THE ADOPTION OF SMART PHONES AND NETWORK EXTERNALITIES

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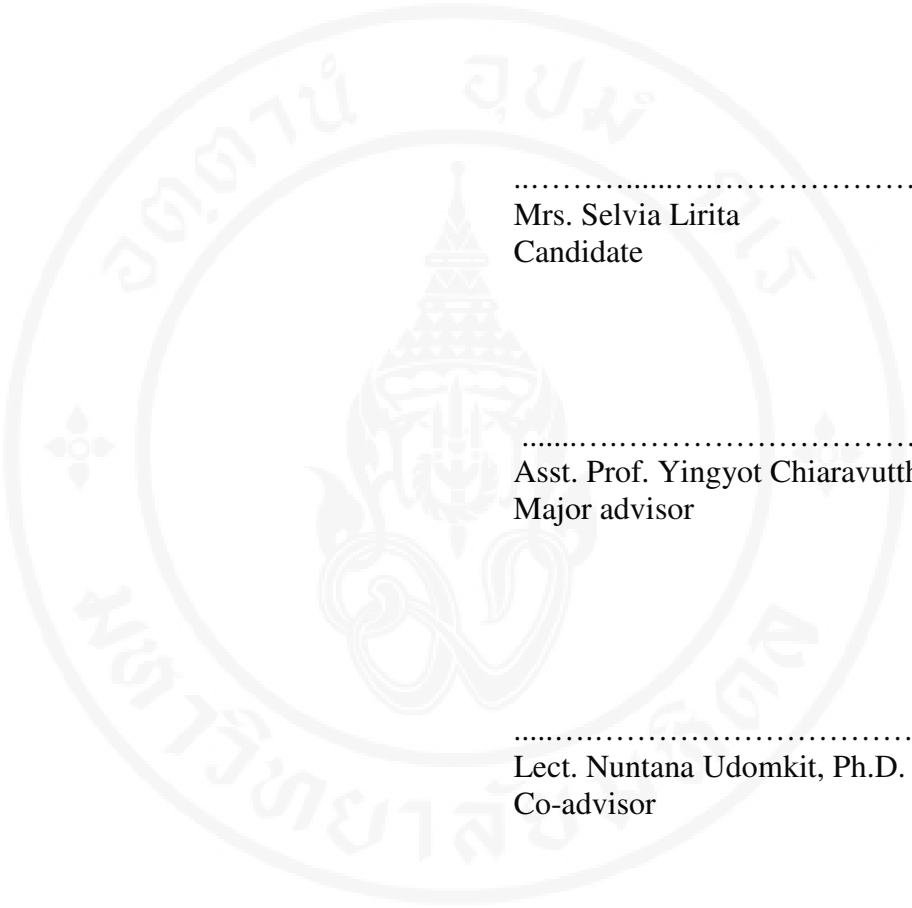

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ABSTRACT

Network externalities occur when a consumer derives the value of a product from the number of other consumers who use the same product. Much literature about network externalities has shown that some industries and some products exhibit network externalities. However, there are still no empirical studies about network externalities and the adoption of smart phones. In recent years, among all smart phone devices, the BlackBerry and iPhone are the leading products with the fastest growth of sales. This paper aims to study whether externalities exist with the BlackBerry and iPhone, and to study the reasons why young consumers in Thailand choose their smart phones. In this study, 200 respondents from Mahidol University International College have been questioned, and a binary logit model has been developed. Finally, the regression results show that the BlackBerry exhibits network externalities, meanwhile the iPhone reveals no sign of network externalities.

KEY WORDS: NETWORK EXTERNALITIES/ BINARY LOGIT/ SMART PHONE/ BLACKBERRY/ iPHONE

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CHAPTER I

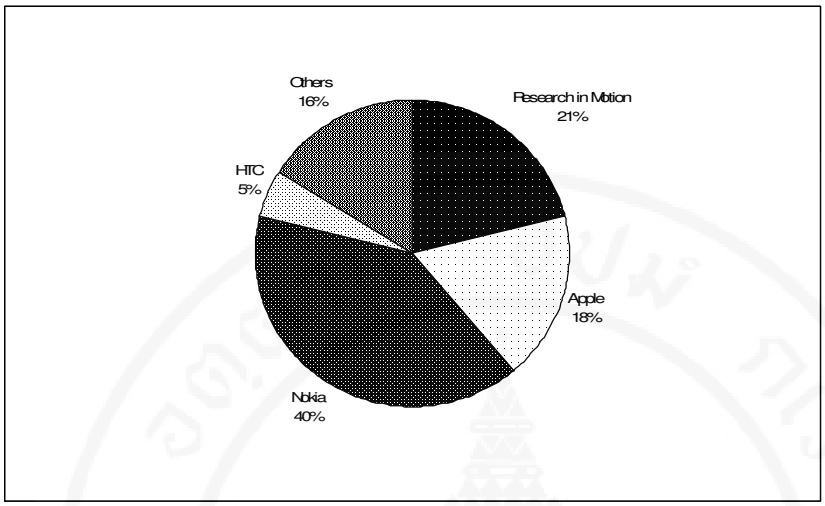
INTRODUCTION

1.1 Overview of Smart Phone Market

In today's global environment, mobile phone has been a major device for people to connect with each other. According to International Telecommunication Union, by the end of 2009, there are 4.6 billion mobile phone subscribers all around the world (ITU, 2010). However, nowadays, mobile phone users demand more sophisticated functions than only to make phone calls and send short messages. They want mobile applications that let them connect to the Internet, check their emails, Facebook, Twitter, even tracking for their stock price movement or personal navigation services. Nowadays, people are using smart phone. Smart phone is a mobile phone that could serve more than a basic mobile phone and could run on its own operating system with special features similar to a laptop or a desktop (Mombert, 2009). The special features include running software applications, handling email and accessing other messaging system, also accessing the web or the Internet (Cassavoy, 2009).

In mobile phone industry, smart phone market share is growing faster than ever. In 2008, a total of 1.19 billion mobile phones were sold worldwide and 13 percent of the sales or 155 million phones sold were smart phones. In 2009, smart phone sales was 180 million units (Gartner, 2009) and the dominant worldwide smart phone vendors (brand) are: 1) Research in Motion (BlackBerry) 2) Nokia (Nokia) 3) Apple (iPhone) 4) HTC (HTC Hero) 5) Others (Palm, Linux, Motorola, Samsung). Up to third quarter of 2009, their world market shares are as shown in Figure 1.1:

Figure 1.1: Smart Phone World Wide Market Share as of Quarter 3 2009



Source: Canalys (2009)

Research in Motion (RIM) and Apple has driven and contributed major growth in the smart phone market. RIM's market share rose from 10 percent in 2007 to 20.8 percent in 2009, and Apple's market share leaped from 3 percent in 2007 to 17.1 percent in 2009 (Gartner, 2009). Among all smart phone products, RIM's BlackBerry and Apple's iPhones are two smart phone products that significantly have the fastest sales growth during 3 years of production.

