

# The Technology Acceptance Model of Online Games in Indonesian Adolescents

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## Abstract

Online games have become a mainstream source of entertainment in the world, including Indonesia. The present study uses an adaptation of the Technology Acceptance Model (TAM) to help us understand how online game is accepted in Indonesia. The participants were school students (N = 1 498) from Year 7 to Year 12 recruited from several schools in Surabaya, East Java, Indonesia. A modified version of the original measures of the TAM was used to assess perceived ease of use and usefulness of online game. Confirmatory factor analysis was used to investigate the construct validity of each measure and path analysis with structural equation modeling was used to test the hypotheses. The results confirmed the relevance of previous established constructs, perceived ease of use, perceived usefulness, and intention in an online game setting in Indonesia, as well as the hypothesized relationships among these constructs according to TAM. Furthermore, the good model fit suggests that TAM is a valid and relevant research model to understand online game usage among Indonesian school students. Although further studies are necessary, the results support the notion that online games in the setting of Indonesian school students is just like any other technology in adult and business settings.

## Model Penerimaan Teknologi Game Online pada Remaja di Indonesia

### Abstrak

Game online telah menjadi sumber hiburan di dunia, termasuk di Indonesia. Studi ini menggunakan adaptasi dari Model Penerimaan Teknologi (*Technology Acceptance Model* atau TAM) untuk memahami bagaimana game online diterima di Indonesia. Partisipan adalah para siswa (N = 1498) kelas 7 - 12 yang direkrut dari beberapa sekolah di Surabaya, Jawa Timur, Indonesia. Versi modifikasi dari alat ukur asli dari Model Penerimaan Teknologi digunakan untuk mengukur persepsi mengenai kemudahan penggunaan dan kebermanfaatan dari game online. Analisis faktor konfirmatori digunakan untuk mengetahui validitas konstruk dari setiap alat ukur. Analisis jalur dengan pemodelan persamaan struktural digunakan untuk menguji hipotesis. Hasil penelitian mengkonfirmasi relevansi dari konstruk-konstruk yang telah dibuktikan penelitian sebelumnya, yaitu: persepsi mengenai kemudahan penggunaan, persepsi mengenai kebermanfaatan, dan intensi dalam konteks game online di Indonesia. Hasil penelitian juga mengkonfirmasi hubungan yang dihipotesiskan antar konstruk-konstruk ini, menurut Model Penerimaan Teknologi. Selain itu, kesesuaian yang baik dari model yang diuji menunjukkan bahwa Model Penerimaan Teknologi merupakan model penelitian yang valid dan relevan untuk memahami penggunaan game online pada para siswa Indonesia. Walaupun diperlukan studi lebih lanjut, hasil ini mendukung gagasan bahwa game online di kalangan para siswa Indonesia adalah seperti halnya penggunaan teknologi lain di kalangan dewasa dan bisnis.

*Keywords:* Information system, Online game, School students, Structural equation modeling, Technology acceptance model

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## 1. Introduction

Online games have been prevalent around the world as a source of entertainment. The number of hours children

and adolescents spend playing video games has increased steadily (Gentile, 2009). With greater accessibility of internet and affordability of computers, handheld devices, and video game consoles, this global

phenomenon of increased usage of online games is also observed in Indonesia.

The increasing popularity of online games in Indonesia can be seen from the number of events by game companies/publishers and warnet (internet cafes). One event to note was the Museum Rekor Dunia Indonesia (MURI; a local Indonesian version of the Guinness Book of World Records) event, which involved hundreds of participants with the purpose to exceed the “150 consecutive hours” record for playing video games – with most of the games being online (Fauzi, 2011). The online game players spent most of these hours with friends in internet cafes. Internet cafes as a place to play online games are common not only in more urban areas such as Jakarta (Kompas Tekno, 2010a), but also in rural areas such as Pesawaran (Kompas Tekno, 2010b).

