

The Demand of Services for Information Technology Industry in Indonesia

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Abstract

This research has a goal for analyzing determinant demand of telecommunication services either mobile phone or internet in Indonesia. This research uses secondary data of publication result from the Indonesian Central Bureau of Statistics in 2012-2013 period for 34 provinces in Indonesia. The demand for mobile phone is considered as the function of Gross Domestic Product (GDP) per capita and the region for dummy while the demand of internet service is the function of mobile phone service request, GDP per capita, proportion of educated society, proportion of the employment, and the region as a dummy. This research also modifies the model by placing the region as a moderating variable on GDP per capita. Furthermore, it is also done by using reduced form (mediation) to estimate the indirect effect on mobile phone ownership towards internet service request. The result of research showed that the demand for mobile phone and internet in Indonesia was influenced by income factor (GDP per capita). Yet In Indonesia, there are still imbalances in adapting the information technology (internet) between the area of Java-Bali and the outside of those areas. The result of research also showed that the demand for the telephone was able to be mediation of internet use. However, some regions (Maluku and Papua) have not optimally exploited mobile phone to access the internet compared to other regions.

Keywords

Mobile phone, internet services, income, territory, multiple linear regression model.

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Introduction

The development of information technology today begins to eliminate barriers among countries. How it could be, information on certain parts will soon be accessible in other parts of world. The flow of information will be unstoppable, and has become a new power in mobilizing public opinions. Today the war is no longer in physical scale, but has entered the part of the war of ideas. Information technology is just like a double-edged sword, on one side it supports the progress of a nation through time efficiency and information cost, but on the other hand it can be a means of controlling public opinion through harmful opinions which distract the order that have been made in politics, economics, social, and other fields. Unsurprisingly, there is also an idea which states that anyone who controls the information will rule the world. For this reason, every country strives to increase the availability of telecommunication

infrastructures, not only to serve as parts of developmental needs but also to meet market demands. The European Union for example has had a strategy 'Digital Agenda 2020'. The Agenda strives to maximise the social and economic potential of ICT, especially the potential of the Internet, a key medium of economic and social activity in all domains (education, commerce, work, communication, culture etc.). The strategic objective is to bring basic broadband connection to all European citizens by 2013 and to ensure that by 2020 all Europeans have access to much faster Internet (above 30 Mbps) while at least 50% of European households should have access to Internet (Vaněk et al., 2011)

In Indonesia, the development of information technology industry has strived by the government, especially from supply side. The policy of telecommunication has been pushed into the perfect competition so that

telecommunication service providers can compete fairly, as intended by price competition. Expected through price competition, the demand for telecommunications can continue to increase, so that it can give more benefits to the society. Another benefit which can be obtained via telecommunication industry is inter-regional connectivity in Indonesia consisted of thousands of islands separated by oceans. However, due to the large coverage area of Indonesia, the telecommunication developments seem to be unequal. Based on the data of communication and information (Kominfo, 2011) showed that based on territorial aspect, the highest telendensity value is Jakarta and Banten, the value reached 169.3 while the lowest teledensity occurred in the area of West Java and Central Java and Yogyakarta with telendensity value of 36.9. This showed that every 100 people in West Java, Central Java and Yogyakarta there were 37 people using mobile phones. While the figures for the Jakarta-Banten telendensity of 169.3 indicated that each contained 170 people as mobile phone users. This implies that the residents of Jakarta, Banten use two or more mobile phones. The telendensity of Kalimantan, Sumatra and Sulawesi-Maluku-Papua was 83.67, 70.85 and 56.75 respectively. While regional telendensity of Java-Bali and Nusa Tenggara was 56.5.

Thus it is necessary to make many efforts to improve the telecommunication industry from the demand aspects among regions in Indonesia. On the demand aspect of the development of information technology industry, either mobile phones or internet access of households in Indonesia is presented as Table 1.

Years	Household Mobile Phone Users (%)	Household Accessing Internet (%)	Household accessing internet through Mobile Phone (%)
2005	19.88	3.34	n.a.
2006	24.60	4.22	n.a.
2007	37.59	5.58	n.a.
2008	51.99	8.47	33.43
2009	61.84	11.59	n.a.
2010	72.00	22.40	53.51
2011	78.96	25.90	55.35
2012	83.52	30.66	62.58
2013	86.09	32.22	68.76

Sources: Statistics of Indonesia, BPS (2014b)

Table 1: Percentage of Household Phone Users and Internet Users in Indonesia from 2005 to 2013.