Table 1.1: BlackBerry and iPhone Led the Sales Growth

Smart Phone	**Units Sold Q3, 2007**	**Market Share (%)**	**Units Sold Q3, 2008**	**Market Share (%)**	**Units Sold Q3,2009**	**Market Share (%)**
BlackBerry	3,298,090	10.6%	6,051,730	15.2%	8,703,262	21%
iPhone	1,107,460	3.6%	6,899,010	17.3%	7,459,939	18%
Nokia	16,0225,690	51.4%	15,485,690	38.9%	16,577,642	40%
HTC	850,400	2.7%	2,308,210	5.8%	2,072,205	5%
Motorola	2,058,500	6.6%	2,313,930	5.8%	Out of Top Five	
Others	7,816,100	25.1%	6,791,530	17%	6,631,057	16%
Total	31,156,240	100%	39,850,100	100%	41,444,104	100%

Source: Canalys (2009)

As shown in Table 1.1, BlackBerry and iPhone are the two leading smart phone products that have the fastest sales growth among the smart phones. Having this achievement, BlackBerrry and iPhone are always interesting to be studied in

terms of which variables lead to better features and better reputation among users, and in terms of which factors that really motivate users to purchase these two leading products.

BlackBerry is a smart phone that is developed by a Canadian company called Research In Motion (RIM) Limited. RIM was built by 2 Canadian genius: Balsilie and Lazaridis. According to Fortune (2009), over the last 10 years, RIM has shown its good performance in stock market, increasing its value from $96 Million to $42 billion. The growth is also shown in its revenue and EPS that the average growth of RIM's revenue from 2007 to 2009 is at 77 percent and the average growth of its EPS (Earning per Share) is at 84 percent (Fortune, 2009). In addition, in Q3 2009, BlackBerry has already shipped it 75th million BlackBerry with 530 carriers across 170 countries.

BlackBerry has distinctive features that are different from other smart phone products. BlackBerry is known with its feature and ability to send and receive email via a wireless network of certain cellular phone operators. As stated by BlackBerry (2010), BlackBerry's system allows access to the email systems, including popular email accounts such as Yahoo, Gmail and Hotmail. BlackBerry handhelds could also be integrated into the organization's e-mail system through "BlackBerry Enterprise Server" (BES) system (BlackBerry Server, 2010). BlackBerry also has instant access to Hotmail and Yahoo Messenger and its exclusive BlackBerry Messenger (BBM), in which communication can only be held between two BlackBerry devices through its PIN identification system. It also allows multiple BlackBerry devices to communicate via group discussion and chat rooms, allowing more users to send pictures and other files over Blackberry network. For added values, there are also special packages for Facebook, ICQ, Myspace and MSN. BlackBerry also launched "App World", a virtual store to challenge developers to make more new applications on BlackBerry (BlackBerry AppWorld 2010). In addition, in order to suit its different target market, BlackBerry has many series that differs in the updated versions of its operating system, its model or design, its prices and its size (BlackBerry, 2010). As for example, see Table 1.2.

Table 1.2: BlackBerry Series

Picture	Series	Special Features
	BlackBerry Bold 9000	Trackball interface, camera 2.0 mega pixel, built-in GPS and Wi-Fi capability
	BlackBerry Bold 9700 (Onyx)	Optical Trackpad, camera 3.2 mega pixel, 3G network support, GPS and Wi-Fi capability
	BlackBerry Pearl	BlackBerry small size phone with colorful choices
	BlackBerry Storm	BlackBerry Touch Screen
	BlackBerry Curve 8300	BlackBerry with large and high resolution screen, multimedia experience with media player support

Source: BlackBerry (2010)

iPhone was introduced in 2007, designed and marketed by Apple Inc. Apple Inc. is an American multinational company that manufactures electronics and software application products, and was established in 1976 by Steve Jobs and Ronald Wayne (Apple Museum, 2010). On July 11, 2008, Apple launched iPhone 3G with faster 3G data speeds and assisted GPS. Later on June 8, 2009, the new iPhone 3GS

was launched with improved performance, higher camera resolution and video capability (Apple, 2010).

Apple's iPhone distinctive feature and capability are its touch screen and MobileMe technology. With its multi touch screen technology, iPhone users can single tap to select and item, zoom in and out with a double tap or finger pinch. Also, with iPhone's MobileMe service, users can update their emails, contacts, file and any information on their devices such as iPhone, Mac and Windows PC synchronously. iPhone sales number has reached more than 30 million units and until Q4 2009, 33.7 million units of iPhone were sold worldwide (Gartner, 2009).

BlackBerry and iPhone have their own distinctive features and see table 1.3, for the details comparison:

Table 1.3: BlackBerry vs iPhone

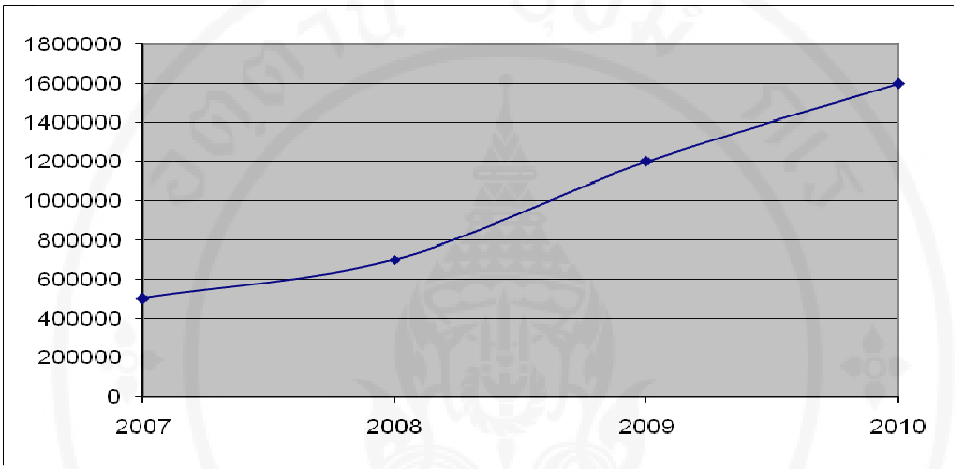
Features	iPhone	BlackBerry
Applications	Apple has more than 100,000 applications as of November 2009	BlackBerry offers more than 2000 applications as of June 2009
Input Method	Multi Touch Screen	Qwerty key board and Multi Touch Screen for BB Storm
Multimedia	Audio, video editing and player, photos	Audio, video player, BlackBerry TiVo (Television)
Connection	3G, WiFi, EDGE	3G, WiFi, EDGE
Internet Browser	Safari browser	BlackBerry Browser
Business Apps Connectivity	Supports Microsoft Exchange	Supports Microsoft Exchange ActiveSync
Messaging with same devices	N/A	BlackBerry Messenger
Memory	16 and 32 GB	8GB MicroSD and 16GB for BlackBerry Storm
Voice Control	Voice Control recognizes the names in Contacts to make a call	N/A
Gaming Experience	More than 13,000 games	More than 250 games

Source: Apple (2010) and BlackBerry (2010)

Thailand is a potential and new growth market for smart phone. Reviewing the smart phone market in Thailand, Thailand market for smart phone is growing rapidly and remarkably. In 2008, smart phone sales have reached 700,000

units sold and in 2009 the sales became 1.2 million units (Post Today, 2010). In the year 2010, it is expected the total number of smart phone sales might reach 1.6 million units or 35 percent increase from the previous year (Post Today, 2010). This figure is as shown on the graph below:

