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# Perceived Usefulness as Key Stimulus to the Behavioral Intention to Use 3G Technology

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# Perceived Usefulness as Key Stimulus to the Behavioral Intention to Use 3G Technology

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A new technology usually faces the challenge to be accepted by consumers. Because of the unique features of new technology, it needs certain approaches to enhance its acceptance. Technology Acceptance Model (TAM) is widely used to study the behavior of organizations and consumers in accepting a new technology. A modified TAM model is applied in the current study to test the impact of advertising appeals of perceived usefulness, perceived ease of use, and social factors on behavioral intention to use 3G technology. Experimental method is utilized on four groups (30 people each) of undergraduate students of Atma Jaya Catholic Univesity. The result shows significant impact of the advertising multimedia exposed to the subjects, specifically perceived usefulness. It is concluded that perceived usefulness is the most salient reason among Atma Jaya Catholic University's students in consuming 3G technology.

**Keywords**: Technology acceptance model, consumer behavior, 3G technology, advertising appeal, intention to use

Teknologi baru biasanya menghadapi tantangan untuk dapat diterima oleh konsumen. Karena fitur-fitur unik dari suatu teknologi baru, maka ia membutuhkan pendekatan-pendekatan tertentu untuk mengembangkan penerimaannya. *Technology Acceptance Model* (TAM) digunakan secara luas untuk mempelajari perilaku organisasi dan konsumen dalam menerima suatu teknologi baru. Sebuah model TAM yang dimodifikasi diterapkan dalam penelitian ini untuk menguji pengaruh *appeals* iklan yang terdiri dari *perceived usefulness, perceived ease of use*, dan *social factors* terhadap *intention to use* pada teknologi 3G. Metode eksperimen digunakan pada 4 kelompok (masing-masing 30 orang) mahasiswa S1 Unika Atma Jaya. Hasilnya menunjukkan pengaruh yang signifikan dari iklan yang ditunjukkan pada subjek, khususnya *perceived usefulness*. Disimpulkan bahwa *perceived usefulness* adalah alasan yang paling menonjol diantara mahasiswa-mahasiswa Unika Atma Jaya dalam menggunakan teknologi 3G.

**Kata kunci:** *technology acceptance model*, perilaku konsumen, teknologi 3G, *appeals* iklan, intensi untuk menggunakan.

## Introduction

A massive consumption of high technology products has altered our culture and lifestyle substantially, by changing our patterns of work and leisure, transportation, family interactions and even changing our sleeping habits. Nowadays technology products are integrated with our daily lives. As a consequence, there is a growing appetite for consumption of high technology products (Wang, Dou & Zhou, 2008).

In contrast, it is challenging for a new technology to be accepted by society. When a new technology is introduced, consumers are basically being asked to change their behavior in some ways. From consumers' point of views, changing their behavior could become a risky experience. Therefore, adopting a new technology is not easy for consumers (Blackwell, Miniard, & Engel (2007). Based on this point of view, the issue of commercializing of a new technology is not only about the innovation in technology, but also about marketing strategies and understanding consumers. This study, therefore, uses multidisciplinary approaches

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(Information Technology, Marketing and Consumer Psychology) to look at the process of consumers' adopting a new technology. Using marketing literature, there are factors, such as competitive advantage, compatibility, and complexity of new technology, which determines the acceptance of new products for potential customers (Kotler and Armstrong, 2006). However, a new high technology product commercialization needs more than that. Understanding consumers' characteristics is as important as the product development and innovation (Rosen, Schroeder & Purinton, 1998).

The technology investigated in this study is 3G. The 3G wireless telecommunication technology is an improvement from 2G wireless telecommunication technology. It uses 1,900 MHz bandwidth to enable users to access data 8 to 10 times faster than the previous technology. Moreover, this technology enables some features; such as music download, internet access, video call, video streaming, and video conference, which bring huge market opportunities to the 3G providers.

Despite all the benefits served by 3G, Widia (2007) indicates some challenges faced by 3G providers in commercializing 3G technology. From the technical perspective, 3G providers have to deal with the issues of space limitation in installing relay towers, as well as dealing with government policies, and network planning. Even, more challenges have to be dealt with from the marketing aspect, such as in relation to increasing the ownership of mobile phone equipped with 3G facilities and how to increase the penetration of 3G applications. Ghozali (2007) noted that the ownership of 3G mobile phone per September 2006 is only 3.43% of the overall mobile-phone users.