While gaming has been recognized as a popular form of entertainment, online games have also been reported to cause potential problems. For instance, news reports on theft by children and adolescents because of lack of money to play in internet cafes are numerous (Winarno, 2013). There has been increasing concerns from the government regarding the potential issues caused by online games among children; to the point where the minister of health has expressed it publicly (Firdaus, 2011).

In general, there have been many documented issues associated with playing online games. These include addiction (Griffiths, 2007; Weinstein, 2010), aggression (Sherry, 2001), and physical injury (Griffiths, 2007). These problems have been recognized and factored into nationwide policies in some countries. South Korea, for example, has trained and deployed counselors to be placed in hospitals and treatment centers to handle individuals with internet addiction (Ju, 2007). Meanwhile, China has enacted laws discouraging more than 3 hours of play time for games per day (Xing, 2007). A diagnostic guideline for online gaming addiction was also founded in the United States, which was published in DSM-V (Block, 2008). At the same time, online games also provides a platform of opportunities for developing businesses – both in terms of the online gaming industry as well as the integration of e-business into online gaming (Sharp & Rowe, 2006). In addition, positive impacts on cognitive, motivation and social aspects of playing online games have been found (Granic, Lobel, & Engels, 2014).

One of the ways to understand online gaming in the Indonesian context is to investigate how intention and acceptance of online games shape behavior towards it. The present study utilizes an adaptation of the Technology Acceptance Model (TAM; Davis, 1989). The original TAM (Davis, 1989) is composed of three components, namely perceived ease of use, perceived usefulness, and usage. He defines perceived ease of use as the degree to which a person believes that using a

particular form of technology would be effortless. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance their productivity. Usage is defined as the use of a technology that is to be explained in a particular context. In short, the main purpose of TAM is to primarily describe the intentions behind the use of a certain technology and then predict the behavior involving the use of said technology. The scales for measuring the two variables on intention have been replicated and shown to be both valid and reliable (Adams, Nelson, & Todd, 1992).

While Davis (1989) validated his model in the investigation on behavioral response towards software packages, TAM itself is versatile noting the fact that it has been expanded, utilized, and validated in different types of technology. For example, TAM has been used to evaluate usage of systems (Gefen & Straub, 1997; Kloppping & McKinney, 2004). Studies have also looked at individual differences in accepting information technology using TAM (Agarwal & Karahanna, 2000; McCloskey, 2004). In this study, the argument that the applicability of TAM is supposedly universal and that cross-cultural issues can also be explored with the model (Taylor & Todd, 1995) is of particular interest. In addition, the extensions of TAM include adding relevant variables such as organizational support, user characteristics, and system characteristics (Igarria, Guimaraes, & Davis, 1995; Zhang & Prybutok, 2004). The adoption of e-commerce has also been modeled using TAM (see for instance McCloskey, 2004). Another example of TAM is the adoption of e-portfolio system (Shroff, Deneen, & Ng, 2011). They show that the e-portfolio system has a good chance to be perceived as useful if it is easy to use, and if the system is perceived as useful and easy to use, then people would have the intention to use it. This interrelationship of the variables in TAM – in which perceived ease of use is influenced by perceived usefulness, and both perceived ease of use and usefulness influence intention to use and usage – has also been shown recently in the context of smart in-store technology (Kim, Lee, Mun, & Johnson, 2017).

A study using modified TAM on perceived factors modifying online games users’ usage and customer loyalty found that perceived group cohesion (as a social factor), perceived enjoyment, and perceived ease of use significantly predict customer preference and loyalty (Hsu & Lu, 2007). Earlier, the same authors (Hsu & Lu, 2004) with an extended version of TAM found that the motivation for playing online games stemmed from social norms, attitude, and flow experience. However, online game use among Indonesian school students is a complex and relatively understudied phenomenon in information systems literature.

