NETWORK EXTERNALITIES IN SOCIAL NETWORK WEBSITES

PRATHANA SRIKAEO

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Ms. Prathana Srikaeo
Candidate

Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Major advisor

Lect. Nuntana Udomkit, Ph.D.
Co-advisor

Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Program Director
Master of Business Administration
Program in Business Modeling and Analysis
International College
Mahidol University

Thematic Paper
entitled

NETWORK EXTERNALITIES IN SOCIAL NETWORK WEBSITES

was submitted to the Faculty of Graduate Studies, Mahidol University,
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on
August 28, 2010

Ms. Prathana Srikaeo
Candidate

Asst. Prof. Sittisak Leelahanon, Ph.D.
Chair

Lect. Nuntana Udomkit, Ph.D.
Member

Asst. Prof. Yingyot Chiaravutthi, Ph.D.
Member

Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Assoc. Prof. Rassamidara Hoonsawat, Ph.D.
Dean
International College
Mahidol University

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Prathana Srikaeo

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PRATHANA SRIKAEO 5038691 ICMA/M

M.B.A. (BUSINESS MODELING AND ANALYSIS)

THEMATIC PAPER ADVISORY COMMITTEE: YINGYOT CHIARAVUTTHI, Ph.D. (ECONOMICS), NUNTANA UDOMKIT, Ph.D. (ECONOMICS AND INTERNATIONAL DEVELOPMENT)

ABSTRACT

This study focuses on network externalities in social network websites, namely, Facebook.com and Hi5.com, since they are the top two social network websites in Thailand. Survey data have been collected from 200 respondents: the first group consists of 100 students and the second group of 100 full-time employees in Bangkok, Thailand. The data have been analyzed by using the logit model.

The results show that network externalities exist in social network websites. The sources of network externalities are the existing friends using a particular site, the willingness for new relationship building, and the large size of the social network. Facebook.com exhibits three sources of network externalities as mentioned above while network externalities in Hi5.com resulted from existing friends using a particular site and the willingness for new relationship building. The other features of social network websites, for example, photo feature, Thai language, and e-mail function, might play an important role but are not significant enough.

KEY WORDS: SOCIAL NETWORK WEBSITES / NETWORK / EXTERNALITIES / TECHNOLOGY ADOPTION

51 pages

ผลกระทบภายนอกในรูปแบบเครือข่ายของเว็บไซต์เครือข่ายสังคมออนไลน์
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ปรารถนา ศรีแก้ว 5038691 ICMA/M

บธ.ม. (การวิเคราะห์และสร้างตัวแบบธุรกิจ)

คณะกรรมการที่ปรึกษาสารนิพนธ์: ยิ่งยศ เจียรวุฒิ Ph.D. (ECONOMICS), นันทนา อุดมกิจ Ph.D. (ECONOMICS AND INTERNATIONAL DEVELOPMENT)

บทคัดย่อ

รายงานฉบับนี้ศึกษาถึงผลกระทบภายนอกในรูปแบบเครือข่ายที่เกิดขึ้นในเว็บไซต์เครือข่ายสังคมออนไลน์ อันได้แก่ Facebook.com และ Hi5.com เนื่องจากเว็บไซต์ทั้งสองมีสมาชิกในเครือข่ายมากเป็นอันดับต้นๆของเมืองไทย ผู้วิจัยทำการแจกแบบสอบถามแก่ผู้ใช้เครือข่ายเว็บไซต์สังคมออนไลน์ข้างต้นจำนวน 200 ชุด แบ่งเป็นกลุ่มแรกคือนักศึกษา จำนวน 100 คน และกลุ่มที่สองคือพนักงานประจำจำนวน 100 คน ในเขตกรุงเทพมหานคร ประเทศไทย จากนั้นผู้วิจัยได้รวบรวมข้อมูลและวิเคราะห์ผลโดยอาศัยแบบจำลองสมการ Logit

จากการศึกษาพบว่า มีผลกระทบจากภายนอกในรูปแบบเครือข่ายเกิดขึ้นในเว็บไซต์เครือข่ายสังคมออนไลน์ สาเหตุหลักสำคัญที่นำมาซึ่งการเกิดผลกระทบภายนอกในรูปแบบเครือข่ายในเว็บไซต์เครือข่ายสังคมออนไลน์นั้นได้แก่ การชักชวนของกลุ่มเพื่อนของผู้ใช้ ความต้องการหาเพื่อนใหม่ และขนาดเครือข่ายของเว็บไซต์ ผลกระทบภายนอกในรูปแบบเครือข่ายในเว็บไซต์ Facebook.com มีสาเหตุมาจากเหตุผลสามประการข้างต้น ในขณะที่ผลกระทบในเว็บไซต์ Hi5.com มีสาเหตุจากการชักชวนของกลุ่มเพื่อนของผู้ใช้ และความต้องการหาเพื่อนใหม่ คุณลักษณะอื่นๆ บางประการของเว็บไซต์เครือข่ายสังคมออนไลน์ ได้แก่ การแสดงภาพถ่าย เนื้อหาเว็บไซต์เป็นภาษาไทย และ อีเมล อาจมีนัยสำคัญในการตัดสินใจเข้าสู่เว็บไซต์เครือข่ายสังคมออนไลน์ แต่ไม่ได้โดดเด่นเท่าสาเหตุหลักสามประการข้างต้น

51 หน้า

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INTRODUCTION

1.1 Overview of Thailand's Online Activities

In today's digital world, computer technology is developing so fast that people can communicate with others by just a click on a device such as a computer or smart phone. The trend in the number of Internet users in the world has been increasing from the years 2000 to 2009. From Table 1.1, the estimated number of Internet users in the world in September, 2009, was over 360 million, with a world penetration rate of Internet users of 25.6%. In Thailand, there were more than 16 million Internet users as of September, 2009, with a 24.4% penetration rate (Internetworldstats.com, 2010).

Table 1.1 World Internet usage and population statistics

World Regions	Population (2009 Est.)	Internet Users Dec 31, 2000	Internet Users Sep 30, 2009	Penetration (%Population)	Growth 2000-2009	Users % of Table
Africa	**991,002,342**	**4,514,400**	**67,371,700**	6.8%	1,392.4%	3.9%
Asia	**3,808,070,503**	**114,304,000**	**738,257,230**	19.4%	545.9%	42.6%
Europe	**803,850,858**	**105,096,093**	**418,029,796**	52.0%	297.8%	24.1%
Middle East	**202,687,005**	**3,284,800**	**57,425,046**	28.3%	1,648.2%	3.3%
North America	**340,831,831**	**108,096,800**	**252,908,000**	74.2%	134.0%	14.6%
Latin America/Caribbean	**586,662,468**	**18,068,919**	**179,031,479**	30.5%	890.8%	10.3%
Oceania/Australia	**34,700,201**	**7,620,480**	**20,970,490**	60.4%	175.2%	1.2%
WORLD TOTAL	**6,767,805,208**	**360,985,492**	**1,733,993,741**	**25.6%**	**380.3%**	**100.0%**

Source: Internetworldstats.com, 2010[1]

The Internet has played an important role in communication since its emergence two decades ago. The Internet development in Thailand can be divided into five periods (The Future of the Internet, 2010). The first is the establishment

[1]The data in Table 1.1 are from Internet Usage and World Population Statistics as of September 30, 2009, from www.internetworldstats.com, accessed February 5, 2010. The website also mentioned that
1) Population figures were based on data from the US Census Bureau.
2) The Internet usage information came from the data published by Nielsen Online, by the International Telecommunications Union, by GfK, local Regulators and other reliable sources.

period during 1957-1991, when e-mails were mostly used among educational institutes. The second age was from 1992 to 1994. Thai people, apart from the educational sector, began to learn how to use the Internet since the network in educational institutes had been created and data had been sent to Internet users. The Black May protest in Bangkok against the government in 1992 was a remarkable event in this developing period. The third age was during 1995 and 1999, when e-commerce emerged in Thailand. In addition, the National Electronics and Computer Technology Center (NECTEC) established the Internet Service Provider (ISP) to offer the customers access to the Internet and serve the growing demand in e-commerce. The fourth period was during 2000 and 2004 when competition among telecommunication service providers was very intense. The Ministry of Information and Communication Technology was established in this period and the Internet was widely dispersed to Thai people, especially the hi-speed Internet such as ADSL (Asymmetric Digital Subscriber Line[2]). The years 2005 until 2009 constituted the Internet's shifting period in Thailand. The National Telecommunications Commission, which was set up in 2004, started to focus more on telecommunication services. In addition, the NECTEC stated that the years 2005 to 2009 were the "cloud computing age" and the age of "social networking" over the Internet in Thailand which is predicted to continue until 2020 (The Future of the Internet, 2010).

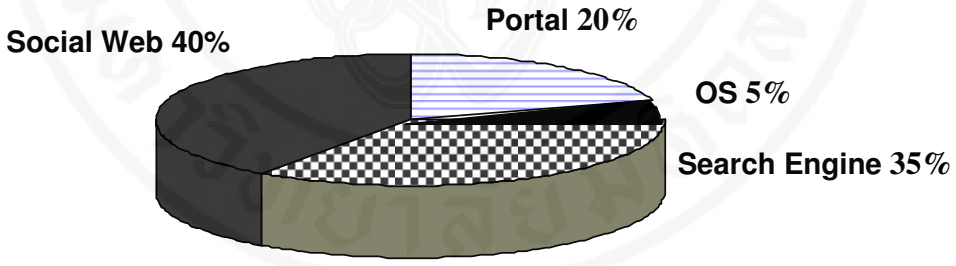
There are many websites that web servers usually visit on the Internet such as social networking sites, search engines, portals, and operating systems (OS[3]). According to the top 20 websites accessed in the world in September, 2009, social websites shared the most portion at 40% compared with other sites, as shown in Figure 1.1. From Table 1.2, Social Networking Websites Review in 2010 shows the world ranking of the top ten social network sites which are direct competitors in the same sector. Facebook.com is ranked first with 250 million users, followed by MySpace.com and Bebo.com. Friendster.com ranks fourth and Hi5.com fifth. As for Thailand, a survey conducted by the National Electronics and Computer Technology

[2] Asymmetric Digital Subscriber Line (ADSL) is a data communications technology enabling faster data transmission over copper telephone lines, faster than a conventional voiceband modem can provide.