Table 1 shows that the number of households using mobile phones continued to increase up to 86.09 per

cent in 2013. However, from the aspect of internet usage was still low, only about 33 percent. Whereas the majority of households accessed the internet (2009-2013) through telephones. This indicates that the phone ownership has not been used optimally by the community.

Several factors which can affect the optimal use of the phone including for the purpose of internet data access were educational level of the telephone users and employment status. Internet access was influenced by someone's education because accessing these data required knowledge which was more complicated than using a regular phone. Internet users are also strongly associated with a person's job, either as students, office workers, or other professional workers. The demand for the service was potentially higher than other groups, such as children and housewives. Some other factors that could affect demand for telecommunication services industry can be viewed from the aspect of micro and macro. Some studies related to the demand for telecommunication services of micro aspects were reviewed by (Omotayo and Joachim, 2008; Wang and Lo, 2002; and Olatokun and Nwonne, 2012). This research generally correlated with the decision of provider's service election that was associated with the factor of quality of service and satisfaction. Several other studies examined the demand for telecommunication services from the macro aspects (Gruber and Verboven, 2001; Ahn and Lee, 1999; and Jha and Majumdar, 1999) by placing the variable gross domestic products (GDP) per capita as a variable affecting the demand.

Studies on the use of telephone and internet in Indonesia were carried out by Utomo, et al (2013) on the public of capital city of Jakarta, which incorporated the element of demographics as a determinant of telephone and internet use. This study investigated the determinants of telecommunication services from the micro level. The study examined the determinants of demand for telecommunication services to the macro scale of all provinces in Indonesia with the involvement of the regional location remained unconsiderable, whereas the position of Indonesia which is divided into several areas with different imbalances in economic development that is more inclined to the Java-Bali obviously a little more influences developmental differences of telecommunication industry between Java-Bali and non Java-Bali. This study examined how aspects of the area, population status (school and work) as well as aspects

of the economy (GDP per capita) affected the demand for telecommunication services in Indonesia.

Review of literature

The demand for services and goods have multiple determinants. As the standard of existing theories, the demand is influenced by the price of the goods themselves, the price of other goods, tastes, income, and population. Price is the major determinant of the demand for goods and services. In essence, the lower the price of an item, the more demand for goods. Conversely, the higher the price of an item, the less demand for goods. The price of other goods also affects the purchase, depending on the nature of the relationship between the two items, whether as a substitution, complementary, and no interconnection. Although goods / services are not interconnected, but still influence demand if factors constant revenue because the increase in price will reduce purchasing power. Consumers will face a more limited budgeting problem so that they must choose certain types of goods. The selection will sacrifice other options that reduce the demand for goods and services. Patterns of relatedness are indicated with an income elasticity with the request indicating the characteristic of the goods of which is essential goods, luxury, or inferior. The income elasticity, $e > 1$ indicates the goods/services of a luxury item; while $0 < e < 1$ is of basic goods; while $e < 0$ indicates the type of inferior goods. Garbacz and Thompson (2007) found that income elasticities of fixed main lines was 0.291, while income elasticities of mobile was 0.933. But when model incorporates the instruments for residential landline and mobile monthly prices, income elasticities of mobile was 1.260 or indicate as luxury goods.

The demand for services in the telecommunication industry is influenced by several factors. Herrmann et al. (2007) stated that the price factor had a vital role, especially in the telecommunication market particularly in mobile phone service providers. Several studies related to the demand for telecommunication services from micro aspects generally reviewed purchasing decisions with customer satisfaction and loyalty. Omotayo and Joachim (2008) found a strong relationship between customer service and customer retention in the telecommunication industry in Nigeria. Park and Ohm (2014) found that satisfaction and with and perceived usefulness of mobile map services were the most significant antecedent of users' attitude toward services and behavioural intention

