

A New Conceptual Model of Mobile Multimedia Services (MMS) and 3G Network Adoption in Indonesia

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Abstract

Though Indonesia had implemented the third generation mobile networks (3G) in late 2006, the number of subscribers to 3G mobile network is still low. The percentage of 3G subscribers to total mobile subscriber in Indonesia is only 8.2%, whereas in other countries, it is relatively high; for instance, Japan 80%, Taiwan 28.5%, and South Korean 14%. Indonesia presents huge opportunity for 3G network penetration, comparing current 3G subscribers (7.5 million) to the population of Indonesia (around 238 million). But this potential huge market is yet to be approached and exploited. To capitalize on this market, however, it is important to understand the potential use of the 3G mobile networks in Indonesia which is a developing country and address the questions such as: Whether or not 3G network applications or use in Indonesia is same or similar to those in other countries such as Europe, Japan, or Taiwan? What can be done by the 3G network/service providers in Indonesia to increase the use of 3G mobile networks?

In this paper, in an attempt to answer these questions, we review and critically analyse varying perceptions about the 3G mobile network, 3G mobile network adoption and adoption models, and the success story of 3G operators in other countries from published literature and publically available information. Using the insights from an extensive review of literature and discussion with people in 3G business, we propose a new conceptual model of 3G adoption that integrates the influences of several adoption factors and takes into consideration Indonesian situation. From our study, we find that in order to increase the usage of 3G mobile network, the operators should market services based on 3G mobile network technology rather than just 3G mobile network technology since customers are interested about services that are offered to them not just the technological features – in fact, most of them do not care of technology used, but they do care about benefits or value they can gain from technology. Mobile multimedia services (MMS) are key services that are being rolled out as part of 3G network. These services can become a demand driver and help to

increase 3G mobile network traffic and usage. Another finding from this study is that customers' key adoption factors for MMS are performance expectancy, effort expectancy, social influence, facilitating conditions, and, especially for Indonesia, the cost of the services. The degree of influence of those adoption factors differ from one group of customers to other groups - the adoption factors depend on sex, age, hobby, and especially in Indonesia is affordability of customers. Those variable become control variable to the adoption factors.

Keywords: Model, Mobile, Multimedia, Services, 3G, Adoption.

Introduction

3G Mobile Network

3G Mobile network is the third generation of mobile networks that offer higher data rates than the previous generation networks (1G and 2G). It offers data rates of 144 Kbps for fast-moving mobile users in vehicles, 384 Kbps for slower moving pedestrian users, and 2 Mbps from fixed locations. While 1G as the first generation which emerged in the 1940s offers wide area low bandwidth, just less than 10 kbps. It used analog technology. 1G can only be used for voice service. 2G as the second generation, launched in the 1990s, offers data rates only between 10 and 20 kbps. It can be used for both voice communication and short message service (SMS). In the US, these were referred to as personal communication systems (PCS) and used technologies such as time division multiple access (TDMA), code division multiple access (CDMA) and global system for mobile-communications (GSM). CDMA and TDMA were deployed in various parts of the US, while GSM was deployed as the common standard in Europe. In Indonesia, 2G system is known as GSM and then it is developed to General Packet Radio Service (GPRS) (Campbell & Schwartz, 2001; Lehr and McKnight, 2003).

With its higher bandwidth, 3G is designed to carry voice, video, and data simultaneously. The types of services that can be supported by 3G include: voice, audio, text, still image, dynamic video; interactive services such as conversations, messages, and restore and storage; distribution services such as point-to-multipoint broadcasts; location-based mobile information services; data services that are dependent on the radio connection; fixed wireless access for broadband connections; wireless packet service for Internet access; and wireless circuit service for voice and low-speed data connections (www.skylinemarketing.com). The service based on 3G technology is called mobile multimedia services (MMS) since it involves at least two media. The media can be a) Speech which is voice telecommunication focusing on mouth-to-ear intelligibility; b) audio which is telecommunication of sound in general, focusing on fidelity; c) video which is telecommunication of full motion pictures and stills, focusing

on fidelity; and d) data which is telecommunication information files focusing on error-free transfer.