There is a generic theoretical model used on the literatures related to technology adoption, called Technology Acceptance Model (TAM). The original model of TAM was based on the Theory of Reasoned Action (TRA) from Ajzen and Fishbein (1980) and the Theory of Planned Behavior from Ajzen (1991). Both theories explain factors predicting behavioral intention from psychological point of view, specifically on attitude. Based on those theories, TAM is developed for the context of introducing a new technology to the users or market, and coming up with two major factors, i.e. perceived usefulness and perceived ease of use. These two factors contribute to the level of consumer intention to use a new technology, which lead to actual behavior of the technology commercialization. Because the model incorporates psychological approach as well as marketing and information technology, therefore this study uses this model which fit with our multidisciplinary point of view.

Interestingly, even though TAM proposes that perceived usefulness and perceived ease of use have a major influence on the adoption of a technology, these factors seemed not being utilized on 3G advertisements in Indonesia. The marketing strategy here focuses more on social factors, such as social status and emotional influences, as well as peer pressure. The most used endorsers in TV advertisements in Indonesia are popular singers or movie stars who are less likely relevant to the product promoted (Puspitasari, 2009). As an illustration, many of the 3G TV advertisements use young people's idols, who acted using 3G to introduce the product to consumers without any explanations about what 3G is, how to use the technology and how useful 3G is for the targeted consumers. Clearly, there is a unique feature of Indonesian culture which is related to the frequent use of this style of advertisement. As a collectivistic society, social norms and values are dominant in influencing people behavior in Indonesia (Hofstede, 2001). Whether the features are related to the 3G commercialization, and thus adjust the TAM model for Indonesian society will be explored in this study.

Earlier version of this study has been presented at a conference in Atma Jaya University in 2009. Based on the discussion on this forum, improvement on data design and analyses were conducted, and the results are reported in this article.

This study employs the modified TAM model as a theoretical model to examine its fitness for 3G technology, in order to understand the process of consumers' adopting a new technology in Jakarta. A number of studies have used TAM model to investigate the adoption of a new technology in many countries (see Horton et. al., 2001; Hu et al., 1999; Jiang et. al., 2000). Thus far, there is no empirical research testing

TAM model in the adoption of 3G technology. The closest topic in this area is a theoretical study by Lu, Yu, Liu and Yao (2003) on wireless internet. The latest researches using TAM model are on the subjects of consumer e-commerce (Klopping & Mckinney, 2004), biometrics (James et. al., 2006), and voice recognition technology (Simon & Paper, 2007).

An important literature contribution of this study is that it seeks to examine TAM model's ability to reflect challenges and difficulties in adopting 3G technology by Indonesian consumers. While consumer education is an important aspect in adopting a new technology (Ferdiyanto, 2006), little attention has been given to this factor on the marketing strategy of 3G technology in Indonesia. In contrast, social factors have been dominating 3G advertisement themes or appeals. The fact that high technology product consumptions are much higher in Asia than any other regions in the world (Rakyat Merdeka, 2007), it is highly likely that there is a uniqueness on adopting a new technology process among Asian consumers, including Indonesia, which should provide an interesting subject to be studied.

Therefore, this study aims to examine the effect of advertising appeals, i.e.: perceived usefulness, perceived ease of use and social factors on consumers' behavioral intention to use 3G technology, specifically for students of Atma Jaya Catholic University of Indonesia, Jakarta.

## Literature Review

The first important step in educating the society on a new technology is to understand how they accept new technology. As stated before, information system literature proclaims a model known as Technology Acceptance Model (TAM). The TAM model is considered to be an appropriate model for this research because the 3G technology studied is a part of telecommunication technology which is closed to the field of information system. More precisely, beside of facilitating communication, telecommunication technology also supports many applications of information system. A similar effort has previously been taken by Lu et al. (2003), which attempted to build TAM model for wireless internet application.