to use them. Then Olatokun and Nwonne (2012) found that the quality of service and availability affected more on the electoral process of the use of telecommunication provider service compared to promotion factor and brand image. The demand for cellular phone services in Malaysia was also reviewed by Rahman et al. (2010) from micro aspects which found that the quality of service and price significantly and positively impact on the demand for mobile phone services. In contrast to these studies, Adikari (2013) conducted a study about a telephone request to the students in Sri Lanka by using the variable of availability of facilities / features of the phone and income as a determinant, the research showed that the income level significantly and positively impact on the demand for mobile phones, whilst the facilities / features provided no effect. Other studies that incorporated demographic aspects in the use of the phone studied the use of the phone at the same time as the use of the internet in Jakarta conducted by Utomo, et al. (2013) using variables gender, age, education level and employment status (working, student, work, and not in the labor force). Regression of all these variables showed that the variables of age, education level and employment status affected the ownership of the phone, but not for gender. While the Internet access via mobile phones showed that all variables were significant except for a group of junior secondary school. Result of a study conducted by Varallyai and Herdon (2010) showed that demands for telecommunication, particularly the use of Internet, decrease along with age increase. In 2008 about 73 percent of a population ageing 16 – 24 years in European countries used the internet, 51 percent by 25- 43 years of age, and only, and only 7 percent by those ageing 66-74 years accessed the internet. While the demographic aspects in the use of the Internet was also seen in the study of Taylor et al. (2003) researching the determinants of Internet use on a variety of purposes, the results showed that the demographic factors and socio-economic (location, gender, education level, marital status, combined with family income and employment status) influenced the internet access for the purpose of working in Central Queensland resident. While people using the internet for online shopping purposes were only influenced by factors of age and level of education. Hsiao and Chen (2014) found that users' gender, age, occupation and income have significant effects on the contract with voice and 3G internet, and the monthly 3G internet fee.

Furthermore, Kalmus et al. (2011) examined aspects of Internet requests from the aspect of personal traits, socio-demographic variables and habitual indicators as well as lifestyle of Estonian population at the age of 15-74 showed that the motive for someone to access the internet was the use of Social media and entertainment (SME), and work and information (WI). The analysis showed that the use for the purposes of WI could be well predicted by frequency of use of the Internet for work/school/home, education level, age, gender, language and income level, as it happened to the lifestyle of participating in the public sector. As the SME needs, income and gender factors had no effect. Usage for SME in addition to do at work / school was also done at home and other places. Al-Hammadani and Heshmati (2011), his work in Iraq included elements of the location / region in addition to demographic factors (such as gender, age, educational level and occupation), cost factor, and the intended use of the internet. The results showed that all of these factors had a significant effect, except for the location (area).

Furthermore, several studies evaluating the demand for telecommunication from macro side were namely Gruber and Verboven (2001); Ahn and Lee (1999); and Jha and Majumdar (1999). These three studies using GDP per capita as one of the variables affected the GCC demand for telecommunication services. Gruber and Verboven (2001) found that countries with a higher GDP per capita and larger fixed networks tended to have the higher rate of adoption of mobile services. These results were also in line with the research of Ahn and Lee (1999) which found that the probability of subscribing to mobile phone services was positively correlated with GDP per capita and the number of fixed lines per person. Abu and Tsuji (2010) conducted a study of panel data from 51 countries from 1997 to 2007 period. The results showed that in the group of developed countries, the use / ownership of the phone was influenced by per capita income, the cost of mobile phones, network infrastructure, fixed network, and fixed telephone costs and technology; while in the group of developing countries, telephone installation was affected by the cost of mobile phones, market size, infrastructure, technology, and technological innovation. Mocnik and Sirec (2010) found that the strongest positive and most significant impact on internet use was ICT infrastructure and people capabilities, followed by income distribution, and investment and international trade.

Material and methods

The study uses secondary data from the Indonesian Central Bureau of Statistics's publication period of 2012 -2013 in 34 provinces in Indonesia. In order to know the factors that affect the demand for telecommunication services, then we analyze them using the multiple linear regression model which has been also used by Abu and Tsuji (2010) and Al Hammadani and Heshmati (2011). We stated this model in equation (1a), where the demand for mobile phones is a function of GDP per capita and region. The layout of the region as well as the estimated dummy variables is to determine differences in the demand for mobile phones based on the region, which is divided into Java-Bali and non Java-Bali-Bali, based on development inequality of Java-Bali and non Java-Bali-Bali. There are seven provinces in Java and Bali, including: DKI Jakarta, D.I. Yogyakarta, West Java, Central Java, East Java, Banten, and Bali. The other 27 provinces are outside of these regions. Development in Java and Bali occurs rapidly, creating a gap between these and other regions, including the availability of telecommunication infrastructures. Sujarwoto and Tampubolon (2016) use region variable to estimate spatial inequality and the internet divide in Indonesia. Furthermore, the model of the relationship between the demand for mobile phones (DFMP), GDP per capita (*GDPC*), and region (*REGI*) are as follows

$$DFMP = \beta_0 + \beta_1 GDPC + \beta_2 REGI + \varepsilon_1 \quad (1a)$$

where β_i ($i = 0, 1, 2$) are regression parameters, ε_1 is error term, and *GDPC* is the natural logarithm of GDP per capita. Furthermore, *REGI* is a dummy variable with $REGI(x) = 1$ if $x =$ a province in the Java-Bali region and $REGI(x) = 0$ if $x =$ is not a province in Java-Bali region.