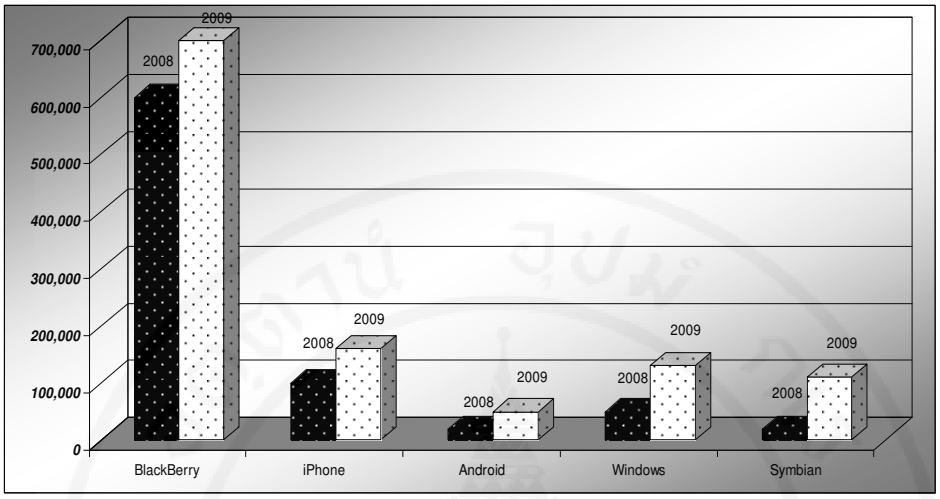
Figure 1.2: Smart Phone Market Growth in Thailand



Source: Post Today (2010)

In 2008, RIM sold 600,000 units of its BlackBerry to Thai consumers and in 2009 the unit sales became 710,000. Meanwhile iPhone sales have increased from 100,000 units in 2008 to 130,000 units in 2009. Compare to other smart phones available in Thailand such as Android, Windows and Nokia Symbian, BlackBerry and iPhone are the leader with their performances of selling the most units. The graph below shows the sales comparison among the smart phone during two consecutive years:

Figure 1.3: Smart Phone Sales Comparison in Thailand



Source: Post Today (2010)

For BlackBerry product in Thailand, Research in Motion (RIM) Limited has been cooperating with 3 mobile service providers: Advanced Info Service PCL (AIS) as the major mobile phone operator in Thailand, Total Access Communication (DTAC) PCL and TrueMove under True Corporation PCL. Interestingly, the battle of smart phone market in Thailand is not only among the smart phone manufacturers, but among the mobile service providers. In this case DTAC, AIS and TrueMove have been competing and gaining their revenues from the sales and the services of smart phones (Post Today, 2010).

RIM strategies into Thailand market are the promotions with many big events including the launch of the product BlackBerry Storm with AIS, the launch of the BlackBerry Curve 8520 white edition with DTAC, and the lauch of BlackBerry Bold and BlackBerry Storm with TrueMove.

The three service providers are also competing in providing the best services to BlackBerry users in Thailand on the price of the handhelds, services, high-speed Internet connectivity, Thai language support, supported triband HSDPA, WiFi connection and supported GPS. As for the marketing strategy, the mobile operators came with different service package and the image of celebrities. Meanwhile, TrueMove offers to the customers its prepaid data packages (60 Baht for 3 days, 140 Baht for 7 days and 599 Baht for 30 days of BlackBerry) with unlimited BlackBerry

data usage via EDGE and GPRS (Marsteller, 2009). AIS introduces three new BlackBerry service packages with 3 different groups, including postpaid, prepaid, and inbound roamers (Pornwasin, 2009). Meanwhile, DTAC offers prepaid unlimited GRPS for around 650 Baht while TrueMove provides the package of unlimited chat, email and Internet package for students for around 300 Baht. Promotion by celebrity is introduced by AIS that it offers exclusive Blackberry content from Thai artist M.L. Chiratorn Chirapravati.

On the contrary, for iPhone, TrueMove is the only mobile service provider company who has exclusive authorization for Apple's iPhone. True Move launched the iPhone 3G in January 2009, and in August 2009 True has also launched the iPhone 3GS. According to TrueMove (2010), 60 percent of True Move's iPhone 3G users use the 8 GB device and 40 percent use the 16 GB version. iPhone in Thailand supports Thai Language keyboard and the marketing strategies include the offering of the price of basic package that is lower than purchasing only the handset, along with the unlimited service in WiFi and 3G. Another promotion include celebrating the events such as the same last four digits number for couples buying iPhone on valentine's festival and payment services such as 0 percent interest installment plan for 6 months.

Nevertheless, while BlackBerry and iPhone are legally offered by official service providers in Thailand, with the presence of gray market, users could also buy the products in some areas in Thailand with lower prices.

1.2 The Importance of The Research

"Network externalities or effects are a change in the benefit that an agent derives from a good when the number of other agents consuming the same kind of good changes" (Liebowitz & Margolis, 1994). It means, the value or utility of a product or service for a consumer increases as more consumers use the product or the service.

This study is to check the existence of network externalities in the smart phone industry in Thailand, particularly the two fastest sales growing smart phone products: BlackBerry and iPhone. The importance of the research is to study whether the network effects of BlackBerry and iPhone lead to less competitive market in Thailand.

1.3 Objectives

The objectives of this study are to study whether externalities exist in BlackBerry and iPhone, and to study the reasons why Thai young consumers choose their smart phones.

1.4 Scope

The scope of the study is the study of 2 major players in the smart phone industry, which are: BlackBerry and iPhone. A questionnaire survey to 100 iPhone users and 100 BlackBerry users in Thailand had been conducted between May 2010 and June 2010. The respondents of the survey are Mahidol University International College students.

CHAPTER II

LITERATURE REVIEW

The concept of network externalities has been studied by many researchers, and has been applied to many business and economic products. The first literature was in 1950, where Harvey Leibenstein analyzed what he called "Bandwagon effect," that the demand for a product is increased due to the fact that the number of other consumers buying the same product increases (Leibenstein, 1950).

This concept is interesting to be studied since some products that exhibits network externalities may distract the normal theory of supply and demand which put the assumption that customers' buying decisions are primarily based on the price of the product or on their own preferences.

As the concept has been more observed and studied, many industries are found to exhibit network externalities. One obvious example is the telephone and fax machine, that the value of the telephone and fax machine increases as more users use them. This network externalities is mentioned to be generated through a "direct" effect of the existing number of users (Katz & Saphiro, 1985). Katz and Saphiro stated that a consumer derives more value from a telephone if the number of consumers that have joined the telephone network increases (Katz & Saphiro, 1985). As for the "indirect" effect, the examples include: personal computer and the software, video game consoles and video games that the value of hardware depends on the availability of the software.

Katz and Saphiro then created the model which shows that in the market where network externalities exist, consumers base their purchase decisions on the expected network sizes and are willing to pay more for its product that consequently make it the market leader. To support the model, Park (2001) studied the competition

between Betamax and VHS in the 1980s and found that network externality is the main reason that VHS outsold Betamax.