The present study aims to explain why Indonesian school students use online games with the TAM theoretical

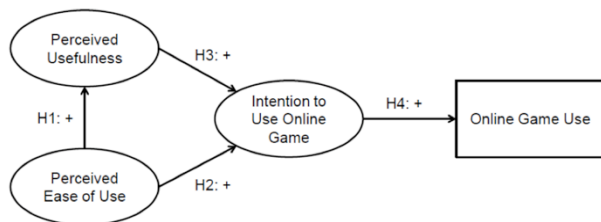
model. As shown in Figure 1, the model postulates that perceived ease of use and perceived usefulness influence the intention to use online games, which in turn would influence the use of online games. Based on this model, the hypotheses of the study are:

Hypothesis 1 (H1): There is a significant positive relationship between perceived ease of use and perceived usefulness.

Hypothesis 2 (H2): There is a significant positive relationship between perceived ease of use and intention to use online games.

Hypothesis 3 (H3): There is a significant positive relationship between perceived usefulness and intention to use online games.

Hypothesis 4 (H4): There is a significant positive relationship between intention to use online game and online game uses.



**Figure 1. Indonesian Technology Acceptance Model of Online Game Research Model**

## 2. Methods

The participants were school students (N = 1,498) from Year 7 to Year 12 recruited from several schools in Surabaya, East Java, Indonesia. In the Indonesian education system high school is divided into middle high school (Year 7 to Year 9) and senior high school (Year 10 to Year 12). Many if not most Indonesians do not leave school before graduating from Year 12 (high school certificate), and the government decided in 2015 to make 12 years schooling mandatory. We believe that our school student sample represents a reasonable population to study online game use in Indonesia because a large proportion of online game users in Indonesia is composed of school students.

To recruit the participants we visited both private and public schools. We obtained required research permission documents from local government institutions, and then we asked for permission and written consent from the principal of each school. We also asked for permission and consent from relevant classroom teachers. This was important because the survey was conducted during school time by taking one lesson time. Because the principals and classroom teachers acted as guardians and caretakers of the children in school, obtaining written informed consent from them can be considered to be equivalent to parents' informed consent. Importantly, the procedure of the study

was conducted in accordance to and approved by the Human Research Ethics Committee of Institute for Research and Academic Publications, Tarumanagara University, Indonesia.

Two research assistants in each classroom, which consisted of typically between 20 to 30 students, administered the paper-and-pencil survey. The survey itself took less than 30 minutes to complete, but the complete data-gathering session took approximately one hour due to an introduction session by the research assistants and a question and answer session after the completion of the survey.

A modified version of the original Davis' (1989) measures was used to assess perceived ease of use and usefulness of online game. To assess perceived ease of use, we used seven items designed to measure the level of effort required to play an online game. We used six items to measure perceived usefulness of online games and three items to measure the intention to use online game. To measure online game usage, we used one item in which we asked whether the participants played one or more online games within the last month. The items are shown in Table 1.

The items of the measures were originally constructed by the author to assure similarity and validity with respect to the original conception of the constructs by Davis (1989). Afterwards, the author consulted with an educational and clinical psychologist who worked with school students to make sure that the items were understandable to school students from Year 7 to Year 12. Lastly, the author consulted with online game players for relevance of the items in regard to current online game context. These steps were undertaken to assure the measures' validity, particularly construct validity and face validity.

Regarding the analyses, we first investigated the validity and reliability of the measures used in this study. Confirmatory Factor Analysis (CFA) was used to investigate the construct validity of each measure. Cronbach's alpha was used to investigate the reliability of each measure and a level above 0.70 was deemed satisfactory as the scales here were not used in a clinical setting (Bland & Altman, 1997). After establishing the validity and reliability of the measures, we began to test the hypotheses of the present study by using path analysis with structural equation modeling (SEM). CFA was estimated using maximum likelihood procedure with robust standard errors and Satorra-Bentler scaled statistic to correct for non-normal distribution. The path analysis was estimated with the weighted-least square procedure with robust standard errors and a mean- and variance adjusted test statistic because of the existence of a dichotomous variable (online game usage). The following fit indices along with the proposed cut-off criteria were used to assess the fit between hypothesized models and the

