

Senior Research

Topic: Was Fixed Internet a Substitute or a Complement To Mobile Internet Between 2010-2012? – Consumer Insight

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Abstract

Thailand first connected to the Internet in 1996 as the third country in South East Asia. After that, its Internet penetration rate has grown rapidly year on year. In 2014, the proportion of Internet users in Thailand hit 28.94% to its total population, according to The World Bank. However, there are two types of Internet connection namely, fixed and mobile. Fixed Internet is a data transmission method through telephone line, cable, and etc. On the other hand, mobile Internet uses cellular data transmissions which allow users to connect to the Internet anywhere. Lately, most mobile network operators in Thailand offers fixed Internet as their new services. It has sparked my curiosity whether there is a relationship between those two types of Internet connection or not.

This research focuses on finding whether there is a substitution or a complementary relationship between fixed and mobile Internet by using data from the Telecommunications Consumption Survey between the years of 2010-2012 from the National Broadcasting and Telecommunications Commission (NBTC). By applying economic regression, the result indicates that during the year 2010-2012, fixed Internet was complementary to mobile Internet.

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1. Introduction

1.1 Background

It is undeniable on how Internet has changed our world. Since the beginning, communication and information sharing have been improved to a new era. Connecting to the other half of the world usually take weeks or even months, but with the world of Internet, it is just only a click away. Over a decade ago, the technological advancement has led us to a world of mobile telecommunication. More and more people are using mobile phone on a daily basis. As time flies, manufacturing technology has made the costs of producing phones; more specifically smartphones, cheaper. Consequently, a price deduction has led the majority of people switch from their feature phones to affordable smartphones, which are capable of connecting to mobile Internet. That is why the figure of world's Internet users is increasing.

There are two ways to connect to the Internet. Either using fixed connection at home or mobile Internet offered by your local mobile network operators. Normally, most of the fixed Internet providers offer unlimited Internet plan for subscribers. On the contrary, due to a limited bandwidth that each operator has on hand, it is not possible to offer the same type of service as what fixed Internet providers do. This fact shapes up on peoples' behavior in consuming Internet on each kind of connection. However, the percentage of internet users to the overall population in Thailand is at the percentage of 28.94 which is below the ASEAN countries' average at the percentage of 34.98 (refer to Figure 1-1), but the number is expecting to grow sharply as the Royal Thai Government has set Internet as one of their strategic development factors.

Thailand was the third country in South East Asia that connected to the Internet in 1996. After almost two decades, there are more than five million subscribers to broadband Internet (Figure 1-2). It is interesting to note that two out of three major mobile network operators are offering broadband Internet as one of their services. AIS newly offered AIS Fibre which is a Hi-Speed broadband using its fiber optic network in 2014. Likewise, True Corporation has long been operating its True Online broadband Internet. People are more and more engaged with the connectivity of Internet. From students to senior citizens, Internet eases how people live. The library for students is available at a click on the Internet or even doctors can pre-diagnose online for those who are in remote areas.



Figure 1-1: Internet Users As Percentage of Population In ASEAN Countries¹

In Thailand, there are three major mobile network operators namely, Total Access Communication Public Company Limited (DTAC), Advanced Info Service (AIS) and True Corporation Public Company Limited (TrueMove). The Thai telecommunication market has been rapidly growing during the past few decades. In January 2015, a total number of mobile subscriptions were at 97 million which is accounted for 150 percent of the overall population. Furthermore, 75 percentages of mobile subscriptions (72.75 M) were using mobile Internet on a daily basis. It is known that Thais have a craze of social media. Table 1-1 illustrates the number of



Figure 1-2: The number of broadband subscribers in Thailand²

¹ Data from World Bank updated on April 17, 2015

² Data from www2.nbtc.go.th

Thai active users on social media. Facebook has ranked Bangkok as the number one Facebook-using city in the world. Although Bangkok is not a very scenic city, it is by far the second most popular city on Instagram. It is clear that the demand for internet, especially mobile internet, in Thailand will keep increasing as the current consumption of social media is a trend among the Thais, particularly teenager.

| | Active Users Per Month | | |
|-----------|------------------------|----------------------------------|--|
| | Million | Percentage of Overall Population | |
| Facebook | 30 | 44% | |
| Line | 33 | 49% | |
| Youtube | 26.2 | 39% | |
| Twitter | 4.5 | 7% | |
| Instagram | 1.7 | 3% | |

Table 1-1: Thailand's Active Social Media Users In 2014³

The Technology Acceptance Model (Figure 1-3) is chosen to explain on the global Internet consumption behavior. It describes on how users accept and use a technology. The model abbreviated as TAM, indicates that when people are presented with a new technology, whether or not they will use it, depends on two factors that alter their decision making process, namely perceived usefulness and perceived ease-of-use. Fred Davis defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance". He also defined perceived ease-of-use as "the degree to which a person believes that using a particular system would be free from effort". However, looking at the digital revolution, it has started with fixed Internet connecting computers to communicate between places in the United States of America. Few decades later, people could contact each other through wired Internet connection. TAM explains that for people who have adopted Internet to their lives at any stage saw the benefits more than the effort to learn on how to use.