The sources of network externalities could be classified into network size, compatibility and other's influence (Chiaravutthi, 2009). The study is to find the existence of network externalities and to identify possible sources of network externalities in the three leading search engine and web-based email providers which are Google, Microsoft, and Yahoo. By looking at the sources of network externalities, the study of 449 students at Mahidol University (MU) and Thammasat University (TU) shows that network externalities do exist in the Google search engine, and finally, among the web-based email service providers only Hotmail web-based email service that exhibits network externalities.

The network size means that there is actually a relationship between user's motivation and decision to purchase a product with the size of the network. The study of network size as the source of network externalities could be shown in the study of Kauffman and McAndrews (1993) with their model showing that the size of the bank network has influenced the decision of banks to join the Automated Teller Machine (ATM) network. Kauffman and McAndrews (1993) have shown that expected shared network size and the size of banking firms are two important elements of network externalities in this industry. The researchers then estimated a model using the adoption data for Yankee 24. Yankee 24 was a group of banks in Connecticut, and the model was estimated using a data set that includes the adoption dates, a proxy for network externalities, and also banking firm characteristics. The result showed that the banks who have a larger network size tend to adopt the ATM network early than other banks who have less or smaller size of bank network.

As for the compatibility, it is the concept that the consumer's purchasing decision is merely on the compatibility of one product to another product. Gandal (1994) estimated hedonic price equations for spreadsheets programs that were compatible with Lotus. The results showed that there exhibits network externalities because users want to share files and because compatible software enables the transfer

of data among a variety of software programs. In 1995, Gandal extends the analysis to Database Management Software (DMS) and this empirical study has shown that consumers are willing to pay a significant payment for spreadsheets software that is compatible with this standardized database management system. Therefore, the study supports the hypothesis that the personal computer software market exhibits network externalities.

The sources of network externalities could also from the other's influence. Peer influence had been studied to have the effect in the increase of use of instant messaging in the network market (Block & Koellinger, 2007). In this study, the authors showed that peer influence has a strong impact on the adoption of Internet-based Instant Messaging services. In addition, the study on peer influence in network markets by Joachim Henkel and Jorn Block (2008) showed that peer influence has given an effect to the growth of the network since early adopters persuade their friends to join the network and also providing them with necessary support and information. The peer effect implies that by recruiting a new user, a network member realizes a continuous flow of utility which is directly linked to his or her use of the good. The study was done on the Internet service Skype and eBay that the network as a whole grew by the number of members who might in turn persuade their friends to also join the network. Unlike Skype, the value of eBay and similar marketplaces lies precisely in the fact that they match strangers with corresponding desires to sell and to buy and are not based on existing ties. Meanwhile Skype is aware of the power of peer effect, and supports this particular peer-based way of diffusion.

There are reasons to believe that smart phones especially BlackBerry and iPhone exhibit network externalities. Firstly, friends' or colleagues' recommendations could influence the purchasing decision that a person may be considered belong to the group if he or she has the same product like others already have. As more users in the group adopt the product, the others may be influenced to adopt the same product. This was studied by Berndt, Pindyck and Azoulay (2000) on the recommendation of antiulcer drugs by other patients. They examined the role of network externalities in the demand for pharmaceuticals and therapeutic class of drugs. Network externalities

arise when the adoption of a drug by one patient happened because of others' influences and recommendations about the drug's efficacy and safety. Therefore, network externalities could lead to the dominance of one drug and not necessarily the safest or the most efficacious drugs provided in the market. Network externalities or network effect could also affect the rate of market diffusion for a new entrant. The researchers' goals were to identify and quantify the magnitude of this network effect and to observe the importance of past sales as a determinant factor in product diffusion.

The influence of celebrities could also motivate consumers to purchase one particular product. Consumers may want to imitate their celebrities' life styles to fit into their lifestyles by adopting the same product or services. In a research by MEC (Media edge: cia) on over 1,000 adults in Indian market, 32 percent of the respondents believed that marketing and promotion of a product by celebrities had made them adopted particular products or services (MEC, 2009). However, to become more effective, celebrity as marketers needs consistency over time in order to build a strong connection between the celebrity and the brand's value or equity.

Secondly, the compatibility between devices could be the reasons of a consumer to adopt a product. BlackBerry has BlackBerry messenger that could only hold communication within the same BlackBerry devices. Chih-Chien Wang in his recent study showed that Instant Messaging Services (IMS) on the Internet is a product that has network effect or network externalities (Chih-Chien Wang, 2010). In IMS, users chat or send their files and messages through Internet Network by sharing their personal identification systems or addresses. The more friends they have, the more active and interactive the communication could be hold among the users. It means, IMS adopters tend to convince others to adopt the same product because their utility of that product depends on the number of users that use the IMS (Instant Messaging Services).

Third involves games applications. BlackBerry and iPhone have player versus player games applications that allow interaction among the users. Nowadays,

according to Nishino and Ueda (2008), the value is created through interaction among consumers. iPhone Apple store has been offering 25 online multiplayer games, real time games using 3G and Wi-Fi, also 27 Bluetooth enabled-multiplayer games (Apple, 2010). The games such as The Big Guns, Baseball Slugger, Dino Smash and Star Hogs are the example of iPhone online multiplayer games. Meanwhile BlackBerry's multiplayer games include BlackBerry multiplayer Championship Chess, Mahjong, and Age of Fantasy (BlackBerry, 2010).

Fourthly, consumers' perception on Research in Motion and Apple as the market leader in the smart phone market may lead them to adopt the products. Research in Motion (RIM) as the manufacturer of BlackBerry was ranked number one by Fortune Magazine as the fastest growing company in 2009 (Fortune, 2009). Meanwhile Apple as the manufacturer of iPhone has been always known with its high and unique reputation in the electronics industry with its Mac computer and awarded by Fortune magazine as the most admired company in the United States in 2008 and in the world 2009 (Fortune, 2009).

Fifthly, the influence of friends could also be the source of network externalities in BlackBerry and iPhone. A user is choosing BlackBerry or iPhone because his or her friend could provide a recommendation or an assistance to use the handset. To support the study on the role of others in influencing a product, Domingos and Richardson (2001) analyzed the network value of a consumer which is defined as a probability that a consumer will buy the product under other's influence.

Lastly, BlackBerry and iPhone have switching costs that may create a perfect lock-in since the product requires customers' money and time to purchase the product and register themselves to the mobile service operators. Widely conventional wisdom stated that switching cost will raise prices and make markets less competitive. In addition, Gourville (2003) listed two reasons why consumers are reluctant to switch to a new product. These are because consumers are sensitive to any changes, and also because they are loss averse consumers that they are not sure with the benefit of adopting a new product.

CHAPTER III

RESEARCH QUESTION AND METHODOLOGY

There are three main questions in this research:

RQ1: Whether or not there is network externalities in the adoption of smart phone and what are the sources of network externalities?

RQ2: What are the reasons that users adopt its primary smart phone?

RQ3: Which usage behavior and demographic characteristics that are more likely to affect the adoption of a particular smart phone?