To support MMS, operators must maintain a network of interconnected and overlapping mobile base stations that hand-off calls as those customers move among adjacent cells. Each mobile base station may support users up to several kilometers away. The cell towers are connected to each other by a backhaul network that also provides interconnection to the wire line public switched telecommunications network (PSTN) and other services. The mobile system operator owns the end-to-end network from the base stations to the backhaul network to the point of interconnection to the PSTN. 3G is also known as Universal Mobile Telecommunication System (UMTS) which is developed to become High Speed Downlink Packet Access (HSDPA) and Long Term Evolution (Campbell & Schwartz, 2001; Lehr and McKnight, 2003).

3G Mobile Network Services around the World

Japan's NTT DoCoMo started offering 3G services in October 2001 in the Tokyo area. Since May 2001, 5,000 residents in the Tokyo area have been using new 3G phones that offer improved i-mode service and real-time videoconferencing. The initial video offering used a 64 Kbps circuit that carried video and audio combined ([http://portal.acm.org/citation.cfm/ACM SIGCOMM](http://portal.acm.org/citation.cfm/ACM_SIGCOMM) Computer Communication Review Volume 31, Issue 5, October 2001). Until Middle of 2008, Japan has the highest percentage of 3G users anywhere in the world, and at the end of August almost four-fifths of the total customer base had either W- CDMA or CDMA2000 1x EV-DO handsets. On an annual basis, the 3G base grew by 25.6% to just below 83.40 million, which represents 79.9% of the total. DoCoMo dominates the 3G sector with 55.1% market share at the end of August, while KDDI has 24.8% and Softbank 19.1% (3G Now Almost Four Fifths Of Japans Subscriber Base FONT FaceGar ITU, 15 September 2008).

In 2001, operators in Europe, which had invested more than \$100 billion to buy 3G radio spectrum licenses and would need to invest another \$100 billion for the build-out of the 3G networks. By the end of the 2007, the third generation connection numbers in Europe grew to reach 81.5 million (European 3G Base Breaks 80 Million Mark ITU, 18 April 2008)

In the end of 2007, South Korean Telecom, the Korean telecommunication market leader, has 21.97 million customers and a market share of 50.5%. (SK Telecom - 3G Goes Through the Roof, ITU, 07 February 2008). South Korean Telecom has June and Nate as browser application for its subscribers. SK Telecom makes use of language and letter uniqueness. Their uniqueness becomes the material for their local content. But, so far, video call service is not much used by Koreans.

Taiwan's 3G services started its operation in 2003. Taiwan's Institute for Information Industry has issued a report on the telecoms market and says that 3G subscriptions reached 6.91 million at the end of 2007. The Institute anticipates that 3G subscriptions will top 10 million. Just over 55% of mobile internet access is carried out via a 3G handset, compared to 32% being carried out over a GPRS network (Taiwan's 3g Subscriptions to Reach 10 Million by Year End ITU, 21 April 2008).

The Mobile World report on Malaysia notes that the country ended 2007 with some 23.3 million subscribers, representing a population penetration level of 93%. Of the subscriber base, just under 1.6 million are using 3G services (U Mobile Launches 3G Services in Malaysia Cellular News, <http://www.cellular-news.com/story/30583.php> 17th April 2008).