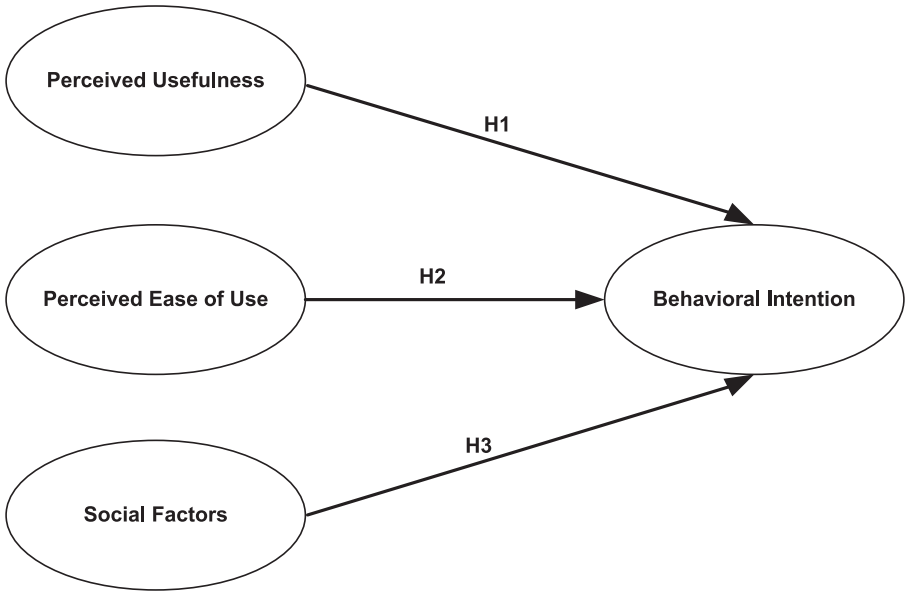
TAM model was developed based on the Theory of Reasoned Action (TRA) attributed by Ajzen and Fishbein (1980; Fishbein and Ajzen 1975). TRA, which is a very influential model in social psychology, assumes that the forming of behavioral intention – which determines the actual behavior – is influenced by attitude toward the behavior and subjective norms. Attitude toward the behavior refer to the belief that a behavior will bring about certain outcomes. For instance, using mobile phone can make someone to be in ease in communicating with others. Subjective norms describe individual belief in others' opinion or others' influences which drive a person to take a certain behavior.

The first TAM model developed (Davis, Bagozzi and Warshaw 1989) describes that perceived usefulness and perceived ease of use influence the forming of attitude. Further, attitude and perceived usefulness will influence behavioral intention – as determiner of actual behavior (Therefore, the TAM model developed by Davis removes the variable of subjective norms from TRA due to theoretical and measurement issues (Davis et al. 1989).

The simplification has made the TAM model became very general and limited in its ability to explain the people's opinions and behaviors toward a new information system or a new technology (Agarwal and Prasad 1998; Mathieson 1991). Moreover, this model is less useful in the context of the acceptance of technology in big society, where variables involved are more in numbers and in complexity.

In the further development, the TAM model was influenced by the theory of planned behavior (TPB) developed by Ajzen (1991). TPB is the extension of TRA. TPB added the variable of perceived behavioral control which influences both behavioral intention and actual behavior. Perceived behavioral control refers to variables which support the acceptance of an information system or new technology, such as the expertise and resources supporting the use of a new technology. The support to the TPB model can be found in the study by Mathieson (1991) and Taylor and Todd (1995).

TAM model has also been extensively modified or combined with other theories of models. For instance, Wang, Hsu and Fang (2005) have added the variables of technology utility and the




Source : Modified Technology Acceptance Model from Simon and Paper (2007, p.34)

Figure 1. Research Model

perceived number of users to the TAM model in their study of internet-based instant messaging services. Klopping and McKinney (2004) have added the variable of task-technology fit in their study of online shopping. Lastly, Wang and Wang (2010) have added the variables of perceived playfulness, perceived value, and self-efficacy in their study of mobile internet. All these studies on TAM model indicate that it is a robust basic model for the study of technology acceptance.

While applying a 'rather' basic model of TAM, we believe, in the context of consumer market (not organizational market), the role of subjective norms can not be ignored. Specifically, for a socially visible products/ technology (such as a smart phone or laptop), people may think that their usage will enhance their social status (Moore and Benbasat, 1991). Other source of social influence comes from network externalities created from the perceived number of users of a technology (Wang, Hsu and Fang, 2005). As the number of user increases, the technology will bring more benefits or values to group of users as a whole. As a technology can bring a high benefit for the users, a person will feel more obliged to follow the crowd. Furthermore, the study by Simon and Paper (2007) confirms that social factors have a significant influence in the TAM model. This study adopts the model as proposed by Simon and Paper (2007).