data: CFI>0.95, RMSEA<0.06, and SRMR<0.08 (Hu & Bentler, 1999). The chi square was reported but not used as a goodness-of-fit criterion because the chi square tends to reject models that are based on large sample size (Bentler & Bonett, 1980). CFA and path analysis were calculated in lavaan ver. 0.5-17 (Rosseel, 2012) in R version 3.2.1. All reported path coefficients or factor

loadings are completely standardized, unless stated otherwise. The  $R^2$  explained variance statistic is reported and would be interpreted according to the guideline by Cohen (1988): small,  $R^2 < 0.01$ ; medium,  $R^2 < 0.09$ ; large,  $R^2 < 0.25$ .

**Table 1. Measurement**

No.	Scale or item
<b>Perceived ease of use</b>	
1	Saya mudah mempelajari cara bermain suatu <i>online game</i> . I find it easy to learn how to play an online game.
2	Saya mudah untuk menjadi terampil dalam bermain <i>online game</i> . I find it easy to be good at playing an online game.
3	Saya mudah melakukan sesuatu yang saya ingin lakukan dalam bermain <i>online game</i> . I find it easy to do what I want to do in online game.
4	Saya mudah untuk bermain <i>online game</i> . I find it easy to play online game.
5	Interaksi dalam <i>online game</i> jelas dan mudah dimengerti. Interactions in online game is clear and easy to understand.
6	<i>Online game</i> fleksibel untuk dimainkan. Online game is flexible with which to play.
7	Mudah bagi saya untuk mengingat bagaimana langkah-langkah dalam bermain <i>online game</i> . I find it easy to remember the steps on how to play an online game.
<b>Perceived usefulness</b>	
1	Bermain <i>online game</i> dapat membantu saya saat mengalami stres atau masalah. Playing an online game can help me when I feel stressed or have problems.
2	Bermain <i>online game</i> adalah salah satu cara saya untuk mendapatkan teman baru. Playing an online game is one way of getting new friends for me.
3	Bermain <i>online game</i> dapat meningkatkan kemampuan saya, misalnya kemampuan berbahasa Inggris. Playing an online game may improve my skills, for example my English language skills.
4	Bermain <i>online game</i> dapat menghasilkan uang bagi saya, misalnya dengan cara menjual avatar. Playing an online game can be a source of income for me, for example by selling avatars.
5	Bermain <i>online game</i> dapat meningkatkan daya imajinasi saya. Playing an online game can improve my imagination skills.
6	Melalui <i>online game</i> , saya dapat berkomunikasi lebih mudah dengan teman saya. By playing an online game I find it easier to communicate with my friends.
<b>Behavioral intention</b>	
1	Saya akan sering bermain <i>online game</i> di waktu yang akan datang. I will play online game often.
2	Saya berniat untuk bermain <i>online game</i> . I am planning to play an online game.
3	Saya berharap permainan <i>online game</i> saya berlanjut di waktu yang akan datang. I wish that my online game play habit continues in the future.
<b>Online game use</b>	
1	Apakah Anda bermain game online dalam satu bulan terakhir: Ya/Tidak Did you play an online game in the last month? Yes / No

### 3. Results

The participants (N = 1,429) were composed of 54% (n = 806) junior high school students and 46% (n = 686) senior high school students. The gender composition was relatively balanced with 42.2% male (n = 629). The average age of the participants was 14.73 years old (SD = 1.93) and the range was from 11 to 20 years old. Thirty-four percent (n = 508) of the participants reported to be current online game players (i.e. played an online game at least once in the last month). The average sum score of the perceived ease of use measure was 27.16 (SD = 11.34) and the score range in the sample was from 11 to 20. The average sum score of the perceived usefulness measure was 21.63 (SD = 8.87) and the score range in the sample was from 6 to 42. The average sum score of the intention to use online game measure was 7.52 (SD = 4.60) and the score range in the sample was from 3 to 21.

