Analyzing the Problem of Digital Divides in Thailand

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1. THE PROBLEM OF THE DIGITAL DIVIDE

It is widely known that internet infrastructure and internet-related activities are highly concentrated in a few developed countries, especially in the United States. However, it is feared that such lop-sided development creates a 'digital divide.' There are also great disparities among Asian and Pacific countries. For example, there were 5,210 internet users per 10,000 population in South Korea in 2001 and only a little over 7 users per 10,000 population in Cambodia. In other words, South Korea is 700 times more "wired" than Cambodia.

There is also another level of the digital divide: the divide within a country. In the case of Thailand, for example, the National Statistical Office (NSO) found that there were 16 internet users per 100 population in Bangkok in 2001 while there was less than 1 (0.9) internet user per 100 population in Sa Kaeo, a province close to the Cambodian border; that is, Bangkok has almost 18 times the internet penetration as Sa Kaeo. How can there be such a large gap? What are the factors that determine the level of internet penetration in a country or in a region within a country? How can the digital divide be narrowed?

2. MODEL OF INTERNET ADOPTION

In this section, we analyze the problem of the digital divide in Thailand. We adopt a model that identifies factors that determine the level of information technology (IT) adoption within Thailand. Our analysis is based on a quarterly labor force survey, conducted by NSO between January and March 2001. About 78,000 households with 178,263 individuals at least 11 years old were covered by the survey. In addition to the demographic profiles of the sample collected for the purpose of the labor force survey, an additional question was added to determine if an individual had used the internet during the previous 12 months. The answer to the question was a binary choice of usage or non-usage.

A model to analyze the factors that determine the usage of the internet needs to deal with binary-choice data. Thus, the use of ordinary least square (OLS) estimator, designed for a dependent variable with continuous values, is not applicable. We adopted a binary logistic regression model. Table 1 shows the variables used in our model. The dependent variable in this regression is the natural logarithm of the odds that an individual is an internet user. The explanatory variables are variables representing characteristics of the individual, including educational level, sex, age, marital status, income, etc. The regression equation is expressed as shown below:

$$\ln(P_i/(1-P_i)) = \beta_0 + \beta_1 \text{URBAN}_i + \beta_2 \text{MALE}_i + \beta_3 \text{AGE}_i + \beta_4 \text{SINGLE}_i + \beta_5 \text{STUDENT}_i + \beta_6 \text{WORKING}_i + \beta_7 \text{FIRM-SIZE}_i + \beta_8 \text{WAGE}_i + \beta_9 \text{YEARS-IN-SCHOOL}_i$$

i = individual index,
P_i = Probability that an individual i is an internet user

Table 2 shows the result of the analysis. From signs and the significant levels of each variable obtained from the regression analysis, we can assess the qualitative impact of an attribute on the probability that the person is an internet user:

- AGE: The sign of the coefficient of AGE is significantly negative, indicating that the propensity to use the internet declines with age. This may reflect the fact that younger persons tend to acquire new technological skill more easily than older persons.
- SINGLE: The sign of the coefficient of SINGLE is significantly positive. This may reflect the fact that a single person tends to have more time to acquire the required technological skills and more time to use the internet.

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Table 1 Variables Used in the Logistic Regression Model

Variable	Name	Definition
Internet user	NET	NET = 1 if the individual has used the internet at least once in the last 12 months. NET = 0 otherwise
Location	URBAN	URBAN = 1 if the individual is living in a municipal area. URBAN = 0 otherwise
Sex	MALE	MALE = 1 if the individual is male. MALE = 0 otherwise
Age	AGE	Age of the individual
Marital status	SINGLE	SINGLE = 1 if the individual is single. SINGLE = 0 otherwise
Study status	STUDENT	STUDENT = 1 if the individual is a student. STUDENT = 0 otherwise
Educational background	YEARS-IN-SCHOOL	Number of years in school, ranging from 0 (no education) to 16 (university education)
Work status	WORKING	WORKING = 1 if the individual is working. WORKING = 0 otherwise
Firm size	FIRM-SIZE	Size of firm or organization that the individual is working for. FIRM-SIZE = 1 if the individual works for a firm with at most 4 employees. FIRM-SIZE = 2 if the individual works for a firm with 5-9 employees. FIRM-SIZE = 3 if the individual works for a firm with at least 10 employees.
Total wages	WAGE	Total wage of a worker, which is the sum of wage or basic salary, overtime payment and major in-kind incomes. This variable is applicable only to employed workers.

Source: National Statistical Office of Thailand. The 2001 Survey of Information Technology.

Table 2 Result of the Logistic Regression to Explain Probability of Using the Internet

	Coefficient	Exp(Coefficient)
URBAN	0.184*** (.007)	1.201
MALE	0.54 (.318)	1.056
AGE	-0.008** (.029)	0.992
SINGLE	0.421*** (.000)	1.523
STUDENT	1.816*** (.000)	6.147
WORKING	0.314 (.196)	1.369
FIRM-SIZE	0.338*** (.000)	1.402
INCOME	0.000* (.059)	1.000
YEARS-IN-SCHOOL	0.581*** (.000)	1.788
Constant	-10.522*** (.000)	0.000

Note: *** significant at 1%, ** significant at 5%, * significant at 10%

- URBAN: The sign of the coefficient of URBAN is significantly positive. This may reflect that telecommunication infrastructure is more developed in municipal areas than in remote areas. It may also indicate that a person seeking advice about how to use the internet is more likely to find it in municipal areas.
- STUDENT: The sign of the coefficient of STUDENT is significantly positive. This can be interpreted as many people have access to the internet at their schools or university.
- YEARS-IN-SCHOOL: As the sign of the coefficient of YEARS-IN-SCHOOL is significantly positive, the probability of using the internet increases with the number of years in school of the individuals. This is likely due to the fact that the use of the internet requires basic computer literacy.

It is interesting to find that gender does not have any significant impact on the probability of using the internet. This may be due to the fact that Thailand has largely achieved gender equality. It also rejects the belief that females tend to be less capable of using new IT than males. The situation may be different in other countries where gender equality has not been achieved.

The above model also enables us to assess the quantitative impact of each personal attribute on the probability of the person being an internet user. The exponent of the coefficient of a binary variable, shown in the last column of Table 2, approximates the number of times the person with the specific attribute is more likely to be an internet user.[1] For example, a person who is a student is about 6.1 times more likely to be an internet user than a non-student, keeping other variables constant. For an attribute with real or integer values, the exponent represents the increased probability of an individual being an internet user for an additional unit of the attribute.[2] For example, an additional year in school means that the person is 1.79 times more likely to be an internet user.

3. DISCUSSIONS AND CONCLUSION

From the above analysis, it is found that the level of internet adoption depends on a number of factors. In other words, the problem of the "digital divide" is not a simple phenomenon but should be viewed as a combination of a number of divides: urbanization divide, age divide and education divide.

Owing to its multifaceted nature, the problem of the digital divide should be addressed not only from an economic perspective, but also from a socio-cultural one. From this perspective, it would be imperative to increase the level of education and provide internet access and training to potential users in schools, universities, workplaces and community access points. Also, it would be beneficial to develop content in local languages.

ENDNOTES

1 For an explanatory variable X_i with binary values, a person with $X_i = 1$ is $e^{\beta i}$ times as likely to be an internet user as a person with $X_i = 0$.

2 For X_i with real or integer values, $e^{\beta i}$ represents the increased probability of being an internet user for an additional unit of Xi.