Perceived usefulness in TAM model refers to the awareness of the user on the productivity, performance, effectiveness (Davis 1989; Lu et al 2003) and benefit in using a new technology. The more a user thinks that a technology is useful, the more he/she wants to use the technology. On the other hand, Simon and Paper (2007) discover that the influence of perceived usefulness on actual use was not significant (on $\alpha$ = 5%). According to the result, they remove the direct relation between perceived usefulness and actual system use. Hence:

H1: Perceived usefulness will positively influence the behavioral intention in using 3G technology.

Perceived ease of use refers to the user understanding on the simplicity in understanding and using a system or technology (Davis et al 1989; Simon & Paper 2007). Perceived ease of use directly influences behavioral intention. The more the user is confidence that a system or technology is easy to understand and use, the higher is the behavioral intention. Therefore:

H2: Perceived ease of use will positively influence the behavioral intention in using 3G technology.

Social factors refer to the influence of one's perception on social pressure to conduct cer-

tain behavior (Simon & Paper 2007; Lu et.al. 2003). The more one thinks that there is a pressure from the environment to use a technology, the more she/he wants to use the technology. Therefore:

H3: Social factors will positively influence the behavioral intention in using 3G technology.

In this research, we did not test the direct impact from perceived usefulness to actual use as argued by Simon and Paper (2007) that the impact was not significant. We also did not test the impact from intention to actual due to numerous research in information systems behavior has used behavioral intention as a moderating variable to actual use (for example: James et al 2006, Lu et al 2003, Hu et al 1999, Taylor & Todd 1995). According to the listed hypotheses above, figure 1 presents the research model.

# Methods

### *Research Design*

The experiment design applied is one factor between subjects design. The factor consists of three treatment variables and one control variable, with pre and post observations. The treatments variables are perceived usefulness, perceived ease of use, and social factors. One neutral message of advertising appeal is used for the control variable.

### *Participants*

In this study, the selected participants were college students. The choice of using students in this study were related to the idea that most students are early adopter or non user of 3G technology when this research commenced. There were 120 students (males and females) selected randomly from the population of under graduate students of Atma Jaya University located in Semanggi campus, Jakarta based on their class schedule. Participants were recruited from the classes run at the same specific time slot in a specific day in the campus. The selection criteria involve several items, i.e. middle-up financial class and early 3G adopters or experienced non 3G users. The experiment procedure was introduced firstly and the participants were asked to fill-in the consent form before going further. potential participants were recruited (mostly by telephone) and we booked a time slot (about 20-30 minutes) to participate in the experiment.

### *Stimuli Development*

The multimedia treatments are developed by hiring a team of semi-professional video film maker who developed the scenarios based on certain criteria given by the researchers. The team shot the film using professional camera. Three ads were developed to become the stimuli representing the variables of perceived usefulness, perceived ease of use, or social factors, respectively. A multimedia material about Atma Jaya University's profile was used as the control stimulus. Each advertising multimedia lasted for about 30 seconds. In the development process, the early version of multimedia treatments were reviewed by students from three classes at Atma Jaya University – i.e. two undergraduate classes and one postgraduate class – and a few modifications were made based on the feedback from the students. This step was taken to enhance the validity of the stimulus. Two experts were also asked to evaluate the validity of the multimedia contents. They indicated that the content of multimedia is relevant with the advertising appeals intended.

### *Procedures*

The experiment process started with the generic questions to assess participants' intention of using 3G technology. Some questions on other technological products were added to disguise the object of the study (3G technology) prior to the exposure to the stimulus. According to the result, potential participants were recruited (mostly by telephone) and we booked a time slot (about 20-30 minutes) to participate in the experiment. As mentioned previously, the 120 recruited students were distributed randomly into one of the four scenarios (three treatment variables and one control variable), where each group has 30 participants.

Table 1a. Gender

| | |
|---|---|
| Male | 53 |
| Female | 67 |

Table 1b. Expenditure for leisure activities

| | |
|---|---|
| < 250 K | 62 |
| 250K - 500K | 51 |
| 501K - 1 Mio | 6 |
| > 1 Mio | 1 |

Table 1b. Expenditure for leisure activities

| | |
|---|---|
| SMS | 17.79% |
| Address Book (phone book) | 16.89% |
| Organizer (date book) | 15.10% |
| Multimedia (kamera, mp3, games, radio) | 14.05% |
| Blue tooth | 12.71% |
| GPRS | 10.01% |
| MMS | 6.88% |
| Email | 6.58% |

The participants were then randomly assigned to view one advertising multimedia for experimental groups, or the profile of Atma Jaya University as the control stimulus presented to a control group. They were required to fill in a pre-questionaire (see the list in appendix) to capture their profile and their first belief about the three variables. The experiment group, then, viewed the multimedia material three times before filling in the post-treatment questions (see the list in appendix). The post-treatment questions aim to see whether there is a change in respondents' intention to use 3G after watching the advertising multimedia.