Network externalities have been defined as an increase that a person derives from a product when the number of others consuming the same kind of product increases. The influence of friends or the word of mouth effect, recommendation by friends, colleagues and family members could be the sources of network externalities.

The value of a smart phone also increases if the coordination between the smart phone users is feasible as it will enable consumers to enjoy higher network benefits in a larger, sustainable network. The main usage of smart phone for coordination activities such as email, application sharing, social network activities, games, individual or group chat with friends or family could also be the sources of network externalities.

In addition, there are still many reasons why users adopt a certain smart phone. It could be because of the product features such as quality camera and video

recording, the ease of use of the smart phone, convenient input method, the storage capacity and battery life time. Design or model of the smart phone, interesting and many available applications on the smart phone and other added value services such as guarantee and 3G service also plays an important role in attracting the users. In further, attractive pricing package offered by mobile service provider in Thailand and the reputation and the name of the company producing smart phone could also be the motive for users to adopt a certain smart phone.

The objective of the adoption of the smart phone by each individual is apparently to maximize the benefits or the satisfaction. The following binary logit model shown in equation (1) represents the decision model of an individual in adopting his or her primary smart phone based on the reasons in using the primary smart phone:

$$\text{Probability } (Y_i = j) = \alpha_j x^b{}_{ij} + u_{ij} \quad (1)$$

for each respondent *i* who selects a particular primary smart phone choice j. x^bij represents the reasons of choosing a smart phone by each individual. In the category of x^bij there are 22 different stated reasons for choosing a particular smart phone which are 1) using smart phone because friends are using it 2) using smart phone because it is easy to use, 3) using smart phone because it has Instant Messaging services, 4) availability of games applications, 5) influence of celebrities, 6) guarantee service, 7) company's name and reputation, 8) price of the smart phone, 9) design or model of the smart phone, 10) camera feature or capability, 11) attractive pricing package offered by mobile phone service provider, 12) convenient input method, 13) recommendation from friends, 14) advertisement from the company, 15) input and software availability in Thai language, 16) interesting applications 17) the number of software applications, 18) political of business figures are using it, 19) 3G capability, 20) speed or the memory performance of the smart phone, 21) storage capacity of the smart phone, and 22) battery life time.

Another binary logit model for capturing the usage behavior and demographic characteristics of behavior is shown below in equation (2)

$$\text{Probability } (Y_i = j) = \beta_j x^c{}_{ij} + u_{ij} \quad (2)$$

for each respondent *i* who selects a particular primary smart phone choice j. x^c_{ij} represents the usage behavior and demographic characteristics of individual respondents in selecting a smart phone. Usage behavior includes 8 different activities which are 1) email, 2) photos/videos, 3) chat with friends or family, 4) entertainment, 5) work or business, 6) social network, 7) games and 8) organizer. Meanwhile, the demographic characteristics include the respondents data which are 1) age, 2) gender, 3) income, 4) hour usage per day, 5) the year duration of using smart phone, 6) the selected mobile service provider, 7) the average smart phone bill or expenses per month, 8) the place of purchasing the smart phone.

For this study, the primary source of the data came from the researcher-made questionnaire to the respondents. A questionnaire has been designed to gather the data regarding the use of smart phone. The researcher had query students as the respondents, and the selected respondents were Bachelor Degree students of Mahidol University International College.

The questionnaire is divided into two parts: the first part asks the respondents the questions about their choice of primary smart phone, the usage of smart phone and the reasons for adopting the smart phone. The second part asked about the demographic data of the respondents. The questionnaire form that was given to the respondents is as shown in the Appendix 1.

The data was collected during end of May to June 2010. The survey collected 100 BlackBerry users and 100 iPhone users in Mahidol University International College (MUIC). The sample used in this study was mostly convenient sampling where students were approached randomly. The survey is expected to give an insight and view of whether network externalities exist in the smart phone and other reasons of smart phone adoption.

The variables acronyms and their explanations are presented in Table 3.1. Certain variables were not included due to insufficient response rate by the respondents.

Table 3.1: Variables and explanations of smart phone

Variable	Explanation
BlackBerry	Selected BlackBerry as primary smart phone = 1, iPhone = 0
iPhone	Selected iPhone as primary smart phone = 1, Blackberry = 0
Email	Using primary smart phone for email = 1, others = 0
Photos	Using primary smart phone for taking pictures or making videos = 1, others = 0
Chat	Using primary smart phone for chatting = 1, others = 0
Entertainment	Using primary smart phone for entertainment such as watching TV, listening to music or radio = 1, others = 0
Work	Using primary smart phone for work or business= 1, others = 0
Social	Using primary smart phone for social network activities such as Facebook, Twitter = 1, others = 0
Games	Using primary smart phone for playing games = 1, others = 0
Organizer	Using primary smart phone for organizing activities = 1, others = 0
Friends	Using primary smart phone because friends are using it = 1, others = 0
Easy	Using primary smart phone because it is easy to use = 1, others = 0
InstantM	Using primary smart phone because it has Instant Messaging services = 1, others = 0
GamesReason	Using primary smart phone because it has many games applications = 1, others = 0
Celebrities	Using primary smart phone because celebrities are using it = 1, others = 0
Guarantee	Using primary smart phone because it has guarantee service = 1, others = 0
Company	Using primary smart phone because of the name and reputation of the company producing smart phone = 1, others = 0
Price	Using primary smart phone because of its price = 1, others = 0
Design	Using primary smart phone because of its design = 1, others = 0
Camera	Using primary smart phone because of its camera capability = 1, others = 0
Package	Using primary smart phone because of the attractive pricing package offered by mobile phone operator = 1, others = 0
Input	Using primary smart phone because the input method is convenient (qwerty keyboard or touch screen) = 1, others = 0
Recommend	Using primary smart phone because friends recommend to use it = 1, others = 0
Advertisement	Using primary smart phone because of the advertisement on the smart phone = 1, others = 0
Thai	Using primary smart phone because the input and software are available in Thai language = 1, others = 0
InterestingApps	Using primary smart phone because it offers users many interesting applications = 1, others = 0
AppsAvailable	Using primary smart phone because it offers users many available applications = 1, others = 0
Figure	Using primary smart phone because political or business figures are using it = 1, others = 0
ThreeG	Using primary smart phone because of its 3G capability = 1, others = 0
Speed	Using primary smart phone because of its speed = 1, others = 0
Capacity	Using primary smart phone because of its capacity = 1, others = 0
Battery	Using primary smart phone because of its battery life time = 1, others = 0
Hours	Hours per day on using the smart phone: 0-1 hour = 1, 2-4 hours = 2, 5-6 hours = 3, 7-9 hours = 4, 10-16 hours = 5, over 16 hours = 6