Current 3G services in Indonesia

Three operators have been actively delivering 3G services in Indonesia since late 2006, namely Telkomsel, Indosat, and Excelcomindo. They offer many different kinds of services that are based on 3G network, as highlighted in Table 1:

Table 1: 3G Services Currently Offered in Indonesia

Telecom Operators	Telkomsel	Indosat	XL
3G Services	<ul style="list-style-type: none"> - Video Call - Mobile TV - Mobile video - Video conference, - Mobile movie, - Video SMS, and - Video surveillance 	<ul style="list-style-type: none"> - Video Call - Mobile TV - Video mail - Video streaming - High speed internet - Video Chat - Video Blog - Video Dating - Video Announcer 	<ul style="list-style-type: none"> - Video Call - Mobile TV - Download content from WAP

Current Status of Adoption and Potential Uses of 3G Mobile Network in Indonesia

The percentage of 3G subscriber to total mobile subscriber in Indonesia is still low. It is only 8.2%. And if it is compared to the percentage of 3G to total mobile subscriber in other countries, as shown in Table 2, 3G Subscribers in Each Country as a Percentage of Total Mobile Subscribers for that Country Respectively, Indonesia has still huge opportunity to catch up. In Japan 3G subscribers as percentage of mobile subscriber is 80%, in Taiwan is 28.5%, and South Korean is 14%.

Table 2 : 3G Subscribers in Each Country as a Percentage of Total Mobile Subscribers for that Country Respectively

Country	Time	Total Mobile Subscribers (million)	3G Subscriber (million)	3G Subscribers as Percentage of Mobile Subscriber
Japan	Middle 2008	104	83	80%
Taiwan	End 2007	24	7	28.5%.
South Korean	End 2007	44	6	14%
Europe	End 2007	728	82	11%.
Indonesia	Early 2008	91.5	7.5	8.2%

Source: International Telecommunication Union (ITU), 2008; Noor, 2007a; Noor, 2007b; Noor, 2008a; Noor, 2008b; Noor, 2008c

More over, if the total 3G subscribers (7.5 million) is compared to the number of entire population in Indonesia which is 238 millions people (<http://www.unapcict.org/member-countries/indonesia>), it shows that there is still huge potential market to be approached. As stated by Ruthledge & Sachet (2009), Indonesia is future giant which is characterized by large population and huge growth potential.

Considering the fact that Indonesia has huge potential market, it is important to increase the utility of the 3G mobile network. Operators should attract the right customers—the high-value customer and work towards improving adoption of services based on the 3G mobile network. More over 3G operators in Indonesia – Telkomsel, Indosat, and Excelcomindo-- had invested huge amount of money in 3G networks and services. They had built network and bought 3G radio spectrum licenses. To build 3G networks, Telkomsel, which has the biggest cellular phone market share in Indonesia, had spent about USD 300 million. Indosat had spent USD 200–300 million, while XL had spent about USD 50–100 million (Librero, et. al., 2008). In addition, towards 3G spectrum licenses, these 3G operators must pay around USD 123 million each year to the Indonesian government (starting from 2006) and the licensing fee is increasing by 20% each year (Noor, 2006).

Review of 3g Technology Adoption

MMS can become a demand driver and help to increase 3G mobile network usage if the customers find MMS offered meet their expectation and are of value to them. To meet the customers' expectation, it is important to know the key factors that influence the customers in adopting MMS. In an attempt to find the key adoption factors, reviewing and critically analyzing adoption models and 3G mobile network adoption is important.

TRA to UTAUT

There are a lot of researches which have been done on customers' adoption, especially adoption of technology. The adoption of technology is largely based on theory of behavior which is rooted in the field of social psychology. Social psychologists attempt to explain how and why attitude impacts behavior. Theory of Reasoned Action (TRA) is behavior theory which was firstly introduced by Fishbein (Fishbein & Ajzen, 1975). TRA became the first influential theoretical model of human behavior. It has been frequently used as theoretical foundation of subsequent prominent models, such as Theory of Planned Behavior and Technology Acceptance Model. The second theory is the Theory of Planned Behavior (TPB) by Ajzen (1985). Then the third, is Technology Acceptance Model (TAM) was developed well by Davis et al. (Davis et al., 1989). The next theories are Combined TAM and TPB (C-TAM-TPB) by Taylor and Todd in 1995 (Taylor & Todd, 1995), Diffusion of Innovation Theory by Roger in 1995 (Roger, 1995). Numbers of researches in this area are growing; theories are supported or rejected which reveal new theories. There is a theory that is developed through a review and consolidation of the constructs of models that earlier research had employed to explain Information System/technology usage behavior. The name of the theory is UTAUT (Unified Theory of Acceptance and Use of Technology) (Venkatesh et al., 2003). The UTAUT holds that three key constructs (performance expectancy, effort expectancy, and social influence) are direct determinants of behavioral intention, and one direct determinant of use behavior (facilitating conditions), as compared with the two direct/indirect determinants of behavioral intention (perceived usefulness and perceived ease of use) contained in the original TAM. Gender, age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behavior. Figure 1, shows us the UTAUT model from Venkatesh et al., (2003).