[3] Operating Systems (OS) such as Microsoft Windows, Linux, and Mac OS X, are software program sets which control the application of software programs to computer hardware and control computer use by users.

Center of NECTEC from August to September, 2009, showed that Hi5.com led the list of the top five social network websites. Others are Wikipedia.com, YouTube.com, MySpace.com, and MyFri3nd.com (Prateepchaikul, 2010 & Sambandaraksa, 2009).

Social network sites (SNSs) are those websites which attempt to include many communication features, such as blogs and posting/comments/testimonial sections of the homepage that are open to the owner and their friends, or in other words, "a wall" and free text messaging or e-mail service. Pictures and videos are allowed to be posted and commented upon on these sites. Sites can support a music orientation by allowing users to embed favorite songs into their homepage and act as friends to their favorite pop groups (Thelwall M, 2008). The owners of these sites earn revenues from the fee from advertisements and shared benefits from partnerships with other businesses on the web pages and receive payment from members in using some special applications on the sites such as online games, virtual gifts, and greeting cards.



Source: Alexa.com, 2009.

Figure 1.1 Market shares of the world top 20 websites in 2009

Table 1.2 The world top 10 ranking of 2010 social network websites

Rank	Social Network Websites
1	Facebook.com
2	MySpace.com
3	Bebo.com
4	Friendster.com
5	Hi5.com
6	Orkut.com
7	PerfSpot.com
8	Yahoo!360°
9	Zorpia.com
10	Netlog.com

Source: Social Network Websites Review, 2010.

Hi5.com is a favorite site among teenagers, with most students having accounts on the website. The students say they use the site to share their photos and chat. There were about 4.3 million Hi5.com users in Thailand in 2009 (Thaiwatch.org, 2009). However, by the end of 2009, Facebook.com became a very popular social network site in Thailand with 1,632,880 members or 12.17% of all Thai Internet users and 0.52% compared with Facebook.com users around the world. This shows a high growth rate, second to world Facebook.com members, since new Thai members registered with this site at a rate of 23,000 each day (Marketingoops, 2010). The trend in online social networking in Thailand might well be changing, particularly since many politicians and celebrities, including Prime Minister Abhisit Vejjajiva and former Prime Minister Thaksin Shinawatra, are engaged in this phenomenon. Mr. Abhisit uses Twitter.com and Facebook.com to acquaint himself with supporters and others in order to explain government policies.

Many well-known Thai businesses such as Krungthai Card Public Company Limited and Central Department Store, major mobile operators such as Total Access Communication Public Company Limited (DTAC) and Advanced Info Service Public Company Limited (AIS), as well as firms like Nokia, Mazda and Toyota have jumped on the bandwagon of social networking to update their marketing promotions and sales, or advertise their products and activities via these sites. Along

with building personal relationships with users, the Kasikornthai Bank Research Center claimed that social networking could become a cost-effective channel for growth online advertising. Its reasons include a clear customer target, capability to penetrate a variety of complex social network communities, and the use of word-of-mouth on product quality (Prateepchaikul, 2010). The number of users on SNSs tends to increase because of easier access to the Internet and the value of being subscribers on one of the networks, which ultimately extends the size of the whole online social network system. Users can have one or many accounts, can remain with their original SNS or switch to others, own more accounts or leave a site due to individual preference.

Hi5.com and Facebook.com were chosen for this study because they are ranked the first and second SNSs in the top ten websites in Thailand (Marketingoops, 2010). By the end of January, 2010, Hi5.com had approximately 4 million users while Facebook.com had about 2 million. However, in terms of traffic on the sites, Facebook.com has become number one among the global SNSs and number three in Thailand (Marketingoops, 2010). Hi5.com had less traffic and was ranked number 5 of the top 10 webs in Thailand, according to Alexa.com (Marketingoops, 2010).

Table 1.3 Top 10 websites and interesting social network websites in Thailand

1. Google.co.th	11. Blogger.com
2. Live.com	14. Dek-D.com
3. Facebook.com	17. Wikipedia.org
4. Google.com	18. Exteen.com
5. Hi5.com	21. Bloggang.com
6. Youtube.com	23. Linkbucks.com
7. Sanook.com	26. Multiply.com
8. Yahoo.com	27. Twitter.com
9. MSN.com	28. Wordpress.com
10. Pantip.com	39. Photobucket.com

Source: Marketingoops.com, 2010.[4]

[4] Marketingoops.com retrieved the data from Alexa.com as of January 31, 2010.

1.2 Hi5.com

In 2002, Ramu Yalamanchi, an Indian graduate student of Computer Science, had the idea of setting up a new website called Hi5.com and using the web for collaboration, communication, and getting people to do more than just send emails and instant messaging. At the time there was not a single place where people could go to get a relevant stream of content from the people whom they knew. He saw this as a way to enhance personal communication.

With the power of this idea, he raised $120,000 and started up Hi5.com on June 27, 2003, an English version targeting all markets. It took the site six months to get its first million members, eighty percent of whom were from outside the U.S. The site continued to grow throughout the world, especially in the Spanish-speaking market. In order for Hi5.com to build its product and offer value, users needed to bring their friends into the service. This was part of Hi5.com's organic growth.

In April of 2004, Hi5.com raised an additional $50,000 which allowed it to become a profitable business by October of that year. The cost of becoming a web-service provider was decreasing and the bandwidth was more efficient while the advertisements were growing. Hi5.com hit its peak at the opportune time[5]. Bill Gossman is now the current CEO of Hi5.com and Ramu Yalamanchi is its director. As of January 2010, Hi5.com claimed to have over 50 million monthly active members (Hi5.comnetworks.com, 2010).

Users can create their own profiles on Hi5.com by going to www.Hi5.com and then posting their personal information such as name, birthday, etc. They are allowed to upload their favorite pictures and movie clips to their profiles. The site members can send requests via email to their friends who, if they accept the requests, will become Hi5.com members. The users can set the terms of information that they have uploaded to their profile. There are also applications for members to play for free, or purchase Hi5.com coins via mobile payments, debit cards or credit cards in order to play special applications, the most popular of which typically gravitate

[5] Information in 1.2 Hi5.com summarized from the following sources; Hi5network.com, (2010), Pimp-My-Profile, (2010), Positioningmag, (2007), Sramanamitra, (2008), and The Wall Street Journal, (2006).

towards communication, interaction, and self expression. Most of these applications are simply fun, such as Super Five or Verb.

Hi5.com was the first social network to become well known in Thailand, beginning in 2005. When there is a new user, he/she will choose Hi5.com because his or her friends are already on this network. Moreover, Hi5.com is easy to use. Users are able to create their own profile layouts or themes according to their taste and preference. Users can select their favorite profile skin such as "Hello Kitty," "Mickey Mouse," "Formula One" or even their own favorite celebrity. Therefore, users can present their uniqueness in expressing themselves to their friends.

In 2006 Hi5.com was the first social network in Thailand to make the Thai language available. Hi5.com officially provides 53 languages so it is easier for the members or users to utilize and enjoy surfing on Hi5.com in their own language, while Facebook.com more recently implemented its website in 64 languages in 2009 and 69 in 2010. Therefore, Hi5.com enjoys a first-mover advantage and status in Thailand in terms of the local language.

Moreover, users can greet their friends by posting "glitter" on their friends' walls. These glitter graphic images are applied as "Contact Tables" for writing comments for various circles of friends. It is one of the best ways to greet family, friends or colleagues by writing cute comments. It is claimed that Hi5.com carefully studies every design it makes for the site so that it is suitable for specific cultures, thereby avoiding any potential problems or conflicts.[6]

Businesses can also take advantage of Hi5.com in building a relationship with customers by creating profiles to communicate the product, promotion, marketing plan and responding to the feedback from comments on the sites. For example, there is a Hi5.com page of the Sony Ericsson Club in Thailand focusing on "What is the cell phone model that you are using?" True Corporation has created its brand profile on Hi5.com named "speedyshark.Hi5.com" and using "Shark" as a symbol of speed. True Corporation also promotes brands of its new products, such as hi-speed Internet, and updates customers about events by sharing photos. The brand will be developed

[6] "We thought about little things like colors. In certain countries certain colors have certain meanings. Black has a connotation in the US, as does purple in Thailand." is one of the quotes from Hi5.com former CEO, Ramu Yalamanchi (Sramanamitra.com, 2008).

and communicated to customers via a profile which is more tangible. The product profile can penetrate and attract customers as members and gurus of the product-related group.

1.3 Facebook.com

In 2004 Facebook.com was established by Mark Zuckerberg as a tool for social interaction, especially among college students. It was available by invitation only. From early September of 2005 to 2006 it promoted a high school version and ever since has become a popular social network site. Zuckerberg's ultimate goal is to turn Facebook.com into the world's standardized communication (and marketing) platform (Hempel J., 2009). The first round of funding of $500,000 occurred in the summer of 2004 by Peter Theil. The second round of $12.7 million by Accel Partners happened in April, 2005. The third round of $27.5 million was from Greylock Partners, with participation from Meritech Capital Partners. Next, Accel Partners and Peter Theil increased their investment in April, 2006 (Facebook.com, 2010). Digital Sky Technologies invested a $200 million preferred stock which resulted in a $10 billion valuation.

