

![Figure 8  The Profit Investment Loop (B3)](image)

**The App Store Competition Loop**

Emerging market growth of application stores would attract new competitors to enter the market for capturing profit opportunities. The first Taiwan’s application store, S-Marketplace, was launched on Oct 2009, followed by two competitors, Hami Apps and Match Market. New entrant, e.g., Hami Apps, will increase investments on
infrastructure and services for attracting more developers and users adopting the application store services. Hami Apps, a fast follower, now have more applications on its application store. Therefore it will intensify the competition between different application stores. Competing application stores may promote additional incentives to attract more developers and users to adopt their services. This will reduce the adoption rates of the original application store and even lower the cross-side effect network effects, forming balancing feedback loops B4 and B4’ (Figure 9).

Figure 9  The App Store Competition Loop (B4 與 B4’)

Strategic Analysis on Application Stores

After analyzing the dynamic forces and their interactions in the application store market, we propose the following strategies for mobile operators to sustain their growth based on the theory of two-sided market (Parker & Van Alstyne, 2005; Eisenmann, Parker, & Van Alstyne, 2006). The most important issue is how to effectively increase the population of developers or customers on the application store to trigger the cross-side network effects for improving business performance of mobile operators.

1. Reducing or even no registration fee for developers

This strategy can be used if mobile operators want to attract more developers to adopt their services as an application store is new to the market. For example, Google Play’s annual registration fee is 74.5% lower than Apple App Store. Comparing to the application stores that charge a higher registration fee, this strategy can reduce the
development costs and increase the incentive for developers who have lower profit margin to adopt the application store with a lower or even no registration fee. The effect may be amplified through the WOM communication among developers (R2’). However, at the market growth or saturation stages, this strategy may not be effective, because other factors, such as service quality (R4), market share (B4’), etc., may have larger impacts on adoption intentions of developers.

2. Improving app review process for providing high quality apps

There are now more than 800 thousands apps with various qualities on Apple App Store and Google Play. Consumers can evaluate application quality either from the recommendation list or to download an application which can be evaluated by themselves. Mobile operator can improve app review process (e.g., objective evaluation criteria) to encourage developers producing high-quality applications and increase the discovery rate of high quality applications. Although this strategy may increase development costs of developers which may lower their adoption intention (R6), but it may increase the discovery rate of high quality application that will increase the adoption rate of developers (R5’). In addition, high quality applications may increase customer adoption rate through the WOM effect (R1), which can trigger the cross-side network effect.

3. Providing apps for location-based services and local contents

Mobile operators usually have a more in-depth understanding on local customer needs relative to developers, because they provide regional telecommunication services. Therefore they can provide apps with location-based services and local contents, e.g., Chinese interfaces, recommended restaurants and attractions, etc., to attract local customers adopting their app stores (R5). This strategy can also trigger the cross-sided network effects (R1) and the WOM effects (R2) to enhance the visibility of the application store.

4. Providing supports for multiple operating systems

The application stores developed by platform providers (e.g., Apple and Google) can only support their operating system running on the mobile devices. On the other hand, since mobile operators provide wireless communications services to customers using mobile devices with different operating systems, it may be an advantage for them to support applications on a variety of operating systems for their application stores. This may bring values to customers and developers, increase their adoption rates (R5 and R5’) and then trigger cross-sided network effects (R1 and R1’) to attract more developers and consumers for adopting the application store. However, this will
also increase the investment costs of mobile operators to set up the multi-operating system environment (B3).

5. Changing revenue-sharing ratios

This strategy aims to increase the revenues of developers for attracting them to adopt the application store (R3), while reducing the revenue of mobile operator that may reduce required investment to improve service quality (B3). Detailed market analysis and trade-off analysis must be performed to evaluate the effectiveness of this strategy.

6. Increasing investments on incremental service innovation

Mobile operators may borrow innovative ideas or concepts from related industries; such as, personal pages for developers to promote their brands, and recommended apps for consumers as they download an application. Innovative services will bring a unique value to developers and consumers and persuade them to adopt the application store. This strategy not only can accelerate same-sided and cross-sided network effects (R1, R2 and R2), but also create competitive advantages for the application store to improve their performance (R5 and R5’).

Though the current mobile application service market is dominated by mobile device manufacturers, such as Apple, mobile operators still have their advantages to capture this market opportunities. The above six strategies is proposed based on system dynamics and two-sided market theory to increase adoption rates of developers and consumer for sustaining business growth of mobile operators.

Conclusions

This research applied system dynamics to capture the complex feedback structure of the mobile application service market. Based on the developed system dynamics model and the two-sided market theory, we developed several strategies for mobile operators to improve the business performance of their application stores.

At the market introduction stage, mobile operators may reduce or remove registration fee for developers and reduce revenue sharing ratio to attract developers to produce applications for the application store, leading to increasing cross-sided network effects to promote user adoption. At the market growth stage, mobile operators can provide apps with location-based services and local contents, increase investments on incremental service innovation, and support multiple operating systems to create additional values to developers and customers for market share expansion. At the market maturity stage, mobile operators may have more rigid review process for
better application quality and consider changing to new business model for capturing next market opportunities.

The research findings can help mobile operators determine appropriate strategic actions to sustain their market growth. Future research will develop the stock-flow diagrams based on the current model for analyzing the behavior of the mobile application market under different strategic scenarios.

REFERENCES