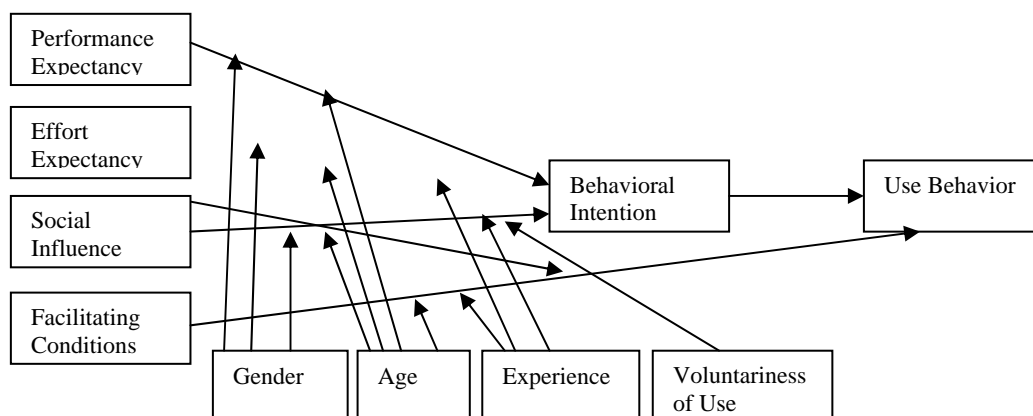


Figure 1: UTAUT Model (Source: Venkatesh et al. 2003)

The theory is developed by Venkatesh et al., (2003). They empirically validated the model with six longitudinal field studies of six different departments of six large firms in six different industries. UTAUT accounted for 70 percent of the variance (adjusted R²) in usage intention, better than any of the eight models alone. UTAUT is believed to be a definitive model that synthesizes what is known and provides a foundation to guide future research in this area.

UTAUT in 3G Mobile Network

Ventakesh et. al. did the research for individual acceptance of new information technologies in organizational context. This paper wants to investigate individual acceptance of service based on 3G technology, review on existing 3G technology and service is very important. The table 3 is the summary of studies related to 3G.

Table 3: Studies Related to 3G Network Adoption

Title	Year	Author(s)	Construct	Significant Results
Determinants of Adoption of Third Generation Mobile Multimedia Services	2004	Margherita Pagani	Perceived usefulness, ease of use, price, and speed of use	Perceived usefulness, ease of use, price, and speed of use are the most important determinants of adoption of multimedia mobile services. The importance of determinants differs by age groups or segments.
A Study on Consumer Adoption Toward 3G Service in Malaysia	2006	Naveena Govindasamy	Relative advantage, compatibility, complexity, trialability, observability, knowledge, persuasion, decision, implementation, confirmation	There are 2 factors perceived important by respondents: 3G service should be free of trial and pricing & packaging should be accommodative for the user to migrate to 3G service. The study indicates there are differences in term of age and gender in adopting 3G
An Investigation of Third Generation (3G) Mobile Technologies and Services	2006	Heikki Karjaluoto	Industry standards, Consumer acceptance, Pricing of services, Internet on mobile, E-mail services, Messaging services, Willingness to use 3G services	The main outcome of using 3G networks and services will be to get access to the same services with faster data connection speed, as long as the price of the network time is high in 3G, operators cannot wait fast diffusion of data centric mobile services. Another important factor affecting future of 3G is the availability of reasonably priced handsets.