Like Hi5.com, Facebook.com users can create their own profiles by going to www.Facebook.com; users have to submit their personal information such as name, birthday, etc. Facebook.com works by enabling users to select one or more networks they would like to join, such as a university, high school, company, geographic area or interest group in music, religion or politics and become members of those networks. They are allowed to upload pictures and movie clips that they like for their profiles. Similar to Hi5.com, members can request friends via email. If those requests are accepted, they will become a part of a buddy list. Users can set the terms of information that they want uploaded to their profile. There are also applications for members to play for free, or purchase Facebook.com credits via credit cards in order to use some special applications such as virtual gifts for special occasions, charity donations or e-cards. Facebook.com's simplified navigation gives users easy access to core site functions and applications. The outstanding core icons, which are "Profile," "Friends," "Networks" and "Inbox," are displayed at the top of the user's profile page. At the left-side bar, the applications "Photos," "Notes," "Groups" and "Events" are

displayed with third-party applications added by users to their personal account (Facebook.com, 2010). In addition, it offers privacy options which encourage using the site to foster relationships with people already known, either friends or friends of friends.

Facebook.com became popular in Thailand in 2009, the same year that it introduced the Thai language; it currently has 69 languages available on its sites. Unlike Hi5.com, Facebook.com has a standardized page which cannot be customized. However, Facebook.com has cooperated with the smart phone Blackberry and the mobile service provider in order to give any new updates on the user's device. It also cooperates with iPhone, Nokia and other mobile phone producers to create a special application compatible with each device so that users can easily facebook from their phones.

Although Facebook.com has advertisements on its site similar to Hi5.com, it offers options for users to thump up or thump down if they dislike the advertisement. Businesses in Thailand, such as Sansiri Properties, Mazda, Dell Computer and HSBC, have joined Facebook.com to create recognition among customers, just as they do on Hi5.com. However, none of this was as dramatic as what happened in the US. According to Fortune, March 2009, President Barak Obama used the websites to promote his policies during the presidential campaign and subsequent election. Dell has considered recruiting new hires from Facebook.com, while Microsoft has already borrowed the new operating system from Facebook.com.

1.4 Features Comparison

Both Facebook.com and Hi5.com have similar general features such as a user profile page, privacy setting, block users, report spam, safety tips, e-mail within the network, games and applications. Some interesting features are listed in the following Table 1.4.

Table 1.4 Facebook.com and Hi5.com interesting features comparison

Feature	Description	Facebook	Hi5
Minimum Age of User (Years)	The minimum age the social network requires users to create an account or profile. Some sites are intended for older users, while others are designed for teens.	13	13
Multilingual (Languages)	The social network allows users to change the language for their profiles.	69	53
Custom Skins	The site provides a gallery of decorative profile skins for users to choose from for their profiles. These options are usually created and uploaded by approved users and hosted directly on the social network site.	No	Yes
Personalized URL	Once registered with the site, the social network will provide users with a custom URL that is usually consistent with users' names or allow users to choose their own URL extension. This is usually to make finding your profile easy for yourself and friends. A common example is http://myspace.com/yourname. Sites that do not provide this option usually give you a URL that includes a series of numbers, letters and symbols that are difficult to remember.	Yes, but only for a minimum of 1000 members registered with Facebook prior to May 31, 2009.	Yes
Max Photo Size	Most sites put some size restriction on individual photos. This is the maximum number of megabytes allowed for each picture uploaded to a user's profile.	4MB	2MB
Blog/Journal	Users can start a blog or journal and post it on their profile.	No, but Facebook has Notes to express the writing and can be forwarded like a chain e-mail.	Yes

Table 1.4 Facebook.com and Hi5.com interesting features comparison (Cont)

Feature	Description	Facebook	Hi5
Chat Rooms	The social network hosts chat rooms.	No	No
Instant Messaging	The social network provides an instant messaging function for users to chat with each other.	Yes	No
Bulletins	A brief announcement of news or opinions posted on the website's homepage or user's profile page	Yes	No
Groups (Numbers of Categories)	The number of groups/ categories the social network provides.	23	22
Forums	Comments posted on a forum page based on a specific subject.	Yes	No
Mobile	The social network has a version of its site designed specifically for mobile phones; the device will notify users once the new feeds are added to the home page of the site.	Yes	No
Music	The entire musical section of the social network is dedicated to music.	Yes	No
Music Video	Music videos are hosted on the site's music section.	Yes	No
Personal Videos	Armature and personal videos are available on the social network.	Yes	No
Classifieds	The social network has a section for online classifieds.	Yes	No
Events	Users can post announcements of upcoming events like concerts or parties.	Yes	No
Books	A section of the website is dedicated to books.	Yes	No
Search for People on the Network by Name	Search for friends by name.	Yes	No
Search for People on the Network by Email Address	Search for friends by email address.	Yes	Yes
Search for People on the Network by School	Search for friends by school or university.	Yes	No
Search for People on the Network by City/ Zip Code	Search for friends by city, zip code or radius of zip code.	No	Yes
Search for People on the Network by Interests	Search for friends with similar interests.	Yes	No
Search for People on the Network by Keyword	Search for friends and groups by general keyword.	No	Yes

Source: Facebook.com, 2010, Hi5.com, 2010, and Social Networking Websites Review, 2010.

1.5 Study Objectives

The study objectives are to examine and evaluate whether network externalities exist in social network websites, namely Hi5.com and Facebook.com, and to identify key important factors that influence Thai web servers in joining social network websites.

1.6 Benefits of the Study

This study of network externalities in social network websites will benefit existing and incoming enterprises to form appropriate strategies in order to survive in this business. Additionally, the government can draw policy implications regarding domination towards new entries if the network externalities are found to exist in the social network websites.

1.7 Scope of the Study

The scope of the study is limited to users in online social network sites in Bangkok, Thailand. The sites to be studied are defined as general social network sites that primarily target social interpersonal communication which does not have specific objectives of connections, by focusing on Facebook.com and Hi5.com, ranked first and second, respectively.

CHAPTER II
LITERATURE REVIEW

"Social network sites (SNSs) are online services via a webpage that allow members to create a public or semi-public profile within a limited system, communicate a list of friends among other users with whom they share a connection or view and pass their list of connections and others' lists within the system." (Boyd & Ellison, 2007).

According to Boyd & Ellison (2007), the above could be characterized by the term "social network site". However, the term "social networking site" is widely used and these two terms are frequently used interchangeably. Boyd & Ellison (2007) suggested not using the term "networking" for two reasons, namely, emphasis and scope. "Networking" emphasizes relationship initiation, which often happens between strangers. People using SNSs are not primarily making friends with strangers, even if that were possible. They would like to get in touch with people with whom they already have an offline relationship. However, these sites can also be oriented towards a work-related context, romantic relationship initiation and connecting with those who share the same interests, such as music or politics (Ellison, Steinfield, & Lampe, 2007).

Normally, the social network sites are those that allow visitors to register and connect with one another in order to communicate and share resources. These connections may relate to offline relationships or be new relationships formed online. Each member of the social network sites typically has a personal profile page with space for a biography, a photograph, and some other personal comments. In addition, there is likely to be a space for the names or pictures of official friends and other site members who have agreed to connect (Thelwall M, 2008). Apart from these common features, each site has some other differences, depending on the target audience and purpose. For example, Youtube.com supports commenting and tagging of videos while Multiply.com and Flickr.com do the same but also focus on image sharing.

ConnectViaBook.com connects people with similar reading preferences. LinkedIn.com, on the other hand, creates useful business contacts and relationships.

Social networks have become an integral part of the Internet technology (Enders A. et al., 2008) and one of the concepts related to the online business today is network externalities. In the context of network externalities, this could result in "first mover advantage" and "winner takes all" or "winner takes most" (Brynjolfsson and Kemerer, 1996, and Chiaravutthi, 2006). As more users value the online social network and participate in it, the social network size becomes larger. There are many reasons why others join the social network. The study by Brandtzæg and Heim (2008) showed that the most important reason was to get in contact with new people. The second reason was to keep in touch with their friends, whereas the third reason was general socialization. The study by Pempek, Yermolayeva, and Calvert (2009) found that the interesting aspects of social network sites were the number of connections formed worldwide, the ability to reconnect with people from the past, and the ability to learn new information. However, the following studies of network externalities classified by the sources of network externality have some characteristics to show why social network sites may exhibit network externality.

Firstly, network size is one of the sources of network externalities. Network externalities exist if there is a relationship between the size of the network or the cumulative number of existing users and the adoption decision of current users. McAndrews and Kauffman (1993) found that banks took the network size as a factor in deciding to join an automated teller machine (ATM) network, which is consistent with the study from Saloner and Shepard (1995) which concluded that banks' adoption rates of ATM depended on the number of bank branches. A similar conclusion appears in the study of consumers' adoption decisions of cellular phone carriers in Japan by Iimi (2005) and the study of brokerage firms' adoption of the International Securities Exchange (ISE) trading platform by Weber (2004).

Secondly, compatibility is another source of network externalities. In order to purchase a network good, the decision depends on whether the product is compatible with other existing products. Greenstein (1993) found from a study of the 1970's that compatibility existed and created network externalities in federal agencies' acquisition of mainframe computer systems from the vendors. This can also be called

a complementary network externality. From the study about competing compatibility standards and network externalities in the PC software market by Gandal (1995), it was concluded that the willingness of consumers to pay depended on the compatibility of the spreadsheet and database management software. In South Korea, the study of network externalities and future usage of Internet services by Chun and Hahn (2006) showed that the network externalities affecting future Internet usage might disappear when the e-mail service was compatible with competing services or reached the mature stage of its life cycle when most people have become members of such a service provider.