In contrast, the control group received a different film. They filled in the pre-experiment questions as the experiment groups did and they watched a neutral advertisement that has no relation to 3G. As such, they are also required to fill in the post-experiment questions.

The intention to use 3G technology is tested using 3 items, which are intention to know more about 3G; intention to try 3G technology; and intention to use 3G technology. The items are measured using a 10-points semantic differential scale from "strongly not agree" to "strongly agree." The choice of 10 scales was a result of discussion with an expert in measurement scale behavior. From the discussion, it was revealed that the larger scale would give the participants more opportunity to express their opinion after watching the multimedia stimuli. The items for pre and post exposure to the ads are changed slightly (but still have the same meaning) in order to prevent the participants from referring to their previous answers while answering the after exposure questions.

# Result and Discussion

### Item Testing

Before proceeding with the data analyses, a series of data validity and reliability has been done. The data validity was tested using Pearson Correlation for pre-questions and post-questions (table 4a-5c). All result of the testing showed that the correlation is significant at 1% (two tailed). Hence, the question measurement is valid.

From the reliability testing, all the Cronbach's alpha scores are larger than 0.7. Some question items in the pre and post showed higher CA value if the item is deleted. In discussion, it is decided to keep the items since the model need to compare exactly 3 pre questions to 3 post questions. Also, the CA presents with high values in all items (larger than 0.7) so that the deletion was arguably not changing the reliability status signigicantly.

Table 2a. Test ease of use between control and experiment groups

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 42.993(a) | 3 | 14.331 | 1.187 | .323 |
| Intercept | .204 | 1 | .204 | .017 | .897 |
| Expenses | 25.647 | 1 | 25.647 | 2.125 | .151 |
| Knowledge | 2.183 | 1 | 2.183 | .181 | .672 |
| TVC Ease | 9.002 | 1 | 9.002 | .746 | .392 |
| Error | 675.991 | 56 | 12.071 | | |
| Total | 781.000 | 60 | | | |
| Corrected Total | 718.983 | 59 | | | |

a R Squared = .060 (Adjusted R Squared = .009)

Table 2b. Test social factors between control and experiment groups

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 27.975(a) | 3 | 9.325 | .860 | .467 |
| Intercept | 10.802 | 1 | 10.802 | .997 | .322 |
| Expense | 6.043 | 1 | 6.043 | .558 | .458 |
| Knowledge | 8.760 | 1 | 8.760 | .808 | .373 |
| TVC Social | 8.604 | 1 | 8.604 | .794 | .377 |
| Error | 607.008 | 56 | 10.839 | | |
| Total | 693.000 | 60 | | | |
| Corrected Total | 634.983 | 59 | | | |

a R Squared = .044 (Adjusted R Squared = -.007)

Table 2c. Test perceived usefulness between control and experiment groups

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 57.205(a) | 3 | 19.068 | 1.707 | .176 |
| Intercept | 26.139 | 1 | 26.139 | 2.341 | .132 |
| Expense | 1.190 | 1 | 1.190 | .107 | .745 |
| Knowledge | 9.017 | 1 | 9.017 | .807 | .373 |
| TVC Useful | 50.424 | 1 | 50.424 | 4.515 | .038 |
| Error | 625.378 | 56 | 11.167 | | |
| Total | 803.000 | 60 | | | |
| Corrected Total | 682.583 | 59 | | | |

a R Squared = .084 (Adjusted R Squared = .035)

**Descriptive Result**

The respondent characteristics are described in table 1a-1c.

Female respondents are larger than male respondents, with expenditure for leisure activities (inclunding communication expense) mainly between IDR. 250K to 500K. This data clearly portrays the characteristic of college students money spending habit. Further, table 1c reveals that the most frequent mobile features are dominated by "traditional features" such as SMS and phone book management. There is only a small percentage showing that some of the respondents have used "newly added features" such as email, GPRS, and MMS.

**ANCOVA result**

Next process was tabulating the answers from pre and post treatment. The differences between the pre and post answer in every participant in every group were calculated. Hence: Xj = Qpost – Qpre, where j is the groups (1 to 4). Then, the Xj was used in data analysis using Univariate Analysis of Variance Technique to identify whether there are significant differences between scenario groups and control group. Hence, we have three results representing each scenario against the control group as described and we analyzed the result independently.