Title	Year	Author(s)	Construct	Significant Results
The use of unified theory of acceptance and use of technology to confer the behavioral model of 3G mobile telecommunication users	2008	Yu-Lung Wu, Yu-Hui Tao, Pei-Chi Yang	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Gender, Age, Experience, Voluntariness of Use	Performance Expectancy has positive influence towards Behavioral Intention” and “Use behavior”. The practicability of system is still the major influential factor that influences the users to use technological service. “Facilitating Conditions” has positive influence towards “Behavioral Intention” and “Use behavior”. “Social Influence” of 3G mobile tele-communication services, has positive influence towards “Behavioral Intention” and “Use behavior”. “Behavioral Intention” of 3G mobile telecommunication services, has positive influence towards “Use behavior”.

From Table 3, it is known that UTAUT can be used to explain 3G mobile communication adoption. It is also known that UTAUT can be used with different respondents, different cultural setting, and different combinations of constructs. The study by Wu, et al (2008) used UTAUT. They modified the UTAUT from Ventakesh et. al. (2003) to make the model fit with their objectives of study. The major difference between Ventakesh et. al. model and Wu et. al. model lie in the temporary dimension and connotation of determinants by “external variables”. Ventakesh et.al. (2003) focused on the specific application software to train the same participant, it was required to carry out three tests in three periods of time before and after training, but Wu, Y (2008) just conducted one test because the study was designed to survey participants at different stages of the temporal dimension all at once. Wu, Tao, and Yang (2008) also added education as one of control variables group, because they though that education was conjectured to be relevant as the other control variables in mobile communication adoption. The figure 2 is the modified UTAUT model for 3G mobile communication from Wu et. al. (2008).

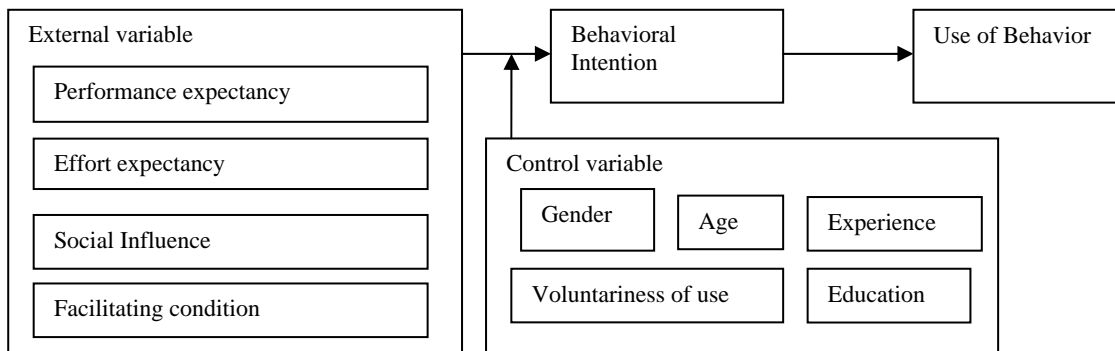


Figure 2: Modified UTAUT Model for 3G Mobile Communication (Source: Wu, Y, et al. 2008)

New 3G Adoption Model Suited for Indonesia

Factor for MMS Adoption in Indonesia

Indonesia has customers' characteristics and economic affordability that are vastly different from other countries. This is known after reviewing several literature and discussion with 3G business players in Indonesia. Darmawan (2006), an Indonesian expert in 3G, wrote that 3G is difficult to be implemented in Indonesia, due to price of device and price of service which are still quite high. If the price of devices reaches 1.5 million rupiah it will become the tipping point for 3G usage. The price of i-phone 3G handset sold by Telkomsel on 20 March 2009 is between Rp. 2.6 to 11 million. Darmawan opinions are supported by Riri Yulieta, Manager Service Department Telkomsel West Java Indonesia, who said that 3G penetration is influenced by gadget penetration.