A third source of network externalities is others' influences. According to Goolsbee and Klenow (1999), Internet users may decide to select a specific search engine or web-based e-mail if their friends are users of it so that they can help and advise them on how to use it more effectively. This influence of friends is called a network spillover. For example, an individual's willingness to pay for anti-ulcer drugs is affected by other patients as well as the physician's influence on the drugs' acceptability, according to Berndt et al. (1999). The recommendation from friends and colleagues influences the adoption decision through word of mouth. The distribution of product information depends on social influence, interchangeably identified as viral marketing and word of mouth.

In this study, the social network sites to be discussed are Facebook.com and Hi5.com. They generally have a primary focus on social interpersonal communication but do not specify the objectives of connection, for example, movie lovers, book readers or other specific preferences such as the now celebrated Youtube.com (Prescott, 2007).

CHAPTER III
METHODOLOGY

In order to explicitly test the network externalities, survey data can be used since they help in studying the aforementioned reasons for adoption. This study uses the questionnaire to collect explanatory data on users' adoption of social network websites and to test the existence of network externalities.

The questionnaire is divided into two parts. The first part asked respondents about their choice of the first social network websites and the reasons for choosing the first site. The second part dealt with demographic data, along with behavior in using the Internet and social networks. Questionnaires were sent to two groups of respondents: 100 undergraduate students from Thammasat and Chulalongkorn Universities and 100 full-time employees from ExxonMobil Limited and Krung Thai Bank who normally use social network sites. The survey was conducted in May, 2010. After data were collected, they were analyzed by using the logit and regression models.

The following research questions were proposed since social network websites do have some characteristics showing that network externalities may exist.

RQ1: Whether social network websites exhibit network externalities and whether network externalities exist in the top two websites, namely, Facebook.com and Hi5.com.

RQ2: What were the reasons users cited in deciding to adopt social network websites, namely, Facebook.com and/ or Hi5.com.

As mentioned earlier, social network websites may exhibit network externalities because the rising number of users in each particular social network website, due to the influence of friends, family members and word of mouth, creates broader connections in that social network and increases the value of that website. In addition, while users join social network websites via normal laptops or desktops, technology allows people to access the Internet via mobile devices. Firms using social

network website services normally compete for the market share so they can become the market leader and finally represent the state of "winner takes all" or "winner takes most." As a result, as the market leader's position shifts from one product to another, the network externalities are expected to shift accordingly.

According to the theory of utilities in economics, consumers try to maximize satisfaction with respect to resource limitations. Satisfaction can be derived from adoption from product attributes or even network externalities. Assuming the objective of maximizing utility, an individual chooses his or her own social network website (called Y_i); the following binary logit model is based on this assumption:

$$\text{Probability } (Y_i = j) = \beta_j x^b_{ij} + \gamma_j x^d_{ij} + \mu_{ij} \quad (1)$$

for each respondent i who selects the first particular social network website choice j. x^b_{ij} represents an individual's different reasons for selecting social network websites. x^d_{ij} includes individual differences in basic demographics, behavior and use of the Internet and social network.

There are many social network websites from which users can choose. However, this study focuses on the two most popular websites, Facebook.com and Hi5.com, because they are the leaders among social network websites in Thai society. In the category of x^b_{ij}, the following reasons represent why users choose a particular social network website: 1) the large number of network users, 2) friends and family members who are using the website, 3) new relationship building, 4) availability on mobile devices, 5) profile surfing, 6) interest in the social network websites' features such as games, photo and video sharing, information/notes/blogs sharing, interesting ads and promotions updates, using event/invitation applications, and other specific applications available on each site, 7) availability in the Thai language, and 8) all-in-one connection within the same site (online messenger, e-mail, and wall-post, depending on particular sites).

The first reason captures network externalities from the network's size. The second and third reasons capture network externalities from others' influences. However, there is no evidence explaining the obvious compatibility of social network websites with other products or services. The availability of the websites on mobile devices may facilitate users to access social network websites because of their

convenience but it is not considered as compatible since it is not compulsory to adopt a particular social network website with its supporting mobile devices. The other reasons are contained in the model since they are important attributes of social network websites.

x^{d}_{ij} is divided into basic demographics, and Internet and mobile usage. Basic demographics consist of age, gender, occupation (student or employee), and income. Internet and mobile usage are measured in terms of knowledge of the Internet by hour(s) of usage per week, year(s) of Internet experience, and frequency of use. Social network website usage is measured in terms of knowledge of online social networks by hour(s) of usage per week, year(s) of social network experience and primary uses in joining an online social network. Other variables in this category include the particular browsers, Internet service speed, mobile Internet adoption, and smart phone usage to access the mobile Internet.

To be more explicit in testing network externalities in social network websites, the dependent variable is replaced by the "percentage of usage in terms of time spent on each site," assuming that the individual can have more than one account in different social network websites as he or she has perfect information about these websites. If there is a network effect, the user will likely spend most of his/her time on the website with a dominant market share if he or she is not using the current market leader's website. Equation (1) is adjusted with the same right-hand side variables, but the dependent variables constitute the percentage of usage in terms of time spent on each particular social network website. This allows users to determine the percentage of time spent on their social network websites.

While many reasons and choices were available in the questionnaire, some choices elicited few responses; these were omitted from the analysis. Tables 3.1 and 3.2 present the acronyms and their explanations for Hi5.com and Facebook.com, respectively. The basic demographics and Internet and mobile usage variables used in Table 3.2 are the same as described in Table 3.1.

Table 3.1 Variables and explanation of Hi5.com

Variable	Explanation
P_Hi5_ First	Choose Hi5.com as the first website when start joining social network = 1, others = 0.
PercentUse_Hi5	Percentage of usage in terms of time spent on Hi5.com.
Hi5_ ProfileSurf	Choose Hi5.com to profile surfing friends' accounts = 1, others = 0.
Hi5_ FriendsUsing	Choose Hi5.com as friends are using this site = 1, others = 0.
Hi5_FamilyUsing	Choose Hi5.com as family members are using this site = 1, others = 0.
Hi5_NewRelations	Choose Hi5.com to make new relationship = 1, others = 0.
Hi5_LargeNetwork	Choose Hi5.com as it has a large number of network users = 1, others = 0.
Hi5_InfoBlog	Choose Hi5.com to share information and blog writing = 1, others = 0.
Hi5_NewsAds	Choose Hi5.com to update interesting advertisements and promotion = 1, others = 0.
Hi5_Photos	Choose Hi5.com to share photos = 1, others = 0.
Hi5_Thai	Choose Hi5.com as it is available in the Thai language = 1, others = 0.
Frequency	The frequency of using the social network site. Everyday = 6, Twice a week = 5, Once a week = 4, Twice a month = 3, Once a month = 2, Once in a while = 1.
Use Socializing	Primary use of social network site for socializing, interaction with friends = 1, others = 0.
Use Personal	Primary use of social network site for personal and family needs = 1, others = 0.
Use Entertain	Primary use of social network site for entertainment = 1, others = 0.
News/Events	Primary use of social network site for news and events = 1, others = 0.
Hours Internet	Hours per week on the Internet.
Hours SNS	Hour per week on social network site.
Years Internet	Years experience on the Internet. 0-1 year = 1, 2-3 years = 2, 4-6 years = 3, 7-10 years = 4, over 10 years = 5.
Mobilenet	Use the Internet package on mobile phone. Yes = 1, No = 0.
IPhone	Use IPhone when accessing the Internet on mobile = 1, others = 0.
BlackBerry	Use BlackBerry when accessing the Internet on mobile = 1, others = 0.
Highspeed	Use Highspeed Internet service when accessing the Internet = 1, others = 0.
IE	Use Internet Explorer as a browser = 1, others = 0.
Firefox	Use Firefox as a browser = 1, others = 0.
Safari	Use Safari as a browser = 1, others = 0.
Male	Male = 1, Female = 0.
Age	Age of the user. 15-20 = 1, 21-25 = 2, 26-30 = 3, 31-35 = 4, 36-40 = 5, 41-45 = 6, 46-50 = 7, Above 50 = 8.
Income	Income of the user. Less than 5,000 THB = 1, 5,000 THB - 10,000 THB = 2, 10,001 THB - 15,000 THB = 3, 15,001 THB - 20,000 THB = 4, 20,001 THB - 25,000 THB = 5, 25,001 THB - 30,000 THB = 6, 30,001 THB - 35,000 THB = 7, 35,001 THB - 40,000 THB = 8, 40,001 THB - 45,000 THB = 9, 45,001 THB - 50,000 THB = 10, Above 50,000 THB = 11.
Student	Yes = 1, No = 0.
Years Joined on SNS	Number of years user has joined a social network (Year 2010 – Starting year joining social network site).

Table 3.2 Variables and explanation of Facebook.com

Variable	Explanation
P_FB_First	Choose Facebook.com as the first website when start joining social network = 1, others = 0.
PercentUse_FB	Percentage of usage in term of time spent on Facebook.com.
Friends Using FB	Choose Facebook.com as friends are using this site = 1, others = 0.
FB_NewRelations	Choose Facebook.com to make new relationship = 1, others = 0.
FB_LargeNetwork	Choose Facebook.com as it has large number of network users = 1, others = 0.
FB_InviteApp	Choose Facebook.com as it has the invitation application to communicate with friends = 1, others = 0.
FB_Mobile	Choose Facebook.com as it is available on mobile devices = 1, others = 0.
FB_ProfileSurf	Choose Facebook.com to profile surfing friends' accounts = 1, others = 0.
FB_InfoNote	Choose Facebook.com to share information and note writing = 1, others = 0.
FB_Photos	Choose Facebook.com to share photos and video = 1, others = 0.
FB_News/Ads	Choose Facebook.com to update interesting advertisements and promotion = 1, others = 0.
FB_Thai	Choose Facebook.com as it is available in the Thai language = 1, others = 0.
FB_All-In-OneConnect	Choose Facebook.com as it has all-in-one connection (online messenger, e-mail, and wall-post). = 1, others = 0.