The validity and reliability of the perceived ease of use, perceived usefulness and intention to use online game measures were acceptable. The reliability of the perceived ease of use scale was high, meeting above the cut-off score for satisfactory reliability ( $\alpha = 0.95$ ). The construct validity of the perceived ease of use scale was acceptable, indicated by meeting two out of three fit indices (Satorra-Bentler  $\chi^2 = 307.652$  (14, 1,492),  $p < .001$ ; CFI = .967; RMSEA = .121 [90% CI = .112, .130]; SRMR = .030). The reliability of the perceived usefulness scale was high, again meeting above the cut-off score for satisfactory reliability ( $\alpha = 0.86$ ). The

construct validity of the scale was acceptable indicated by meeting two out of three fit indices (Satorra-Bentler  $\chi^2 = 94.291$  (9, 1,492),  $p < .001$ ; CFI = .976; RMSEA = .081 [90% CI = .070, .093]; SRMR = .028). The reliability of the intention to use scale was high, which also met the cut-off score for satisfactory reliability ( $\alpha = 0.92$ ). The construct validity of the intention to use online game scale was acceptable indicated by meeting all fit indices (Satorra-Bentler  $\chi^2 = 0.001$  (3, 1,492),  $p < .001$ ; CFI = 1.00; RMSEA = .000 [90% CI = .000, .000]; SRMR = .000). All item factor loadings significantly load into its respective latent factor (see Table 1).

The research model, i.e. technology acceptance model, had good fit to the data, which is indicated by meeting two out of three fit indices (Satorra-Bentler  $\chi^2 = 762.969$  (116, 1,492),  $p < .001$ ; CFI = .937; RMSEA = .063 [90% CI = .059, .067]; SRMR = .036). All hypothesized paths were confirmed with statistical significance ( $p < .001$ ), see Figure 2 for detailed path coefficients and factor loadings. Perceived ease of use was significantly associated with perceived usefulness ( $\beta = .80$ ,  $p < .001$ ) and explained a large variance ( $R^2 = .63$ ). Both perceived ease of use ( $\beta = .38$ ,  $p < .001$ ) and perceived usefulness ( $\beta = .39$ ,  $p < .001$ ) were significantly associated with intention to use online game and together explained a large variance ( $R^2 = .53$ ). The intention to use online games was significantly associated with perceived usefulness ( $\beta = .61$ ,  $p < .001$ ) and explained a large variance ( $R^2 = .38$ ).

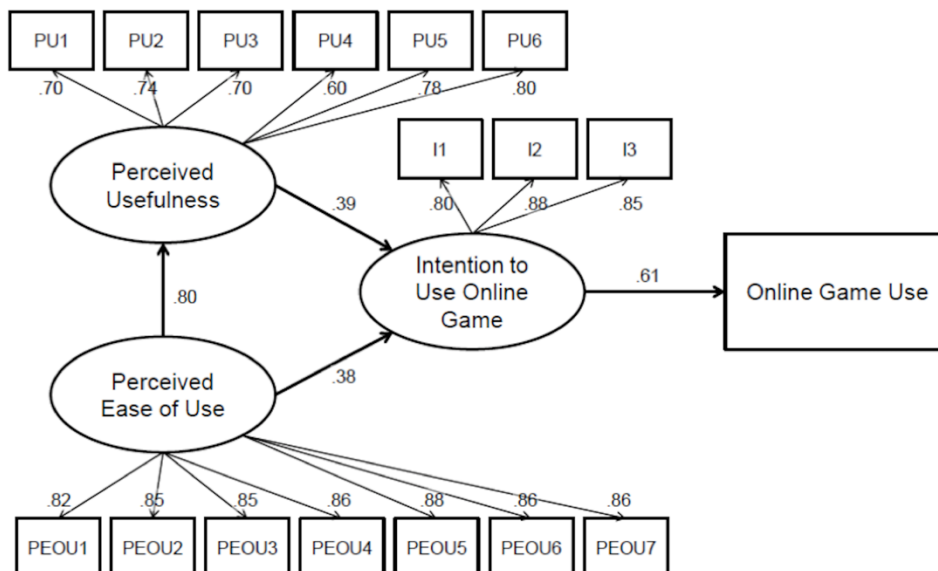


Figure 2. Path analysis of the Technological Acceptance Model.