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Riri Yulieta and Yudi Wisuda supported by Taufan Cahyono --one of sales executive from Indosat—and Achmad Salman—one of Telkomsel’s sales executive said that 3G penetration is influenced by network availability which is recently just available in big cities of Indonesia. They also said that the adoption factors are different from one user to others depends on individuals education, occupation, economic status, and hobby. People hobby can become driver in building MMS community which according to Atmonadi (2007) this community can become a generic factor in the success of 3G technology. People use MMS because they want to maintain communication with their community. Based on this preliminary information, it is understood that there are several adoption factors which are different from factors that have been discussed in the UTAUT Model both from Wu, Tao, and Yang (2008) and Ventakesh et. al. (2003).

The UTAUT model proposed by Wu, Tao, and Yang (2008) and Ventakesh et. al. (2003) did not include “price” and content/application factors as independent variables and did not involve hobby, and phone expenses as control variables, where as according to Indonesian 3G business players these factors play important roles in customer adoption of MMS in Indonesia. As it can be seen from UTAUT Model from Wu et.al. (Figure 2), there are four independent variables, namely Performance expectancy, Effort expectancy, Social Influence, and Facilitating condition.

“Price” based on importance rating (Pagani, 2004) ranked third after “usefulness” and “ease of use”. Based on the survey conducted in Malaysia by Malaysian Communication and Multimedia Commission (MCMC) the latest 2005 Hand Phone Users Survey in January 2005 it is known that many people have yet to adopt 3G. The findings from the survey collected from close to 5,000 mobile subscribers cited that the biggest attribute for them not to migrate are 3G mobile phone and service charge (Govindasamy, 2006). “Price” seems to be important determinant as it is also happen in i-mode DeCoMo Japan (Bohlin et. al. 2003). One of Orange 3G services key success factors is ability to offer adapted pricing to customers affordability (Achouche, 2008).

“Price” can become determinant factor in MMS adoption in Indonesia. Especially in Indonesia where the GDP per capita was still very low USD 3,700 in 2007 (www.unapcict.org/member-countries/indonesia) compare to Malaysia which was estimated to reach \$14,500 in 2007 (www.indexmundi.com/malaysia/gdp_per_capita_ppp.html), and Japan which was estimated to reach USD 35,300 in 2008 (www.cia.gov/library/publications/the-world-factbook/print/ja.html). Based on the description, this study adds “price” as independent variable which will influence the adoption of MMS in Indonesia. The “price” variable consists of two indicators, namely “price of devices” and “price of service”.

Content/application is another factor which is important in adoption. One of Orange 3G key success factors is deep and large content offering, through different formats.

There are more than 60 broadcast and thematic channels for live tv and 3000 videos, of which are 500 new specially made for mobile as video on demand service (Ahouche 2008). DoCoMo was success in running i-Mode business because DeCoMo able to motivate other companies to support the company in delivering good i-mode services (Bohlin et. al. 2003). The availability of content which are needed by customer is important for MMS adoption. The ability to choose the type content to be streamed in real time is a powerful development in mobile communications (Ravindran, 2009).

Besides adding new independent variables “price” and content/application to UTAUT, this study also adds new moderating variable, namely affordability of customers and hobby. The basic idea of adding moderating variable to the UTAUT model is to know whether there is significant difference in influence of the independent variable to dependent variable among certain group of people. This is important to know in order to make service really fit with certain group of customer. If there is significant different among difference group of people in adoption factors, the operators should make segmentation in delivering MMS to customer. As stated by (Ruthledge and Sachet, 2009) that when an operator is facing mobile number portability and cannot solely compete in price, they have started to use customer service to optimize their value proposition and move from discounting to segmentation and bundling. Funk in Kaasinen (2005) and Bohlin et. al. (2003) lists the lessons learned from mobile Internet, they stresses that targeting the right kind of customers is one of the real factors behind the success of i-mode in Japan.