Note: The basic demographics and Internet and mobile usage variables used in Table 3.2 are the same as described in Table 3.1.

The descriptive statistics for all variables are presented in Table 3.3. The results of the survey shows that 47.50% of the sample group chose Hi5.com as the primary social network website and 11.50% selected Facebook.com as the first website when start joining online social network. This reflects the timing of Hi.5com, which became popular in Thailand before Facebook.com did. The percentage of time spent on Facebook.com is 87.80%, which is greater than Hi5.com's percentage at 11.80%. The numbers show that 74.50% of the responders selected Facebook.com because they are influenced by their friends who already use this site. For Hi5.com, 53% of the responders chose this site because their friends are using it.

Table 3.3 Descriptive statistics of variables

	Mean	SD
P_Hi5_ First	0.475	0.501
PercentUse_Hi5	0.118	0.228
Hi5_ Profile Surf	0.135	0.343
Hi5_ Friends Using	0.530	0.500
Hi5_FamilyUsing	0.065	0.247
Hi5_NewRelations	0.130	0.337
Hi5_LargeNetwork	0.080	0.271
Hi5_InfoBlog	0.060	0.238
Hi5_NewsAds	0.010	0.100
Hi5_Photos	0.255	0.437
Hi5_Thai	0.025	0.157
P_FB_First	0.115	0.320
PercentUse_FB	0.878	0.229
FB_Friends Using	0.745	0.437
FB_New Relations	0.245	0.431
FB_Large Network	0.250	0.434
FB_InviteApp	0.070	0.256
FB_Mobile	0.146	0.354
FB_Profile Surf	0.165	0.372
FB_InfoNote	0.290	0.455
FB_Photos	0.430	0.496
FB_NewsAds	0.070	0.256
FB_Thai	0.055	0.229
FB_All-In-One Connect	0.210	0.408
Frequency	5.330	1.300
Use Socializing	0.870	0.337
Use Personal	0.090	0.287
Use Entertain	0.540	0.500
Use News	0.305	0.462
Hour Internet	23.995	20.741
Hours SNS	11.630	13.102
YearsInternet	4.385	0.825
Mobilenet	0.555	0.498
IPhone	0.185	0.389
BlackBerry	0.185	0.389
Highspeed	0.830	0.377
IE	0.830	0.380
Firefox	0.435	0.497

Table 3.3 Descriptive statistics of variables (Cont)

	Mean	SD
Safari	0.205	0.405
Male	0.320	0.468
Age	2.650	0.775
Income	5.785	2.466
Student	0.500	0.501
YearJoined SNS	5.275	3.244

CHAPTER IV
RESULTS AND ANALYSIS

The results of the equation (1) which determined the selection of the first social network websites are presented in Tables 4.1 and 4.3 for Facebook.com and Hi5.com, respectively, and the results of regression which determined the percentage of usage in terms of time spent on each website are presented in Tables 4.2 and 4.4 for Facebook.com and Hi5.com, respectively.

By sources of network, the variable capturing network externalities from the network size in Hi5.com is Hi5_LargeNetwork. The other variables capturing network externalities from other's influences are Hi5_FriendsUsing, Hi5_FamilyUsing, and Hi5_NewRelations. Similarly, the variable capturing network externalities from the network size in Facebook.com is FB_LargeNetwork. The other variables capturing network externalities from other's influences are FB_FriendsUsing and FB_NewRelations.

The results of the binary logit model in Table 4.1 show that network externalities exist among circles of friends in selecting Hi5.com as the first social network website because the variables Hi5_FriendsUsing and Hi5_NewRelations are significant at P-value < 0.05 and P-value < 0.15, respectively. More existing friends using Hi5.com would motivate certain users to join this site in order to keep connections, share information, and enjoy the functions in Hi5.com with their friends. Also, the newcomers to Hi5.com would want to make new relationships with other members on the same sites by friends suggesting Hi5.com or by other friends' suggestions. However, the variable Hi5_LargeNetwork, which measures network externalities, is not significant enough to explain the reason for choosing Hi5.com as a primary social network site.

The other reason for members to use Hi5.com is profile surfing. The significance of variable Hi5_ ProfileSurf at p-value < 0.15 means that users on this site tentatively sign on the web to surf and just read or update information from other

profiles without any specific intention to communicate with the owners of those pages. This result associates with the insignificance of other variables describing Hi5.com's features. Other features of Hi5.com -- information/blog writing, news/advertisements, photo sharing, and Thai language -- are interesting for network building, but the test shows they are not statistically significant to become the keys of decision making for primary social network website adoption.

The users who selected Hi5.com as their first social network site tended to primarily use social network websites for personal/family needs as the variable; Use_Personal is significant at p-value < 0.05. The users who are now using iPhone explained the selection of Hi5.com as first choice from the significance of variable IPhone at p-value < 0.05. However, they would rather not use Hi5.com via the mobile Internet. Other demographics, behavior and use of Internet and social network variables, apart from those mentioned earlier are not significant enough to describe the model.

Table 4.1 Binary logit model for selecting Hi5.com as the first social network website

	P_Hi5_ First	P_Hi5_ First
Hi5_ ProfileSurf	0.891*	0.090
	(1.628)	(0.190)
Hi5_ FriendsUsing	0.753***	0.566**
	(2.108)	(1.873)
Hi5_FamilyUsing	-0.548	-0.355
	(-0.646)	(-0.541)
Hi5_NewRelations	0.867*	0.348
	(1.485)	(0.723)
Hi5_LargeNetwork	1.022	0.723
	(1.389)	(1.180)
Hi5_InfoBlog	-0.018	-0.122
	(-0.027)	(-0.184)
Hi5_NewsAds	0.403	-0.115
	(0.243)	(-0.052)
Hi5_Photos	-0.137	0.233
	(-0.328)	(0.619)
Hi5_Thai	-0.536	-0.551
	(-0.451)	(-0.419)

Table 4.1 Binary logit model for selecting Hi5.com as the first social network website (Cont)

	P_Hi5_ First	P_Hi5_ First
Frequency	0.005	
	(0.039)	
UseSocializing	0.249	
	(0.395)	
Use_Personal	1.543***	
	(2.517)	
Use_Entertain	-0.490	
	(-1.284)	
Use_News	0.557	
	(1.379)	
Hours_Internet	-0.004	
	(-0.361)	
Hours_SNS	-0.007	
	(-0.382)	
YearsInternet	0.208	
	(0.927)	
Mobilenet	-1.321***	
	(-2.943)	
IPhone	1.450***	
	(2.267)	
BlackBerry	0.617	
	(1.200)	
Highspeed	0.405	
	(0.968)	
IE	-2.456	
	(-0.452)	
Firefox	-0.036	
	(-0.093)	
Safari	0.275	
	(0.491)	
Male	-0.039	
	(-0.106)	
Age	-0.325	
	(-1.238)	
Income	0.045	
	(0.607)	
Student	-0.567	
	(-1.391)	

Table 4.1 Binary logit model for selecting Hi5.com as the first social network website (Cont)

	P_Hi5_ First	P_Hi5_ First
YearJoinedSNS	-0.172	
	(-3.138)	

Notes: Numbers in parenthesis are t-statistics.

***Significant at p-value < 0.05; **Significant at p-value < 0.10; *Significant at p-value < 0.15

Since one user can have more than one account on social network websites, the left-hand side variable is the percentage of usage on each particular site and the right-hand side variables are the same variables as shown in the equation (1). See Table 4.2. Network externalities exist in the percentage of time spent on Hi5.com from the significant variables measuring network, which are Hi5_FriendsUsing and Hi5_NewRelations. They are significant at P-value < 0.05 and P-value < 0.15, respectively. The time that people spend on Hi5.com arises from the fact that their friends are using this site and this influences users to log on to the site to communicate with existing friends. Wall-posting or giving a profile comment can be made on friends' web pages. The area along the right-hand side of the page is the board for posting the text back and forth. Users can scroll up and down each web page to see all postings which are aligned in the same column. The comments on each topic of discussion cannot be separated under specific topics. This could be a time-consuming exercise in understanding the content of discussions for each topic since users will have to look for what they would like to know by screening the comments on the whole page.

Building new relationships is another key to spending more time on Hi5.com. Users can directly recommend friends to one another. In addition, members can decide whether or not to send a friend request to those whom they would like to know via Hi5.com's suggestions, which normally recommend those who already have common friends with the requester. Otherwise, they can look for new friends from those who allow their profiles to be open to the public with an open relationship status. Hi5.com also has an easy search tool to find friends by using an e-mail contact importer. This tool supports the users in finding their friends or other people on the

Hi5.com network by putting the e-mail addresses in the tool box. Network externalities are then created from the others' influence, as mentioned above.