Notes. Ellipses represent latent variables. Rectangles represent observed variables. PU = Perceived Usefulness. PEOU = Perceived Ease of Use. I = Intention to Use Online Game. Numbers in the labels of the rectangles indicate item number, for example PEOU1 is item 1 of the PEOU scale. The path coefficients and factor loadings are completely standardized and all are statistically significant ( $p < 0.001$ ). Residuals are not shown.

#### 4. Discussion

The results of the present study confirmed the relevance of previous established constructs, perceived ease of use, perceived usefulness, and intention, in an online game setting. The results also confirmed the hypothesized relationships among these construct according to TAM. Furthermore, the good model fit suggests that TAM is a valid and relevant research model to understand online game usage among Indonesian school students.

Considering that TAM is a theoretical model originally validated in an entirely different context to our study, the results are surprising. TAM was originally validated on a sample of adult white collar workers in the United States in a context of computer usage (Davis, 1989). The present study showed that TAM was also valid in an entirely different context, i.e. Indonesian school students in the context of online game use. Although TAM has been validated in various technology contexts (e.g. e-commerce, Wu & Wang, 2005) and countries (e.g. Taiwan, Hsu & Lu, 2004), studies with samples recruited from WEIRD (white, educated, industrialized, rich, democratic) countries have been shown to often fail to generalize outside such countries (Henrich, Heine, & Norenzayan, 2010). TAM seems to be an exception to the rule.

Despite the general impression that TAM seems to be generalizable in many contexts, a closer look may reveal fine differences. A meta-analysis of 136 studies about TAM showed that the shared variance ( $R^2$ ) of the three constructs in TAM ranges from 0.27 to 0.45 (K. Wu, Zhao, Zhu, Tan, & Zheng, 2011). This is qualitatively smaller than the results found in this study in which the shared variance of the three constructs ranges from 0.38 to 0.63. One of the most striking differences is on the influence of perceived ease of use to perceived usefulness of which the shared variance in this study can be considered large at 0.63 and in the meta-analysis, a degree smaller at 0.37 (K. Wu et al., 2011). Speculatively, this means that in school students the perceived usefulness of online game is very much dependent on its perceived ease of use. The importance of perceived ease of use is vital for the popularity of online game in school students, but maybe not as important in other setting such as among office workers.

Future studies on online game usage among school students in Indonesia may use the results presented in this study as a stepping-stone. Other variables such as those advocated in newer TAM model such as TAM3 (Venkatesh & Bala, 2008) can be investigated to improve our understanding of online game usage among school students in Indonesia. In addition, future studies should theorize the variables in TAM that play the role as mediators and compute the indirect effect. Another line of research would be to build on this validated TAM

model to explain some of the issues regarding online game use, such as online game addiction (Jap, Tiatri, Jaya, & Suteja, 2013). Additionally, the extent of the generalizability of this finding is not known. Indonesia is a large island country with very different cultures and religions in the different islands. Future studies may investigate whether there are cross-cultural differences regarding the strength of perceived ease of use and perceived usefulness in explaining the intention to use online games, which is currently pursued by my research group. Another potentially fruitful line of research would be to investigate gender differences and rural-urban differences in online game usage and acceptance.

#### 5. Conclusion

One important implication would be that online gaming in an Indonesian school student setting is like any other form of technology in an adult and business setting. Consequently, any strategy that has worked in increasing or reducing the acceptance of technology in adult and business setting may also be effective in the context of online games and Indonesian school students.

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