³ Data from Digital Advertising Association of Thailand

Figure 1-3: Technology Acceptance Model⁴



1.2 Objective

This research aims to identify and study the relationship between fixed and mobile Internet during the years of 2010 to 2012 because there was only one Thai major mobile network operator offering both services. By using an econometric approach, the relationship between two connections will be investigated and can be used as a case to further study on the Thai Internet Service Providers (ISP) industry. The clear relationship will help another mobile operator to understand more on the Thais' behavior on using Internet, and most importantly, whether or not to invest in broadband Internet to attract new user for future mobile Internet services.

2. Literature Review

According to (Vogelsang 2010), the number of mobile communication users has surpassed fixed-line subscriber. With the number of over four billion users worldwide in 2008, mobile communication has changed the way people connect one another. Recently, many mobile network operators in developed countries have reported flat or even shrinking voice call revenues (Gerpott, Thomas and Weichert 2013). For example, total mobile voice call in the European Union (EU) and the United States of America decreased by 3.8% and 3.5% respectively in 2011 compared to the prior year. However, the trend towards the connectivity of mobile Internet has rapidly grown which has contributed more revenue to mobile network operators.

Mobile Internet users are either prior fixed Internet users or new users to the Internet. The investigation on mobile Internet among mobile network operators have based on Technology Acceptance Model (TAM). According to (Davis, Bagozzi and

⁴ Technology Acceptance Model Version 1 by Fred David (1989) Source: en.wikipedia.org/wiki/Technology_acceptance_model

Warshaw 1989), consumer perceptions on mobile Internet's "usefulness" and "ease of use" are crucial to mobile Internet acceptance. However, TAM has also been criticized. According to (Lo' pez-Nicola' s, Molina-Castillo and Bouwman 2008), TAM is considered lacking in ability to account for social influence and to explain user intention.

Smartphones and tablet have such powerful features. They allow users to access fixed Internet services straight from the devices (Reuver, Ongena and Bouwman 2013). Fixed-mobile convergence somehow has created such convenience services like Facebook, Skype, etc. It is no doubt on why the number of mobile Internet users has a significant growth rate globally. In Thailand, a country which is considered to be a developing country, has a massive number of mobile Internet subscribers because of the inelasticity of mobile Internet (Srinuan, Srinuan and Bohlin 2012). The study further shows that service application is another factor that influences the adoption of mobile Internet. In a developed country like South Korea, the study shows no difference to Thailand case. Service application (messaging) is one of the main factor in adoption mobile Internet because of it usefulness (Cheong and Park 2005).

3. Methodology

3.1 Data

This research acquired Telecommunication Consumption Survey of Thailand data from the National Broadcasting and Telecommunication Commission (NBTC) during years of 2010-2012. The survey was based on a field survey using quantitative research method. Specifically, multi-stage sampling was applied to randomly select the respondents with a 95 percent confidence interval.

Telecommunication Consumption Survey aimed to study further on the current technologically converged society. As mobile phone is not only used to call, Internet services are also part in mobile communication services. That is why NBTC needs to understand consumption behavior to better shape its policies in order to benefit Thai society the most. However, I only used partial information from this data. The data sets in the Internet sector from each yearly survey were used as a raw data set in my model. The number of observations from all three years in this data is a total of 10040 surveys. Base on TAM, the assumption which applies here is that mobile Internet is a relatively newer than the fixed Internet. Therefore, mobile Internet user is

either someone who is new to the Internet world or who was a fixed Internet user. Most of the cases here who are mobile Internet users were fixed Internet users. As a consequence, mobile Internet connectivity variable is treated as a dependent variable.