Users do not dedicate their time on this site just to go profile surfing other friends' accounts in their network, as seen from the significance of variable Hi5_ProfileSurf with its negative coefficient. The other feature of Hi5.com which is significant enough to explain the model is photo sharing. Members of this site may spend time sharing photos among friends. Hi5.com allows users in the same network to comment and tag their friends' names on the photo albums. The site allows users to make a slide show of their photos on their profile pages by importing the slideshow application. Users can spend time decorating the skin of the slideshow from many layouts available. The demographics, behavior and usage of the Internet and social network variables in this model show that the frequency of using social network websites is inversely related to the time spent on Hi5.com. It is possible that many current popular social network websites have attracted members to spend their time on their sites because of the lower ranking of Hi5.com over the past few years. The users who have experienced many years of Internet use mostly maintain Hi5.com accounts but apply for other websites as another channel for online social networking. The younger members of Hi5.com spend more time on the site which is perhaps to be expected since adults are responsible for many tasks in daily life and do not have much time to focus on online relationships. Young people, in contrast, are in that life cycle when they can enjoy friendships and not worry about the responsibility of work.

Although the two variables Hi5_FriendsUsing and Hi5_NewRelation are significant, network externalities may not exist in Hi5.com because the large size of the network has no effect on users adopting Hi5.com as a primary social network website or spending time using it. The analysis from Tables 4.1 and 4.2 shows a similar result, that is, that network externalities exist but within the same group of users who have been friends before; the network expanded among friends who already had offline relationships and those who would like to make new relationships.

Table 4.2 Linear regression model for percentage of time spent on Hi5.com

	PercentUse_Hi5	PercentUse_Hi5
Hi5_ ProfileSurf	-0.084***	-0.095***
	(-2.500)	(-2.849)
Hi5_ FriendsUsing	0.084***	0.104***
	(2.911)	(3.467)
Hi5_FamilyUsing	0.046	0.090
	(0.754)	(0.805)
Hi5_NewRelations	0.124*	0.168***
	(2.484)	(2.724)
Hi5_LargeNetwork	-0.042	-0.055
	(-0.760)	(-0.900)
Hi5_InfoBlog	0.023	0.041
	(0.401)	(0.600)
Hi5_NewsAds	0.000	-0.027
	(0.005)	(-0.439)
Hi5_Photos	0.066***	0.041
	(2.017)	(0.599)
Hi5_Thai	0.004	-0.083
	(0.727)	(-1.210)
Frequency	-0.079***	
	(-3.724)	
Use_Socializing	-0.034	
	(-0.731)	
Use_Personal	0.043	
	0.859	
Use_Entertain	0.016	
	(0.444)	
Use_News	0.003	
	(0.087)	
Hours_Internet	0.001	
	(0.548)	
Hours_SNS	0.000	
	(-0.016)	
Years Internet	-0.032*	
	(-1.500)	
Mobilenet	0.021	
	(0.538)	
IPhone	-0.056	
	(-1.207)	
BlackBerry	-0.049	
	(-1.261)	

Table 4.2 Linear regression model for percentage of time spent on Hi5.com (Cont)

	PercentUse_Hi5	PercentUse_Hi5
Highspeed	-0.071	
	(-1.430)	
IE	0.022	
	(0.528)	
Firefox	0.003	
	(0.088)	
Safari	0.018	
	(0.328)	
Male	0.034	
	(0.997)	
Age	-0.055***	
	(-2.252)	
Income	0.007	
	(1.004)	
Student	-0.027	
	-0.855	
YearJoinedSNS	0.003	
	(0.617)	

Notes: Numbers in parenthesis are t-statistics.
***Significant at p-value < 0.05; **Significant at p-value < 0.10; *Significant at p-value < 0.15

Network externalities clearly exist in selecting Facebook.com as the first social network website. As seen in Table 4.3, the variables FB_FriendUsing and FB_NewRelations, which capture the source of network externalities from others' influences, are significant at p-value < 0.05 to explain the equation (1), and FB_LargeNetwork, which captures network externalities from the network size, is significant at p-value < 0.15. The important reason newcomers join Facebook.com network is that their friends have been members of the site. The model with demographics, behavior and use of the Internet and social network variables shows that users select Facebook.com as the first social network website in order to communicate with existing friends and build new relationships. Like Hi5.com, Facebook.com has a tool to search people by typing in their e-mail addresses. This is an easy way to check if those the users are searching for are members of Facebook.com or not. If yes, they can send a friend request to add him or her to the network. If they have not yet become Facebook.com members, they will be advised to

send an invitation to him or her to register in Facebook.com's account. Seeing many friends using this site motivates more members to join the network. New relationships will be developed by direct suggestions from existing friends as well as from the feature called Friend Suggestion once Facebook.com has found that the users have common friends, the same interests and schools or universities from the information on their personal profiles. The large size of the social network is another factor motivating users of Facebook.com to find their previous friends from high school or college and with whom they may have lost contact since graduation. Thus, users value the large size of the social network Facebook.com and select this site as the first social network website.

The users who love to update news and advertisements from Facebook.com decide to use it as the first social network site. The advertisement boxes are displayed on the home page for Facebook.com's users. They can follow the links on the advertisement boxes for more information and provide feedback to Facebook.com staff as to whether they like these ads or not. In addition, many popular websites such as CNN.com, Youtube.com, or Twitter.com have an imbedded Facebook.com icon for Facebook members to click and share the news, advertisements, songs, or posts provided on those sites. For example, after Facebook.com members read the news or watch a video on CNN.com, they can click the 'Share' button to share the information. Next, the link of the news webpage on CNN.com will appear on the personal profiles of their Facebook.com account and also appear on the home page of their friends' accounts to show them that they have read and watched that news. A lot of businesses today have become Facebook members and created the icon 'Find us on Facebook' in order to access their targeted customers more directly. They use Facebook's Share button to allow customers to display the link of their products, news, and promotion on Facebook.com's personal page, too. Starbucks Coffee, for example, launched a new seasonal black tea during Songkran in Bangkok in 2010. They promoted it on their website and their Facebook.com page, asking customers to drink it for free. Mazda Thailand, as another example, invited Facebook.com users via the ads bars in Facebook.com to take a test drive of the new models Mazda2 car and Mazda2 Zedan before they launched them into the market.

It is surprising that the Internet service via mobile are negatively related to the choice of using Facebook.com (FB_Mobile). Facebook.com will have to admit that all applications on their website are not applicable via Facebook's built-in applications on mobiles such as quiz (questionnaires with multiple choices) and chat-window (instant messaging). Users might feel more comfortable accessing the websites via computers because all features of the site can be displayed properly and completely. Moreover, some users do not want to pay the mobile Internet service charges, which are still considered expensive, if they do not need to do business or engage in other activities online via the mobile phone.

Profile surfing and writing any information via "Note" (which is similar to "Blog" writing on other websites) are significant but not in the same category of choosing Facebook.com as the first social network website. Profile surfing means users sign in on an account in order to read or watch information, photos or stories displayed on their friends' profiles without any interaction. The negative t-statistic of profile surfing could imply that users on the Facebook network normally associate with each other when they open their friends' profile pages. The communication among members of Facebook.com could also imply that building relationships is significant since they do not choose this site only for profile surfing others' accounts. Surprisingly, users do not choose Facebook.com as the first website to personally write on Note to share diaries, stories or essays, even though Facebook.com has this feature. It is possible that reading and writing "Note" will take a lot of time on each page if users do not have a specific interest in a particular issue or a person's writing style. Users might prefer joining other Blog websites or join Groups, which are sub networks created by Facebook.com members who share some common interests, such as hobbies, religious beliefs or political views rather than writing "Note" on their personal pages. Both "Groups" and other "Blog" websites clearly state the content's purpose and areas of interest for writing, reading and debating issues.

The demographics, behavior and use of the Internet and social network variables which are positively significant to explain the model are Use_Socializing, Mobilenet, BlackBerry, Highspeed, and IE. The other variables which are negatively significant in explaining the model are Frequency, Hours_Internet, Income, and YearJoinedSNS. Socializing is, of course, the primary objective in joining online

social networks. Mobile Internet and smart phones allow users easier access to social network websites via mobile devices, especially BlackBerry which is designed to support the Internet surfer. Those who use Facebook.com via Blackberry can set the devices to show any new updates and notification of activities on Facebook.com. The high-speed Internet also allows people to enjoy online social networks easily and quickly; they mostly use the Internet Explorer, the market leader browser, to access the cyber world and social networks. Even if Facebook.com is a rising star in the social networking world, users who spend more time on online social networks and hours a week on Internet usage only tentatively dedicate their time to Facebook.com. It is reasonable to imply that they might have other interests on other websites. Moreover, people with higher incomes might not have enough time or interest to spend much time on the Internet. People with more years of experience in social networks might also join websites other than Facebook.com for alternative purposes or they may have been using social networks long enough and are satisfied with other online social networks.

Table 4.3 Binary logit model for selecting Facebook.com as the first social network website

	P_FB_First	P_FB_First
FB_FriendUsing	3.075***	0.835
	(1.974)	(1.183)
FB_NewRelations	3.350***	0.486
	(2.616)	(0.923)
FB_LargeNetwork	2.636*	1.270***
	(1.606)	(2.128)
FB_InviteApp	-0.695	1.072
	(-0.453)	(1.341)
FB_Mobile	-6.264***	-2.031*
	(-2.713)	(-1.609)
FB_ProfileSurf	-8.208***	-2.501***
	(-3.318)	(-2.559)
FB_InfoNote	-1.802**	-0.983*
	(-1.757)	(-1.574)
FB_Photos	1.701	0.427
	(1.096)	(0.739)
FB_NewsAds	4.312***	1.402*
	(2.762)	(1.515)

Table 4.3 Binary logit model for selecting Facebook.com as the first social network website (Cont)

	P_FB_First	P_FB_First
FB_Thai	1.110	1.268*
	(0.728)	(1.569)
FB_All-In-OneConnect	-1.078	-0.479
	(-0.821)	(-0.624)
Frequency	-1.375***	
	(-2.99)	
Use_Socialize	7.892***	
	(3.926)	
Use_Personal	-1.370	
	(-1.002)	
Use_Entertain	-0.155	
	(-0.090)	
Use_News	1.106	
	(0.791)	
Hours_Internet	-0.146***	
	(-3.199)	
Hours_SNS	0.020	
	(0.262)	
Years_Internet	0.490	
	(0.866)	
Mobilenet	2.126*	
	(1.480)	
IPhone	1.124	
	(0.849)	
BlackBerry	5.317***	
	(3.057)	
Highspeed	2.187**	
	(1.647)	
IE	3.079**	
	(1.789)	
Firefox	1.039	
	(1.243)	
Safari	-2.113	
	(-0.937)	
Male	-1.500	
	(-1.027)	
Age	-0.249	
	(-0.302)	
Income	-0.623***	
	(-2.358)	

Table 4.3 Binary logit model for selecting Facebook.com as the first social network website (Cont)

	P_FB_First	P_FB_First
Student	-0.705	
	(-0.623)	
YearJoinedSNS	-1.816***	
	(-6.034)	

Notes: Numbers in parenthesis are t-statistics.