Variable	Explanation
Year	The length of usage in years: 0 – 1 year = 1, 2-3 years = 2, Over 3 years = 3
Male	Male = 1, Female = 0
Age	Age of the respondent: 18-20 years old = 1, 21-23 years old = 2, Above 23 = 3
AIS	AIS as user's mobile service provider = 1, others = 0
TrueMove	TrueMove as user's mobile service provider = 1, others = 0
Income	Monthly income of respodents: 0-5,000 Baht = 1, 5,001-10,000 Baht = 2, 10,001-15,000 Baht = 3, 15,001 – 20,000Baht = 4, 20,001-25,000 Baht = 5, 25,001 – 30,000 Baht = 6, Above 30,000 Baht = 7
OfficialStore	Purchase smart phone at the smart phone official store/website = 1, others = 0
Smallvendor	Purchase smart phone at small vendors such as from Pantip Plaza, MBK
Expenses	Average smart phone bill or expenses per month: Less than 500 Baht = 1, 501 – 1,000 Baht = 2, 1,001 – 1,500 Baht = 3, 1,501 – 2,000 Baht = 4, More than 2,000 Baht = 5

The descriptive statistics of variables for smart phones are presented in Table 3.2. There is some interesting information found from the survey of 200 smart phone users in Thailand. From the purpose of using smart phone, 56.9 percent of the respondents stated that they use smart phone mainly for chatting with friends, colleague or family. More than half of the respondents also stated that they use smart phone for sending and receiving email and taking photos or videos. Large percentage of respondents (51.5 percent) stated that the main use of smart phone is to access social network media in the Internet such as Facebook and twitter. However, only 28 percent of the students use smart phones for the purpose of work or business.

When asked to identify their main reasons of using smart phone, 50 percent stated that the reason of selecting particular smart phone is because it has instant messaging system and application. The other majority reasons are because the smart phone is easy to use and because of the design or model of the smart phone. Surprisingly, unlike the common opinion that Thai young consumers are attracted to smart phone because of the influence of the celebrities, the survey shows that only 12 percent of the respondents purchase the smart phone because the celebrities are using it. Moreover, advertisement seems to give little effect to the adoption of smart phone that only 17.5 percent of the respondents purchase the smart phone because of the advertisement.

For demographic variables, 40 percent of the respondents are male with average age 18-20 years old and average income of 5,000 – 15,000 Baht.

Approximately 40 percent of the survey respondents choose AIS as their mobile service provider and in terms of purchasing behavior, they mostly purchased their smart phones at small vendors (39 percent).

When asked about the number of hours of using smart phone, survey results confirmed that in average, the respondents use their smart phone for 5-6 hours per day and just recently started using the smart phone (1 year in average).

Table 3.2: Descriptive statistics of variable for smart phones

	Mean	**Standard Deviation**
BlackBerry	0.500	0.501
iPhone	0.500	0.501
Email	0.545	0.499
Photos	0.530	0.500
Chat	0.569	0.461
Entertainment	0.425	0.495
Work	0.280	0.751
Social	0.515	0.501
Games	0.345	0.476
Organizer	0.352	0.479
Friends	0.395	0.490
Easy	0.490	0.500
InstantM	0.500	0.500
GamesReason	0.245	0.431
Celebrities	0.120	0.325
Guarantee	0.085	0.280
Company	0.175	0.380
Price	0.130	0.330
Design	0.475	0.500
Camera	0.265	0.440
Package	0.135	0.340
Input	0.380	0.773
Recommend	0.315	0.465
Advertisement	0.175	0.380
Thai	0.060	0.238
InterestingApps	0.405	0.492
AppsAvailable	0.340	0.474
Figure	0.010	0.090
ThreeG	0.225	0.418
Speed	0.280	0.450
Capacity	0.200	0.401
Battery	0.120	0.325
Hours	3.455	1.440
Year	1.335	0.580
Male	0.400	0.490
Age	1.380	0.545
AIS	0.405	0.492
TrueMove	0.205	0.404
Income	2.425	1.330
OfficialStore	0.225	0.418

	Mean	Standard Deviation
Smallvendor	0.390	0.488
Expenses	2.315	0.959

CHAPTER IV

RESULTS AND ANALYSIS

The results of equation (1) for the users who chose BlackBerry as their primary smart phone are presented in Table 4.1.

Table 4.1: Model for selecting BlackBerry based on the reasons in using smart phone

Variables	Coefficient	Z-Statistics	P-value
Friends ***	5.753	4.220	0.000
Easy	0.637	0.789	0.429
InstantM ***	2.622	3.075	0.002
Gamesreason ***	-5.956	-3.298	0.001
Celebrities	1.142	1.024	0.305
Guarantee	-2.013	-1.094	0.273
Company	-0.521	-0.504	0.614
Price	0.125	0.105	0.915
Design	-0.490	-0.705	0.480
Camera	-0.014	-0.016	0.987
Package	-0.433	-0.399	0.689
Input **	1.517	1.693	0.090
Recommend ***	2.576	2.760	0.005
Advertisement ***	3.266	1.987	0.046
Thai*	-3.666	-1.529	0.126
Interestingapps	-0.238	-0.316	0.751
Appsavailable	-1.263	-1.692	0.090
Figure	42.223	0.000	1.000
ThreeG **	-2.179	-1.851	0.064
Speed ***	-4.7912	-3.210	0.001
Capacity ***	-3.5095	-2.907	0.003
Battery **	2.811	1.813	0.069

Note: N=100. *** P-value < 0.05. ** P-value < 0.10 * P-value < 0.15.

The sources of network externalities could be from the network size, compatibility, and others' influence. Therefore, there are three variables that closely related to network externalities which are 1) "Friends" (network size), 2) "InstantM" (compatibility) and 3) "Recommend" (others' influence). The result from the equation (1) has shown that network externalities exist in the adoption of BlackBerry. This can be seen from the result that variable "Friends" are statistically significant. It means that users choose BlackBerry because their friends are also using BlackBerry and the

utility that a consumer derives from purchasing a Blackberry depends on the number of friends that have used the product.

The fact that users use BlackBerry since it has instant messaging services is another reason why users choose BlackBerry. BlackBerry has BBM (BlackBerry Messenger) in which communication can only be held and restricted between two or more BlackBerry devices (compatibility). Therefore, users want to use the same chat service as their friends and to share their files, photos or videos with their friends or colleagues with the application that is compatible with the one that they are using. In terms of others' influences, the variable "Recommend" is significant with p-value of 0.005. Therefore, friends' influences or friends' recommendations affect the adoption of BlackBerry and it also means that the distribution of information of BlackBerry relies on social influence or word of mouth. In addition, since the variable "Advertisement" contains a p-value of 0.046, it seems that the aggressive advertisement by the company and the mobile service providers had effectively affected users to choose BlackBerry. As also shown in Table 6, input reason contains p-value of 0.090 which means users adopt BlackBerry due to their preference of using qwerty keyboard for their smart phones. For battery reason, the fact that BlackBerry has up to ten days stand-by time and talk time up to four and a half hours also leads users to choose BlackBerry.

The less significant variable is "Celebrities". Contrary to many beliefs, celebrities and business figure do not seem to have an influence on the decision in adopting BlackBerry as the primary smart phone. The other less significant variable is the design of the smart phone. From the result presented in Table 6, the various models and design offered by BlackBerry are not the factors that influence the buying decision of the consumers.

There are five significant variables that have negative correlation with the adoption of BlackBerry: "Gamesreason", "ThreeG", "Speed", "Thai" and "Capacity". It means, these variables decrease the probability of users' in adopting BlackBerry. As shown in Table 6, games applications that BlackBerry offer might discourage the users

to adopt BlackBerry. The fact that BlackBerry only offers limited games applications and the limited hardware performance in playing games could be the reasons why users do not choose BlackBerry. The limited number of BlackBerry products with 3G capabilities, and the lack of speed and capacity for users, might also discourage the users to adopt BlackBerry.