| Variable | Observation | Mean | Standard Deviation | Mininum | Maximum |
|----------------------------|-------------|-----------|--------------------|---------|---------|
| ADSL Connectivity | 10040 | 0.2384462 | 0.4261546 | 0 | 1 |
| Dialup Connectivity | 10040 | 0.0079681 | 0.0889125 | 0 | 1 |
| Wifi Connectivity | 10040 | 0.0263944 | 0.1603132 | 0 | 1 |
| Free Connectivity | 10040 | 0.1733068 | 0.3785311 | 0 | 1 |
| Mobile Connectivity | 10040 | 0.2001992 | 0.4001693 | 0 | 1 |
| Male | 10040 | 0.4741036 | 0.4993538 | 0 | 1 |
| Age | 10040 | 37.26444 | 15.34491 | 12 | 70 |
| Income | 10040 | 12305.08 | 13195.88 | 0 | 30000 |
| Household | 10040 | 3.931375 | 1.592445 | 1 | 15 |
| Urban | 10040 | 0.5668327 | 0.4955379 | 0 | 1 |
| Primary | 10040 | 0.3150398 | 0.4645549 | 0 | 1 |
| Junior High | 10040 | 0.1813745 | 0.3853474 | 0 | 1 |
| Senior High | 10040 | 0.1690239 | 0.3747917 | 0 | 1 |
| Diploma | 10040 | 0.0702191 | 0.2555287 | 0 | 1 |
| Undergrad | 10040 | 0.2020916 | 0.4015802 | 0 | 1 |
| Above Undergrad | 10040 | 0.0404382 | 0.1969946 | 0 | 1 |

Table 3-1: Summary Statistics

3.2 Method

An econometric approach is the main method to analyze the data. Three econometric models are chosen to test the data, namely ordinary least square (OLS), Probit and Logit model. Because of the binary choices of characteristics for mobile and fixed Internet, OLS is not a good model to be used. The only reason why the author keeps the OLS method is to compare its result with Probit and Logit results. The main idea is to find whether using fixed internet has an effect on adopting mobile internet or not. Normally, using fixed Internet has two main constraints which are time and mobility. Whenever the benefits yielded by Internet are more than the cost of waiting for fixed Internet, people will adopt mobile Internet to their lives. However, the author separates the process into two parts.

- First is to construct a relationship equation. The author refers to TAM as one key assumption. The mobile Internet user is either a new user or a prior fixed Internet user. As a consequence, the mobile Internet connectivity is treated as a dependent variable in this model. For fixed Internet connectivity, it is separated into four sub-variables which are ADSL, Dialup, Wifi and Free.
- Second is to test the constructed equation on the given models. The size of the effect will be calculated.

3.3 Model

The relationship equation is constructed to examine the effect of substitute or complement between fixed and mobile Internet. The hypothesis is set as if fixed and mobile Internet are complementary goods, the coefficient in front of an independent sub-variables x (ADSL, Dialup, Wifi and Free) will yield a positive value. On the other hand, if fixed and mobile internet are substitute goods, the coefficient in front of each independent sub-variables x (ADSL, Dialup, Wifi and Free) will yield a negative value.

$$Y_{i} = \beta_{1} + \beta_{2}ADSL_{i} + \beta_{3}Dialup_{i} + \beta_{4}Wifi_{i} + \beta_{5}Free_{i} + \delta X_{i} + e_{i}$$
(1)

Where

- ADSL is a type of subscriber line which is an upgrade from copper telephone line. It enables faster data transmission.
- Dialup is a type of data transmission over copper telephone line. The user has to dial to a given number in order to connect to a network.
- Wifi is a local area wireless computer networking technology. It allows devices to network via radio bands.
- Free is a free Internet connection which was available in public places in Thailand during the given period.

For example, if ADSL and mobile Internet are complement goods, β_2 will yield a positive value. Furthermore, control variables (δX_i), which are age, sex, income, number of house, urban, and level of education are included to make sure that the model is unbiased. Finally, the author uses OLS, Probit and Logit models to estimate equation (1).

4. Result

The estimation from all three econometric model (the focuses are Probit and Logit model) yields positive values which indicate that fixed Internet was an complement good to mobile Internet during the year 2010-2012. It means that fixed Internet to Thai users led to the adoption of mobile Internet. The reason why price index is not included with this model is because during the period of three years, price of Internet was relatively constant. However, there was for sure the existence of heteroskedasticity problem because of the co-movement between the dependent variable (y) and the independent variables (x). As a result, robust regression was applied.

In detail, dialup connectivity in all three models is statistically insignificant due to its low variable. Being a dialup user has no effect in using mobile Internet. Also, sex, number of household, primary education and junior high are statistically insignificant. It means that those variables are factors, which contribute no effect in using mobile Internet. For ADSL, Wifi and Free yield positive coefficient towards mobile Internet connectivity. Therefore, they are considered as complementary goods with mobile Internet.