In UTAUT Model by Wu et.al., there are five moderating variables, namely gender, age, experience, voluntariness of use, and education. Gender and age are considered still relevance to this study, but experience, voluntariness of use, and education are not included to become moderating variable. This study thinks that those variables are not too relevance to be moderating variable. Such as experience which means that the user experiences the innovation of the new system and begins to have voluntariness and freedom is not too relevance. MMS is not heavily deal with devices which is complicated, it actually deals with user friendly devices. Thus, we do not need to classify customer because of their experience of using the service. That is the obligation of company to give the experience to all customers. Voluntariness is "the extent to which potential adopters perceive the adoption decision to be non-mandatory. This is not relevance in this study since this study has setting in individual customer not in office setting which is using certain technology or service based on technology is a mandatory. All the customers have their freedom. Education is also considered not too relevance to be moderating variable, because people usually use service not because of their education, but it is more based on need or value which come from hobby. People hobby is considered to be more powerful in moderating the influence of independent

variable to dependent variable in MMS. Thus, hobby will become moderating variable to the adoption factors.

The amount of money that the customers earn is also becomes the controlling variable to the influence of adoption factors. In Indonesia the income gap between the citizens are very wide. There is a group of people who earn very high income and in another side there is a group of people who earn very low income. Facing this fact, it is possible for those groups to have different budget for telecommunication. These differences may possible to make difference in the influence of independent variable to dependent variable in MMS adoption.

The New Conceptual Model for MMS Adoption in Indonesia

We propose new conceptual model, a modified UTAUT model, shown in Figure 3 that integrates the influences of several adoption factors and takes into consideration Indonesian situation. We add one new factor namely price to the four factors in existing model, and two new control variables, namely hobby and affordability of customers to the two existing control variable.

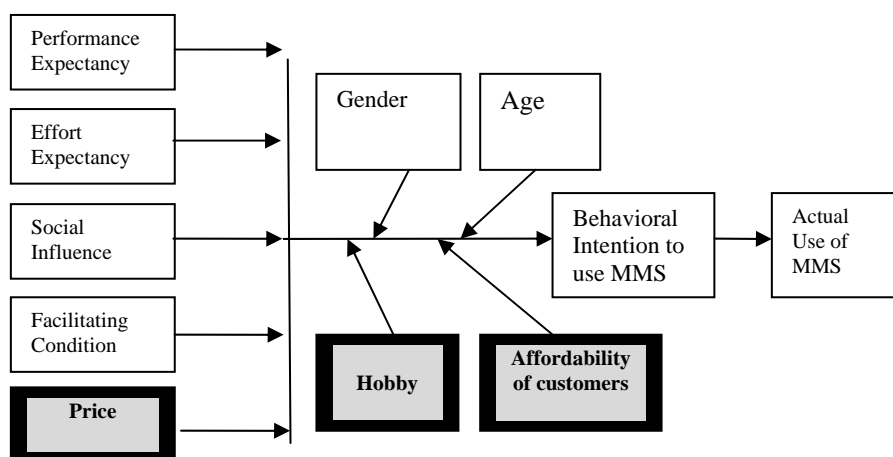


Figure 3: The New Conceptual Model for MMS Adoption in Indonesia

Conclusion

In this paper, we presented a new conceptual model for MMS adoption in Indonesia. It describes the possible factors that influence MMS adoption and the variable that mediate the adoption factors. This adoption models and the findings based on it will be useful to 3G operators in Indonesia in deciding on their strategic initiatives and marketing programs of MMS that better matches with customers' needs and expectations which in turn will increase the number of 3G subscribers, MMS adoption, and network traffic. This paper highlighted the work in progress, and further work will test and validate the model.

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