The results of equation (2) for the users who chose BlackBerry as their primary smart phone are presented in Table 4.2.

Table 4.2: Model for selecting BlackBerry based on the usage and demographic behavior

Variables	Coefficient	Z-Statistics	P-value
Email	-0.263	-0.413	0.679
Photos	-0.796	-1.220	0.222
Chat ***	3.693	4.299	0.000
Entertainment *	-0.904	-1.565	0.117
Work **	-1.354	-1.874	0.060
Social ***	3.960	4.199	0.000
Games ***	-3.167	-3.769	0.000
Organizer *	-1.092	-1.493	0.135
Hours *	0.314	1.640	0.101
Year *	-0.748	-1.514	0.129
Male	-0.235	-0.380	0.703
Age	-0.286	-0.502	0.615
AIS ***	2.037	3.230	0.001
TrueMove	-1.346	-1.473	0.140
Income	0.084	0.350	0.725
OfficialStore	-1.363	-1.589	0.111
SmallVendor **	1.130	1.778	0.075
Expenses	0.397	1.265	0.205

Note: N=100. *** P-value < 0.05. ** P-value < 0.10 * P-value < 0.15.

In terms of the purpose for using BlackBerry, the consumers' main purposes are for chatting and social network activities. As presented in Table 7, users who use their smart phones for chatting and accessing social network activities such as Facebook and Twitter are most likely to choose BlackBerry as their primary smart phones. In contrary, even though BlackBerry is known for its ability to send and receive email via a wireless network, the result shows that the users do not use BlackBerry for emailing activities. This might be because respondents use other means such as university computers or their own laptops since the university facilitate students with Internet lab and Wi-Fi covered area.

As also shown in Table 7, the intensive smart phone user or the one who uses phone for long hours in a day seems more likely to choose BlackBerry as his or her primary smart phone. The consumers who like to buy their phones in small vendor stores are also more likely to adopt BlackBerry. This might be due to the availability of any BlackBerry models in small vendor stores and the phone purchasing habits of the respondents. Variable "AIS" is also significant, which can be explained by the fact of the attractive pricing package offered by AIS BlackBerry that it offers unlimited usage at Baht 650 per month or Baht 400 per month for the usage of up to 10MB.

Basic demographic variables such as gender has no effect to the adoption of BlackBerry and other factors such as sampling respondents' age, income and smart phone expenses are also not related to the adoption of BlackBerry. A negatively significant correlation can be found in the number of years in using BlackBerry. This can be explained by the fact that RIM BlackBerry has just entered Thailand in 2008 which means most users are basically new BlackBerry users.

For iPhone, the results of equation (1) are presented in Table 4.3.

Table 4.3: Model for selecting iPhone based on the reasons in using smart phone

	iPhone		
	Coefficient	**Z-Statistics**	**P-value**
Friends ***	-5.663	-4.389	0.000
Easy	-0.311	-0.405	0.685
InstantM ***	-2.222	-2.959	0.003
Gamesreason ***	5.131	3.198	0.001
Celebrities	-0.361	-0.368	0.712
Guarantee **	2.435	1.531	0.125
Company	0.869	0.833	0.404
Price	-0.480	-0.412	0.680
Design	0.512	0.765	0.444
Camera	0.222	0.266	0.789
Package	0.144	0.140	0.888
Input **	-1.391	-1.584	0.113
Recommend ***	-2.221	-2.430	0.015
Advertisement **	-2.327	-1.552	0.120
Thai	3.193	1.237	0.215
Interestingapps	0.273	0.401	0.688
Appsavailable	0.908	1.296	0.194
Figure	-41.667	-2.71E-06	1.000
ThreeG ***	2.504	2.189	0.028
Speed ***	4.206	3.003	0.002
Capacity ***	3.392	2.860	0.004
Battery ***	-2.866	-1.971	0.048

Note: N=100. *** P-value < 0.05. ** P-value < 0.10 * P-value < 0.15

Variables that determine the existence of network externalities such as "Friends", "Recommend" and "InstantM" have negatively significant correlation with the adoption of iPhone. The outcome of the binary logit model shows that network externalities do not exist in the adoption of iPhone. The variable "Friends" is negatively correlated, which means that Friends' influence may even discourage consumers to adopt iPhone. The "InstantM" variable is also in negative correlation, implying that Instant Messaging Service (IMS) might decrease the probability of consumers purchasing iPhone.

The first main reason that iPhone is chosen is because of its games capability. This implies that iPhone users decided to adopt iPhone because it offers high capabilities to play games along with the available games applications. Another reason that iPhone is selected is because it provides features such as high speed, large capacity to 32 GB, stand-by time of up to 270 hours and talk time of up to four and a half hours. The variable "Input" is also significant but negative, which implies that Apple's iPhone distinctive feature of the multi touch screen is not attractive to users.

However, even though 3G service and network has not been yet available officially in Thailand, the consumers still consider 3G capability as important factor in their decision of purchasing the smart phone. Nevertheless, even though iPhone is a product of Apple Inc. that is known as a company with a high reputation and premium brand, the variable "Company" is not that significant.

Based on equation (2), the binary logit model that is based on the consumers' usage behavior and demographic characteristics is as shown in table 4.4.

Table 4.4: Model for selecting iPhone as the primary smart phone

	iPhone		
	Coefficient	**Z-Statistics**	**P-value**
Email	0.208	0.279	0.779
Photos	0.978	1.173	0.240
Chat ***	-4.016	-3.706	0.000
Entertainment	0.662	0.954	0.339
Work **	1.728	2.034	0.041
iPhone			

	Coefficient	Z-Statistics	P-value
Games ***	3.431	3.363	0.000
Organizer ***	2.296	2.338	0.019
Hours	-0.231	-1.094	0.273
Year	0.765	1.378	0.168
Male	0.480	0.661	0.508
Age	-0.105	-0.137	0.890
AIS **	-2.131	-2.892	0.003
TrueMove	0.165	0.139	0.889
Income	0.072	0.245	0.805
OfficialStore *	1.416	1.467	0.142
SmallVendor ***	-1.676	-2.179	0.029
Expenses	-0.376	-0.949	0.342

Note: N=100. *** P-value < 0.05. ** P-value < 0.10 * P-value < 0.15.

As for the purpose of using iPhone, the use of smart phone for games and organizer is statistically significant. It seems that those who likes games and organize their schedule and activities with their phones are more likely to choose iPhone as their primary smart phone. Different from BlackBerry users, iPhone users do not use iPhone for chatting and accessing social network websites. Even though iPhone has messaging application called IM+ that can keep users connected to Twitter, Skype Chat, Facebook, Google Talk, Yahoo, MSN/Live Messenger, AIM/iChat, ICQ, MySpace and Jabber, consumers do not select iPhone for this kind of purpose. From the purchasing habits and behavior of the consumers, the users who purchase iPhone in official store (rather than small vendor stores) seem to be more likely to adopt iPhone. As for the demographic characteristics, gender, age, income and expenses are not the determinant factors in this model.