***Significant at p-value < 0.05; **Significant at p-value < 0.10; *Significant at p-value < 0.15

Network externalities exist in the model describing percentage of time spent on Facebook.com. The variables FB_FriendUsing and FB_LargeNetwork are significant at p-value < 0.05 which show that users spend time on Facebook.com to communicate with their friends who are currently holding Facebook accounts and they enjoy the large size of the social network. Many members unexpectedly discover past acquaintances on Facebook.com such as friends from childhood, school friends, and college friends. As mentioned earlier, users of Facebook.com group themselves in sub-networks. One user can join many sub-networks and he or she can spend a lot of time on his or her personal and network pages. More and more users joining the network create more connections and so contribute to the growing number of users on Facebook.com.

Users spending time to share and comment on photos or videos of their friends trigger the significance of the variable FB_Photo. Facebook.com has a tag feature to tag friends on the same network to notify others about the pictures and videos the users post on the site. After one user has been tagged on the photos or videos, those pictures and videos will show up on the personal and home pages of users who have been tagged as well as on the home page of the tagged person's friends, depending on the privacy setting of those posts. It is not surprising if one user is a friend of another user who is tagged on a picture of Mark Zuckerberg's photo album who set the privacy of the album to share the photos with friends of friends; that user might want to see his or her friend's picture and also Zuckerberg's picture at the

same time. It is possible that a user would stay longer on Zuckerberg's photo album in order to spend more time looking at the other pictures in his album.

Surprisingly, the variable FB_NewsAds is negatively significant in terms of the percentage of time surfing on Facebook.com. Users might spend more time on other applications of Facebook.com instead of checking the news and advertisements. The Thai language available on Facebook.com encourages the members to stay on the site. The percentage of time using Facebook.com has a positive relationship with the frequency of joining social network websites. Users spending more time on the network do not positively describe the primary use of the social network for personal/ family needs. The users with more years of experience on the Internet show that they tentatively spend much of their time on Facebook.com. Also, those using iPhone enjoy their time on the online social network as well as on the device designed to support many popular websites such as Facebook.com, Youtube.com, and MovieMajor.com. The age of social network website users is positively related to the percentage of time spent on the social network. Employees spend time joining online social networks in order to maintain a relationship with the people already known offline. The standard skins and features of social network websites are considered interesting and useful for them to spend time on the network, whether for personal relationships or business purposes.

As described above, network externalities exist in Facebook.com in terms of percentage of time spent but not obviously in selecting Facebook.com as the first social network website. The large size of the network facilitates existing friends to invite new users and new connections created from the linkage between friends of friends and users with some common interest. The sub-networks are connected within the whole network of Facebook.com.

Table 4.4 Linear regression model for percentage of time spent on Facebook.com

	PercentUse_FB	PercentUse_FB
FB_FriendUsing	0.106***	0.159***
	(2.570)	(3.051)
FB_NewRelations	-0.012	-0.012
	(-0.352)	(-0.376)
FB_LargeNetwork	0.096***	0.060***
	(3.003)	(2.643)
FB_InviteApp	-0.018	-0.053
	(-0.334)	(-1.221)
FB_Mobile	-0.025	0.020
	(-0.792)	(0.776)
FB_ProfileSurf	0.000	0.031
	(0.003)	(1.251)
FB_InfoNote	(-0.001)	0.032*
	(-0.057)	(1.466)
FB_Photos	0.078***	0.062***
	(2.463)	(2.280)
FB_NewsAds	-0.077***	-0.020
	(-2.188)	(-0.547)
FB_Thai	0.079*	0.039
	(1.436)	(1.081)
FB_All-In-OneConnect	-0.003	0.025
	(-0.089)	(0.808)
Frequency	0.075***	
	(3.915)	
Use_Socializing	0.042	
	(0.845)	
Use_Personal	-0.096***	
	(-2.162)	
Use_Entertain	-0.013	
	(-0.355)	
Use_News	0.016	
	(0.471)	
Hours_Internet	0.000	
	(-0.358)	
Hours_SNS	-0.001	
	(-0.701)	
Years_Internet	0.034*	
	(1.606)	
Mobilenet	-0.029	
	(-0.715)	

Table 4.4 Linear regression model for percentage of time spent on Facebook.com (Cont)

	PercentUse_FB	PercentUse_FB
IPhone	0.109***	
	(2.289)	
BlackBerry	0.056	
	(1.309)	
Highspeed	0.030	
	(0.549)	
IE	-0.057	
	(-1.436)	
Firefox	-0.248	
	(-0.905)	
Safari	-0.050	
	(-1.082)	
Male	-0.029	
	(-0.951)	
Age	0.061***	
	(2.585)	
Income	-0.007	
	(-1.013)	
Student	0.054	
	(1.467)	
YearJoinedSNS	0.000	
	(0.044)	

Notes: Numbers in parenthesis are t-statistics.

***Significant at p-value < 0.05; **Significant at p-value < 0.10; *Significant at p-value < 0.15

CHAPTER V
CONCLUSION

Hi5.com exhibits network externalities initiated by influences from friends who have offline relationships and new friends found on the online social network. Facebook.com does not only show network externalities from existing friends' influences and new relationships built up from circles of friends on the network but also from the large size of the network which attracts the users to join and stay on the site.

Even if social network websites try to include various features such as photo and video sharing, Note/Blog sharing, news and advertisement updates, games, chat windows and many others, they do not play important roles as the first place for selecting the first social network website when start joining online social network and spending time enjoying it. Cyber servers can find any website with a specific purpose rather than use the add-ons of social network websites.

The major reason users decide to adopt the first social network website is that their friends have been using that particular site. The other important reason is to make new relationships. The large network size is a determining factor in Facebook.com's adoption since this site has about 250 million active users and facilitates users to expand their own network and strengthen the linkage among networks from many overlapping friends' circles and groups of old and new friends who share a common interest. Network externalities would be a competitive advantage for the existing social network website in reaching customers from many target groups. The third party websites can share the benefit of friends' suggestions and the large size of the social network by partnership with social network websites in order to expand their customer base.

The social network's page can be another channel to market businesses and create brand awareness. In addition, they can indirectly promote and communicate their sites on the other users' profile pages via the share link. Products and services are indirectly promoted from friends to friends via fan pages, or directly suggested to

friends on the same network. Businesses as well as other sectors can use the information in social networks to update and forecast the trends in market, social or politics issues. However, the social network websites should bear in mind the information privacy of the members on their network. Businesses might lose some of the market share if they overlook the network externalities in social network websites.

The businesses placing advertisements via Facebook.com or Hi5.com create the revenue for those sites. The social network websites can use the revenue to create and develop more interesting features to attract users to remain on their sites. The members may also act as another marketing channel to invite more friends to become users on the network. It is possible in the future that new users may value the other features of the sites instead of friends' network and network size to apply for social network accounts.

It might be difficult for newcomers to enter social network websites and compete with Hi5.com and, especially, Facebook.com. It is noticeable that most social network websites already share some common features. The existing groups or sub networks, such as fan pages of President Barak Obama and Mark Zuckerberg, under the dominant social network develop and strengthen their relationship among themselves; while the new entrant like Google.com is going to jump into the social network market. However, the new webs of social networks should differentiate themselves from the existing social network websites to attract customers and establish their websites on the online social networks.

The social welfare aspects regarding the contribution and disadvantages of social network websites to society are left for future research.

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APPENDICES

APPENDIX A
QUESTIONNAIRE (ENGLISH VERSION)

"Network Externalities in Social Network Websites"

1. What year did you join a social network website? _____

2. From the list below, what was the first primary social network website that you used when start joining social network?

❑ Facebook.com ❑ Hi5.com ❑ WindowLives.com
❑ MySpace.com ❑ Bebo.com ❑ Friendster.com
❑ Zorpia.com ❑ Other, please indicate _____

3. If you are currently holding more than one social network account at the same time, please give the approximate percentage of usage in terms of time spent on each site.