Model (1a) may be further modified by introducing the region as moderating variable on GDP per capita. This is done on the basis of telecommunication infrastructure is more developed in Java and Bali, and still limited for outside of the region; so although GDP per capita in a province is high, but if it is located outside Java and Bali; it will affect the demand for mobile phones. Reformulation of model (1a) becomes:

$$DFMP = \beta_0 + \beta_1 GDPC + \beta_2 REGI + \beta_3 GDPC \cdot REGI + \varepsilon_2 \quad (1b)$$

where β_i ($i = 0,1,2,3$) are regression parameters, ε_2 is error term, and $GDPC \cdot REGI$ is interaction

factor between GDP per capita (*GDPC*) and region (*REGI*).

As demand for internet services (*DFIS*) as model (2a) is a function of the demand for mobile phones (*DFMP*), GDP per capita (*GDPC*), proportion of the population enrolling in school (*PPES*), the proportion of the working population (*WORK*), and the location of the provinces (regions) as dummy variables (*REGI*).

$$DFIS = \alpha_0 + \alpha_1 DFMP + \alpha_2 GDPC + \alpha_3 PPES + \alpha_4 WORK + \alpha_5 REGI + \varepsilon_3 \quad (2a)$$

where α_j ($j = 1,2,3,4,5$) are regression parameters, ε_3 is error term, and *DFMP* is a percentage of household telephone users. The demand for internet service is also applicable for interactional factors between GDP per capita and region in model (2b), as follows

$$DFIS = \alpha_0 + \alpha_1 DFMP + \alpha_2 GDPC + \alpha_3 PPES + \alpha_4 WORK + \alpha_5 REGI + \alpha_6 GDPC.REGI + \varepsilon_4 \quad (2b)$$

where ε_4 is error term, α_j ($j = 1,2,3,4,5,6$) are regression parameters,. Furthermore, the estimate of the full model on mobile phones variables resulting in reduced form as Model (2c)

$$DFIS = \alpha_0 + \alpha_1 (\beta_0 + \beta_1 GDPC + \beta_2 REGI + \varepsilon_1) + \alpha_2 GDPC + \alpha_3 PPES + \alpha_4 WORK + \alpha_5 REGI + \alpha_6 GDPC.REGI + \varepsilon_3 \quad (2c)$$

where ε_3 is error term, The significance of the indirect effect GDP per capita and region via mobile phone demand in the demand for internet use Sobel Test.

Results and discussion

The development of the demand for telecommunication services in Indonesia

Table 2 presents the demand for telecommunication

services by households in Indonesia. Table 2 shows that areas with the highest proportion in the control of the mobile phone is Sumatra region with the proportion of 88.35 percent. This also applies to rural RT, and not for an urban neighborhood dominated by Kalimantan with the proportion of 96.32 percent. Based on BPS data in 2014, the province with the household had a mobile phone with the highest proportion over 95 percent was Kepulauan Riau (Sumatra), DKI Jakarta (Java-Bali region), and East Kalimantan (Kalimantan), While the lowest one was Papua (Maluku and Papua region), which has not even reached 50 percent. While the Java-Bali region as the center of the Indonesian economy only ranks as the third after the Sumatra and Kalimantan.

In the aspect of the ownership of the number of active mobile phones, it seems that the households in Maluku and Papua had a higher mobile phone number other areas. But this seems to have more limited features and not used optimally for example for data access needs. Table 2 shows that on average, the highest proportion of households with access to the Internet is located in Java and Bali, while Maluku and Papua is the second lowest, after the Nusa Tenggara region. Based on BPS data in 2014, the provinces with the highest percentage of Internet usage were Jakarta (located in the Java-Bali region), and DIY (Java-Bali region) and Riau (Sumatra region).

The determinant of demand for telecommunication services

Table 3 presents a model of the demand for telecommunication services in Indonesia. Model (1) and (2) are equal to the demand of telephone service. On models (1a) shows that the GDP per capita affects the demand for mobile phone services, which was in line with research of Gruber and Verboven (2001); Ahn and Lee (1999); and Jha and Majumdar (1999); and Abu and Tsuji (2010) for the case of developed

Territory	Mastering Mobile Phone (%)			Average Active Phone (unit)	Internet (%)		
	Urban	Rural	Average		Urban	Rural	Average
Sumatera	94.89	83.93	88.35	2.11	46.56	16.01	28.42
Java-Bali	90.75	77.69	86.65	2.27	48.85	20.93	40.16
Nusa Tenggara	86.21	59.59	66.43	1.74	36.65	6.79	14.64
Kalimantan	96.32	83.47	88.31	2.26	50.44	14.94	29.36
Sulawesi	92.49	76.86	81.62	2.04	47.16	14.11	24.39
Maluku and Papua	94.75	49.50	63.10	2.34	42.67	7.38	18.45

Sources: BPS 2014b, processed

Table 2: Households Mastering Mobile Phone and Internet Access by Region in Indonesia during 2012.