CHAPTER V
CONCLUSION

The main objective of this research is to study whether externalities exist in BlackBerry and iPhone. BlackBerry and iPhone are the two leading smart phone products that have the fastest sales growth among the smart phones. Currently, BlackBerry and iPhone also have a strong positive image among users.

As for the result for the study, the product BlackBerry reveals a sign of network externalities. It can be concluded that consumers decide to adopt BlackBerry because other consumers are using the product. It means, the utility that a user derives from the adoption of BlackBerry increases with the number of others using BlackBerry.

Friends' or colleagues' recommendations as the source of network externalities have become the main factors in adopting BlackBerry. The power of word of mouth seems to work in the adoption of BlackBerry that a person may not be accepted or belong in the same group if the person does not use the same product as his / her friends.

As for the network benefit, consumers purchase BlackBerry in order to conform with others they wish to be associated with. The network benefit also comes from the built- in instant messaging services (BlackBerry Messenger) that can reduce SMS or MMS costs that the same BlackBerry users can share files, pictures and messages to their members or group in the real time. This would clearly lower the monthly expenses especially to those who would like to keep a frequent and close contact with their friends or colleagues.

Meanwhile, iPhone reveals no sign of network externalities. It can be concluded that consumers decide to adopt iPhone only because of its features and games reason. However, the research can also be interpreted that better features could lead to an increase in the number of users.

From the result of the study, we can conclude that BlackBerry and iPhone has a reverse relationship. BlackBerry users choose BlackBerry because of other users and not because of its features, meanwhile iPhone users choose iPhone because of its features.

Network advantage is the key reason that BlackBerry has grown so fast among other smart phones. Meanwhile, the success of iPhone depends on how effectively this firm can provide users with better features and quality and thus establish their reputation. Since BlackBerry exhibits network externalities, it has made less effective competition in the Thai market, and the smart phone industry for the new entrants may become less attractive. Therefore, the challenge to the new entrants is to provide better technology for the consumers or to create the network benefit to boost the consumers' utility of joining the network.

The fact that BlackBerry exhibits network externalities may lead to the success of BlackBerry over a long run market share. By utilizing the network, the company will get more return for each new user and more return as the network grows. In further, network externalities may create winner-take-all markets that makes Blackberry become a dominant player.

The increasing utility of the product to the customers may enable new entrants to have also chance of success if: 1) the new entrants could create different features and technology that has unrivalled competitive advantage with the existing standards, 2) the new entrants could make a new technology compatible with the existing standards so that the technology switching could happen gradually, while offering the consumers more superior technology and design 3) new entrant could

implement low cost leadership strategy, offering the product at a greatly discounted price to increase the speed of adoption.

Meanwhile, the challenge for iPhone Apple is to keep coming up with innovated product both hardware and software or even created standardization. In addition, the company can leverage the firm's (Apple) reputation for more success in the future.

With its now Evo 4G product that has 3D game capabilities and HDTV experience, HTC could compete with iPhone as long as it can provide more number of applications. Meanwhile, Google Android could target on focused market segmentation such as enterprise / business users, that would make the company becomes a direct competitor of BlackBerry. As for Nokia, the company should focus on creating a main product or a flagship product that could compete with other competitors. Nokia should also offer more attractive and easier interface since Nokia is known for its easy and responsive user interface. For Windows smart phone, even though it was popular among business users with its Pocket PC and Windows Mobile, the fact that Windows charges license fees for handset manufacturers has made mobile phone manufacturers prefer to switch to Android that offers the platform for free. Therefore, Windows should focus on their smart phone product and reduce its license fees for the continuation of their position in the smart phone market.

Lastly, new entrant such as Acer and other existing manufacturers such as Nokia, HTC and Android could also create their own network as in BlackBerry or demonstrate network externalities which lead to more attractive competition in the market.

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APPENDIX

Appendix 1 The questionnaire

1. Which one is your **primary** smart phone? Please answer only one.
   - ❑ BlackBerry
   - ❑ iPhone

2. Which BlackBerry / iPhone model that you are currently using?

   - ❑ BB Curve
   - ❑ BB Bold 9000
   - ❑ BB Bold Onyx
   - ❑ BB Pearl
   - ❑ BB Storm
   - ❑ iPhone 2G
   - ❑ iPhone 3G
   - ❑ iPhone 3Gs

3. What do you use your primary smart phone mainly for? You may answer more than one.
   - ❑ Email
   - ❑ Work/Business
   - ❑ Photos/Videos
   - ❑ Social Network i.e. Facebook, Twitter, Hi5
   - ❑ Chat with friends/family
   - ❑ Games
   - ❑ Entertainment
   - ❑ Organizer, Calendar
   - ❑ Other, please indicate _____

4. For your primary smart phone, why do you use this particular smart phone? You may answer more than one.
   - ❑ Friends are using it
   - ❑ Recommended by friends
   - ❑ Recommended by experts
   - ❑ See from advertisement
   - ❑ Easy to use
   - ❑ Available in Thai language
   - ❑ Provides Instant Messaging
   - ❑ Interesting applications
   - ❑ Games
   - ❑ Many available applications
   - ❑ Celebrities are using it
   - ❑ Political / Business figures are using it
   - ❑ Guarantee and Warranty
   - ❑ Available in Thai language
   - ❑ Company's name
   - ❑ Support 3G
   - ❑ Price
   - ❑ Speed
   - ❑ Design / model of smart phone
   - ❑ Capacity
   - ❑ Camera and video resolution
   - ❑ Battery life time
   - ❑ Attractive package offered by mobile service provider
   - ❑ Convenient input method i.e touch screen, qwerty keyboard

5. On average, how many hours a day do you use your smart phone?

❑ 0-1 hour ❑ 2-4 hours ❑ 5-6 hours

❑ 7-9 hours ❑ 10-16 hours ❑ over 16 hours

6. How long have you been using your smart phone?

❑ 0-1 year ❑ 2-3 years ❑ Over 3 years

7. Gender

❑ Male ❑ Female

8. Age

❑ 18 – 20 ❑ 21 – 23 ❑ Above 23

9. Which mobile phone service provider do you use for your smart phone?

❑ DTAC ❑ AIS ❑ TrueMove

10. Where do you currently live?

❑ Bangkok ❑ Nakhon Pathom ❑ Others _____

11. What is your monthly income?

❑ 0 – 5,000 Baht ❑ 5,001 – 10,000 Baht

❑ 10,001 – 15,000 Baht ❑ 15,001 – 20,000 Baht

❑ 20,001 – 25,000 Baht ❑ 25,001 – 30,000 Baht

❑ Above 30,000 Baht

13. Where did you purchase your smart phone?

❑ Official store ❑ Department store such as Power Buy

❑ Mobile phone operator ❑ Mobile phone store such as Jay mart

❑ Small vendors such as in MBK, Pantip Plaza

14. What is your average smart phone bill or expenses per month?

❑ Less than 500 Baht ❑ 501 - 1000 Baht ❑ 1001 – 1500 Baht

❑ 1501-2000 Baht ❑ More than 2000 Baht

BIOGRAPHY

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