| | Model 1 | Model 1 | Model 1 |
|--------------|-----------------|---------------------------|--------------------------|
| Variables | OLS | Probit (Marginal effects) | Logit (Marginal effects) |
| | Mobile Internet | Mobile Internet | Mobile Internet |
| Constant | 0.319 * | | |
| | 0.020 | | |
| adsl | 0.032 * | 0.026 | * 0.024 * |
| | 0.011 | 0.007 | 0.006 |
| dialup | 0.066 | 0.055 | 0.041 |
| | 0.047 | 0.039 | 0.031 |
| wifi | 0.139 * | 0.074 | * 0.059 * |
| | 0.029 | 0.022 | 0.019 |
| free | 0.087 * | 0.048 * | * 0.040 * |
| | 0.012 | 0.009 | 0.007 |
| male | -0.011 | -0.003 | -0.005 |
| | 0.007 | 0.006 | 0.005 |
| age | -0.006 * | -0.008 | * -0.007 * |
| | 0.000 | 0.000 | 0.000 |
| income | 1.78E-06 * | 2.54E-06 | * 2.28E-06 * |
| | 3.66E-07 | 0 | 0 |
| hh | -0.003 | -0.002 | -0.002 |
| | 0.002 | 0.002 | 0.002 |
| urban | 0.021 * | 0.020 | * 0.016 * |
| | 0.007 | 0.006 | 0.005 |
| primary | -0.037 * | -0.017 | -0.023 |
| | 0.012 | 0.035 | 0.034 |
| junior_high | -0.015 | 0.079 | 0.074 |
| | 0.014 | 0.048 | 0.052 |
| senior_high | 0.078 * | 0.179 | * 0.170 * |
| | 0.015 | 0.059 | 0.069 |
| diploma | 0.056 * | 0.206 | * 0.198 * |
| | 0.019 | 0.068 | 0.082 |
| undergrad | 0.238 * | 0.353 * | * 0.341 * |
| | 0.017 | 0.067 | 0.084 |
| ab_undergrad | 0.326 * | 0.500 * | * 0.506 * |
| | 0.029 | 0.079 | 0.100 |
| n | 10040 | 10040 | 10040 |
| R-squared | 0.216 | 0.260 | 0.260 |

Table 4-1: The Estimation Result

Note: * means that the coefficient is statistically significant at 95% confidence intervals

5. Telecommunication Sector Analysis and Suggestions

In 2015, Total Access Communication PLC (dtac) is the only one major operator, which does not offer fixed Internet services. This research shows that most of fixed internet (except dialup) are complementary to mobile internet. According to TAM, people who use mobile Internet are either new users or were fixed internet users. In this case, once the usefulness of mobile Internet is perceived. People will surely adopt mobile Internet.

Nowadays, the way of communication has shifted toward social networking applications. So as Thailand, Line application has grown its popularity from teenagers to elderly people. As a consequence, the demand for voice calls, which used to be the main revenue source of mobile operators, has been moved towards mobile Internet. This research suggests that fixed Internet is a complementary good with mobile Internet. So, I propose the strategy of offering fixed Internet together with mobile Internet if investment cost is in a reasonable range. Or else, finding a good partner will do so. It is predicted that it will help reduce the demand for mobile Internet as the bandwidth is limited. In order to gain more market share in this highly competitive market, offering broadband network will help gain new users toward mobile Internet and will also increase the number of MNP toward its own mobile network.

6. Conclusion and Limitations

6.1 Conclusion

Two kinds of Internet connections have been long known for their unique characteristics. Fixed Internet plan is usually unlimited usage while mobile Internet usually gives a limited usage plan because of their limited resource. Fixed line Internet used to be everything for all activities online. The development in technology has changed the way people connect to the Internet since the introduction of the fast, robust connective attributes of mobile Internet.

This research aims to find a relationship between two types of connection. This interest has grown from my observation in the mobile sector in Thailand. Two out of three mobile network operators are offering the fixed Internet along with their mobile services. This has raised me a question of why. By using Telecommunication Consumption Survey data from NBTC during 2010-2012, the relationship equation has been set to identify the interested relationship based on TAM assumption. The result shows that fixed Internet, namely ADSL, Dialup and Free, is considered as complementary goods for mobile Internet.

Looking back to myself, the relationship I have discovered is true based on my experiences. I have long been an ADSL subscriber. After the Internet has engaged more in my life in many ways, the need of Internet on-hand has started to grow as I could not achieved mobility with fixed internet. When the mobile Internet has been introduced, I did use the service because of its usefulness and thus, Technology Acceptance Model was right in my case.

As our world is transitioning from voice calling to online social messaging, mobile operators shall adapt its strategies to get the most out of the market. It is no doubt that mobile Internet is a key product these days. I strongly believe that using fixed Internet as an introduction to mobile Internet is indeed a very smart move due to its cost efficiency. Having fixed Internet on-hand also makes it easier to introduce bundle packages to offer customers as well as keeping existing ones loyal. This research supports that fixed Internet is statistically significant as a complementary good towards mobile Internet. It explains why most of the operators are offering fixed Internet as part of their services.

6.2 Limitations

The relationship equation and econometric model, which were used in this model, are not yet perfect. It requires a higher level of knowledge to make it more accurate. However, with my passion and interests in the telecom market, I am committed to come back and refine this model with an adequate set of skills for the better version.

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