In this analysis, two covariate variables were applied, i.e.: (1) the expenditure of the students for leisure; and (2) the knowledge of 3G technology. The expenditure of the students is scaled in four points of monetary amount of expenditure (<250k, 250k-500k, 500k-1m, >1m). The knowledge of 3G technology is also scaled in four points. However, because the selection of a highest point in the scale is considered to be unqualified, the data only shows variation on three points. Those two covariate variables are

entered into the ANOVA equation. Table 2a-2c displays the result.

The item to be detailed is TVC(*) which means the scenario being tested between pre and post test, comparing between scenario and control group. The results from table 2a – 2c reveal that only table 2c (perceived usefulness scenario) shows p-value (0.038) < 0.05 while ease and social variables show p-value 0.392 and 0.377. The significance of perceived usefulness means that there is significant difference of X value (X is subtraction between post minus pre behavior) between the group who had been exposed by stimuli of perceived usefulness and the group who had been exposed by control treatment. In contrast, the other experimental groups (ease of use and social factors) showed that the treatement and the control groups are indifferent in both scenarios.

According to the ANCOVA analysis, the result indicates that hypothesis 1 is supported, while hypothesis 2 and 3 are not. The findings suggest that only perceived usefulness is significant in influencing students' intention to consume 3G technology. Perceived ease of use and social factor did not influence their intention to use 3G technology.

## Conclusion

In general, this study provides evidence that an experiment approach is able to highlight the effect of advertising appeals, particularly perceived usefulness on consumers' intention to use 3G technology. Taken all variables together, the results suggest that the modified TAM respond significantly to perceived usefulness only in Indonesian young adults. The finding supported the previous survey findings in this study showing that perceived usefulness explained more variance on intention than other variables (perceived ease of use and social factors).

This study shows that perceived usefulness is still an important factor considered by consumers to adopt a new technology. Therefore, although TAM model was developed in Western society, its applicability in the Indonesian setting is partially confirmed, particularly for perceived usefulness. While initially it was argued that social factor is a salient factor in influencing Indonesian consumers, this study suggests that the role of social factors for Indonesian consumers might not be as substantial as predicted before. Otherwise, social factors might be still meaningful, but they do not have a direct influence on intention to use. They can be part of the external factors suggested by TAM model, which influence perceived usefulness and perceived ease of use. Or it might influence behavioral intention through some mediating variables. The possible options of social factor position to fit into the TAM model need to be further examined.

In terms of perceived ease of use, while TAM model put this variable as one among the main factors influencing consumers' intention to use, this is not the case in this study. Perceived ease of use stimuli did not significantly influence students' intention to use 3G technology. Respondents of university students chosen for this study are typically familiar with high technology products might make this factor need not be considered in consuming 3G technology. 3G is perceived as such a common technology which did not challenge their capabilities to understand and use. With different samples, however, different results are possible.

To conclude, in practical perspectives, the implication of this study is that consumer education, demonstrated by the significant contributions of perceived usefulness on behavioral intention, is important to ensure the effectiveness of the process of adopting a new technology. The slow process of 3G penetration, as well as the lack of optimization on using 3G features among mobile phone users, might be because of ignoring consumer education in the marketing campaign of 3G in Indonesia. There is a need to promote perceived usefulness in 3G marketing strategies. Also, while social factors are intensively used on 3G advertisements in Indonesia, it should be utilized in combination with other factors so that the marketing strategy will be more effective.

We suggest the 3G providers to focus on usefulness of using 3G in their marketing campaign not only for the purpose of introducing the new 3G features, but also for keeping customers' aware of the importance of the existing features. Through the finding, we argue that a stand alone commercial advertisement focus-

sing on ease of use or peer influence only is not a good option for getting 3G adoption by targetted consumers. A more comprehensive strategy needed with collaboration between the 3G operators and the handset producers (such as Blackberry, Nokia, Sonny Ericsson, etc) might create a far better result for 3G marketing effort.

Given that, further study on the issue should be interesting. Variables that contributes to the model can be developed in more creative way by putting the collaboration factors such as 3G features from specific mobile phone vendor as well as putting into a broader area of consumers. For instance, the next study can expand the scope of applicants from younger consumers to older customers rather than focussing on college students only. Finally, it would be better to test the model in population where price consideration to adopt the technology to individuals is not an issue.

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