❑ Facebook.com_____% ❑ Hi5.com_____%

4. What is (are) the reason(s) you are using *Facebook.com*? You may answer more than one.

❑ Friends are using it
❑ Large number of network users
❑ Available on mobile device
❑ Information/ Notes sharing
❑ Update interesting ads and promotions
❑ All-in-one connection within the same site (online messenger, e-mail, and wall-post)
❑ Other, please indicate_____
❑ New relationship
❑ Set up event/ Invitation
❑ Profile surfing
❑ Photo and video sharing
❑ Available in Thai
❑ Games

5. What is (are) the reason(s) you are using *Hi5.com*? You may answer more than one.

- ❑ Profile surfing
- ❑ Friends are using it
- ❑ Family members are using it
- ❑ New relationship
- ❑ Large number of network users
- ❑ Information/ Blogs sharing
- ❑ Update interesting ads and promotions
- ❑ Photo sharing
- ❑ Available in Thai
- ❑ Games
- ❑ Other, please indicate _____

6. How often do you use the social network site?

- ❑ Everyday
- ❑ Twice a week
- ❑ Once a week
- ❑ Twice a month
- ❑ Once a month
- ❑ Once in a while

7. For what do you primarily use the social network site? You may answer more than one.

- ❑ Education
- ❑ Work/Business
- ❑ Socializing, interacting with friends
- ❑ Personal/Family needs
- ❑ Entertainment
- ❑ News and Events
- ❑ Other, please indicate _____

8. On average, how many hours a week do you use the Internet?

_____hours/week.

9. On average, how many hours a week do you spend on a social network website?

_____hours/week.

10. How long have you been using the Internet?

- ❑ 0-1 year
- ❑ 2-3 years
- ❑ 4-6 years
- ❑ 7-10 years
- ❑ over 10 years

11. Do you use the Internet package on a mobile phone?

❑ Yes ❑ No

12. If you use the Internet on a mobile phone, which mobile brand do you have?

❑ iPhone ❑ Blackberry ❑ Other, please indicate _____

13. What service do you use to access the Internet at home?

❑ Dial up service ❑ High Speed Internet

❑ Other, please indicate _____

14. What browser do you use? You may answer more than one

❑ Internet Explorer ❑ Firefox

❑ Safari ❑ Other, please indicate _____

15. Gender

❑ Male ❑ Female

16. Age

❑ 15-20 ❑ 21-25 ❑ 26-30 ❑ 31-35

❑ 36-40 ❑ 41-45 ❑ 46-50 ❑ Above 50

17. What is your personal income per month?

❑ Less than 5,000 THB ❑ 5,000 THB - 10,000 THB

❑ 10,001 THB - 15,000 THB ❑ 15,001 THB - 20,000 THB

❑ 20,001 THB - 25,000 THB ❑ 25,001 THB - 30,000 THB

❑ 30,001 THB - 35,000 THB ❑ 35,001 THB - 40,000 THB

❑ 40,001 THB - 45,000 THB ❑ 45,001 THB - 50,000 THB

❑ Above 50,000 THB

APPENDIX B
QUESTIONNAIRE (THAI VERSION)

แบบสอบถาม

เรื่อง "Network Externalities in Social Network Websites"

(ผลกระทบภายนอกในรูปแบบเครือข่ายในเว็บไซต์เครือข่ายสังคมออนไลน์)

1. คุณเริ่มเข้าสู่เครือข่ายสังคมออนไลน์ในปีพ.ศ.ใด? _____

2. จากรายการต่อไปนี้, เว็บไซต์ใดคือเว็บไซต์แรกที่คุณใช้ในสังคมออนไลน์?

❑ Facebook.com ❑ Hi5.com ❑ WindowLives.com
❑ MySpace.com ❑ Bebo.com ❑ Friendster.com
❑ Zorpia.com ❑ อื่นๆ, โปรดระบุ _____.

3. โปรดระบุเวลาที่คุณใช้โดยเฉลี่ยในปัจจุบันบนเว็บไซต์สังคมออนไลน์ด้านล่าง

❑ Facebook.com_____% ❑ Hi5.com_____%

4. จากรายการต่อไปนี้ ข้อใดคือเหตุผลที่คุณเลือกเป็นสมาชิก Facebook.com? สามารถเลือกตอบได้มากกว่า 1 ข้อ

❑ เพื่อนๆต่างเป็นสมาชิก ❑ เพื่อหาเพื่อนใหม่
❑ มีผู้ใช้เครือข่ายเป็นจำนวนมาก ❑ สำรวจโปรไฟล์ผู้อื่น
❑ เข้าเว็บผ่านโทรศัพท์มือถือได้ ❑ ใช้งานง่ายในภาษาไทย
❑ เพื่อแลกเปลี่ยนข้อมูลผ่านหน้ากระดาน หรือ โน๊ต ❑ เล่นเกม
❑ เพื่อแลกเปลี่ยนหรือแสดงรูปภาพหรือวิดีโอ
❑ เพื่อรับข่าวสารโปรโมชั่น โฆษณาต่างๆ ❑ ใช้ส่งคำเชิญเข้าร่วมงานผ่าน Events tab
❑ เป็นศูนย์รวมช่องทางการติดต่อในเว็บเดียว (ผ่าน online messenger, อีเมลล์ และ หน้ากระดาน)
❑ อื่นๆ, โปรดระบุ _____

5. **จากรายการต่อไปนี้ ข้อใดคือเหตุผลที่คุณเลือกเป็นสมาชิก Hi5.com**? สามารถเลือกตอบได้มากกว่า 1 ข้อ

❑ สำรวจโปรไฟล์ผู้อื่น ❑ เพื่อนๆต่างเป็นสมาชิก
❑ คนในครอบครัวเป็นสมาชิก ❑ เพื่อหาเพื่อนใหม่
❑ มีผู้ใช้เครือข่ายเป็นจำนวนมาก ❑ เพื่อแลกเปลี่ยนข้อมูลผ่านหน้ากระดาน หรือ บล๊อค
❑ เพื่อรับข่าวสารโปรโมชั่น โฆษณาต่างๆ ❑ เพื่อแลกเปลี่ยนหรือแสดงรูปภาพ
❑ ใช้งานง่ายในภาษาไทย ❑ เล่นเกม
❑ อื่นๆ, โปรดระบุ_____

6. โดยเฉลี่ย คุณเข้าเว็บไซต์สังคมออนไลน์บ่อยแค่ไหน?

❑ ทุกวัน ❑ 2-3 ครั้ง/สัปดาห์ ❑ 1 ครั้ง/สัปดาห์
❑ 2-3 ครั้ง/เดือน ❑ 1 ครั้ง/เดือน ❑ นานๆครั้ง

7. ประโยชน์แรกที่คุณคำนึงถึงในการเข้าสู่เครือข่ายสังคมออนไลน์คืออะไร? สามารถตอบได้มากกว่า 1 ข้อ

❑ เพื่อการศึกษา ❑ เพื่องาน/ ธุรกิจการค้า
❑ เพื่อการเข้าสังคม ติดต่อกับเพื่อนฝูง ❑ ความจำเป็นส่วนบุคคล/ ครอบครัว
❑ เพื่อความบันเทิง ❑ เพื่อรับรู้ข่าวสารเหตุการณ์ต่างๆ
❑ อื่นๆ, โปรดระบุ _____

8. โดยเฉลี่ย คุณใช้เวลาเล่นอินเตอร์เน็ต กี่ชั่วโมงต่อสัปดาห์?

_____ชั่วโมง/สัปดาห์

9. โดยเฉลี่ย คุณใช้เวลาในเว็บไซต์เครือข่ายสังคมออนไลน์ กี่ชั่วโมงต่อสัปดาห์?

_____ชั่วโมง/สัปดาห์

10. คุณใช้งานอินเตอร์เน็ตมาแล้วเป็นระยะเวลากี่ปีโดยประมาณ?

❑ 0-1 ปี ❑ 2-3 ปี ❑ 4-6 ปี
❑ 7-10 ปี ❑ มากกว่า 10 ปี

11. คุณใช้แพ็คเกจอินเตอร์เน็ตบนมือถือหรือไม่?

❑ ใช่ ❑ ไม่

12. หากคุณใช้แพ็คเกจอินเตอร์เน็ตบนมือถือ คุณใช้งานมือถือยี่ห้ออะไร?

❑ iPhone ❑ Blackberry ❑ อื่นๆ, โปรดระบุ _____

13. คุณใช้บริการอินเตอร์เน็ตประเภทใดที่บ้าน?

❑ Dial up service ❑ High Speed Internet

❑ อื่นๆ, โปรดระบุ _____

14. คุณใช้งาน Browser ประเภทใด? สามารถตอบได้มากกว่า 1 ข้อ

❑ Internet Explorer ❑ Firefox

❑ Safari ❑ อื่นๆ, โปรดระบุ _____

15. เพศ

❑ ชาย ❑ หญิง

16. อายุ (ปี)

❑ 15-20 ❑ 21-25 ❑ 26-30 ❑ 31-35

❑ 36-40 ❑ 41-45 ❑ 46-50 ❑ มากกว่า 50

17. รายได้ต่อเดือน?

❑ น้อยกว่า 5,000 บาท ❑ 5,000 บาท - 10,000 บาท

❑ 10,001 บาท - 15,000 บาท ❑ 15,001 บาท - 20,000 บาท

❑ 20,001 บาท - 25,000 บาท ❑ 25,001 บาท - 30,000 บาท

❑ 30,001 บาท - 35,000 บาท ❑ 35,001 บาท - 40,000 บาท

❑ 40,001 บาท - 45,000 บาท ❑ 45,001 บาท - 50,000 บาท

❑ มากกว่า 50,000 บาท

BIOGRAPHY

NAME	Prathana Srikaeo
DATE OF BIRTH	28 November 1983
PLACE OF BIRTH	Trang, Thailand
INSTITUTION ATTENDED	Thammasat University, 2002-2005 Bachelor of Arts (Economics) Mahidol University, 2007-2010 Master of Business Administration (Business Modeling and Analysis)
HOME ADDRESS	78/29 Pracharaj Soi 5 Taladkwan Muang Nonthaburi 11000 Email: aomprathana@hotmail.com
EMPLOYMENT ADDRESS	ExxonMobil Limited 54 Harindhorn Building North Sathorn Road Bangrak Bangkok, Thailand 10500 Tel. 02-352-7404 Email: th-ptr@exxonmobil.com