Variable	Model 1a	Model 1b	Model 2a	Model 2b	Model 2c
<i>C</i>	9.792	-18.452	-68.643**	-72.167**	-63.933
<i>DFMP</i>			0.481***	0.463***	
<i>GDPC</i>	16.735**	23.353***	10.178**	11.913*	18.223**
<i>PPES</i>			0.1	0.066	0.1
<i>WORK</i>			0.58	0.554	0.58
<i>REGI</i>	0.908	69.091	9.482***	25.296	9.918
<i>R</i>	0.481	0.521	0.859	0.86	
<i>R</i> ²	0.232	0.271	0.737	0.739	
Adj <i>R</i> ²	0.18	0.196	0.689	0.679	
<i>F</i> -statistic	0.019	0.025	0	0	

Note: *1% significant level, **5% significant level, and ***10% significant level

Sources: Own processing

Table 3: Estimation results of the model.

countries. While the position of the area showed no significant difference in the use of mobile phones in Indonesia. After having the interaction between the region and the GDP per capita as Model (1b), it appears that despite the negative sign, the position of the area is not a significant factor that will increase the influence of GDP on the demand of mobile phones.

Further, fitting model of internet demand (2a), (2b), and (2c) seems that for the entire internet demand model presented, it appears that education and employment status variables had no significant effect. The results of this study are not consistent with Utomo’s research, et al, (2013); Cerno and Amaral (2005) and Taylor et al. (2003). In the Model (2a) as an initial model of Internet service demand showed that the use of any mobile phone and GDP per capita effected on households Internet use in Indonesia. The results of this study confirmed the findings of Cerno and Amaral (2005), and Utomo et al (2013) showing that using a phone positively affected Internet access at home.

The results also showed that households using internet in Java-Bali region were higher than the outside of that region. This finding was not in line with Al-Hammadani and Heshmati (2011) for the case of Iraq. Furthermore, when the region was positioned as a moderating factor of GDP capita (Model 2b), it showed no significant result. The final model of the internet demand of households in Indonesia (Model 2c) which is a full model of (2a) appears that the effect of GDP per capita for internet usage is increasing due to the mediation of the use of mobile phones. The biggest effect of GDP per capita for internet usage in Model 3 was 10.178 and increased to 18.223 (Model 2c). This indicates that mobile phone ownership may be

mediated the use of the internet for households in Indonesia.

The use of mobile phones in the media showed the increasing growth of features provided by the telecommunication industry, even the feature had been well understood not only the urban population, but also rural population. BPS data (2014b) on the Indonesian communication statistics showed that in 2012 there were 62.58 per cent households accessing Internet through mobile phones; and this number increased to 68.76 percent in 2013. However, the results of research Utomo et al. (2013) confirmed that the use of media in the phone to access the internet was not significant, yet the majority frequency on adolescents in Jakarta was with higher levels of education. The use of Internet access for this group covered the whole purposes studied, which were email, social networks, religious websites, news, job searching, capital markets, economic trends, work related projects, studies, and other general information. In the case of Spain, as well as research Cerno and Amaral (2005) that there was about 25.2 percent of the Spanish population accessed the internet, and the majority of them accessed over the phone that was equal to 74.6 percent

Conclusion

Indonesian territory is separated by oceans and consists of various islands requiring connectivity among regions. This connectivity can be done via telephone and internet media. The development of telephone and internet usage in Indonesia is increasing from year to year. This increase is influenced by the income (GDP per capita). In addition to the revenue factor, internet usage is also influenced by the region. So it seems

that in Indonesia still lies an inequality adaptation in information technology between Java-Bali and out of Java-Bali. This condition will certainly affect the economy of the regions concerned. Therefore, efforts should be to improve the supply side. The results also show that the demand for the phone is able to mediate the use of internet.

In Indonesia, in 2012 there were 62.58 percent households accessing Internet through mobile phones; and this number increased to 68.76 percent in 2013. However, there are still regions (Maluku and Papua) which have not been optimally used telephones to access the Internet compared to other areas.

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