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Materials Science and
Engineering

PAPER • **OPEN ACCESS**

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To cite this article: I Mulyawan and W Rafdinal 2021 *IOP Conf. Ser.: Mater. Sci. Eng.* **1098** 032022

Mobile games adoption: An extension of technology acceptance model and theory of reasoned action

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Abstract. This study aims to analyze the effect of game features and trust on the intention to play mobile games based on the technology acceptance model and theory of reasoned action. 408 respondents were engaged in this study to obtain the data which were then analyzed using PLS-SEM. The results show that game features, attitude, and subjective norms are the significant determinants of intention to play mobile games. Attitude toward playing online games is influenced by game features, perceived usefulness, and trust. Perceived ease of use does not have a significant effect on attitude. This study bridges the gap in the mobile game adoption literature by explaining how the relationship between game features and trust. This will drive the intention to play mobile games based on the technology acceptance model and theory of reasoned action to obtain a more comprehensive explanation of mobile game adoption.

1. Introduction

The mobile game is a technology application that continues to grow and has become a significant trend in modern society. In the mobile game market, 21.8 billion game applications were downloaded from the Apple Store and Google Play in Q1 2017-2018, up 15.3% from the same quarter a year earlier [1]. In the mobile game market, the number of online mobile game users is 42% of the gaming market of which the share in 2020 is expected to represent more than half of the total gaming market. With the Asia Pacific becoming the largest market, all of Asia (excluding China, Japan, and Korea) are the fastest-growing regions in the coming years with total game revenue increasing to $ 10.5 billion by 2020 [2]. Therefore, the future in this sector is very optimistic and this market growth will continue to increase in the coming years. As a result, game developers are continually looking for ways to improve game features and build gamers' behavior to play the game.

To understand mobile game adoption, a useful starting point is to describe some broad parameters that determine game features. Over time, game developers have learned to utilize the involvement of games' quality by using various game features [3]. Several previous studies have analyzed the importance of game features and trust to the game developer in online games [4–6]. However, no previous studies have analyzed the effect of the game features on trust to the game developer in influencing mobile game adoption. In this study, trust to the game developer is considered as the drive force of mobile game user behavior because well-known game developers in the game industry and game features attract the users. Trust is a factor that influences individual attitudes and preferences toward the use of technology in mobile games [7]. Therefore, game features and trust to the game developer are inseparable factors in mobile game adoption.

Several previous studies used the technology acceptance model (TAM) to analyze mobile game adoption [8,9]. In analyzing mobile game adoption, this study integrated and modified TAM [10] and the theory of reasoned action (TRA) [11]. Based on TAM theory, perceived usefulness and perceived ease of use are important factors in technology absorption. These factors can affect the attitude that will affect playing intention [12]. In TRA, attitude and subjective norm are important tendencies in influencing intention in playing games [13]. These theories are modeling decision making in terms of behavioral intention to use certain technologies. Previous research has not yet integrated TAM and TRA with game features and trust to the game developer which are important factors in the context of mobile game adoption. Thus, we believe that this is the right model to analyze mobile game adoption.

The scope of this research is limited to the intention to play mobile games in Indonesia. Indonesia was chosen because the number of game players is expected to continue increasing every year [14] with a total of 9,756,690 people playing online games [15]. Therefore, this study aims to gain a clear understanding of the relationship between game features and trust to the game developer that will drive the decision and behavior to play mobile games based on TAM and TRA.

2. Methods

This study examines the construct validity and reliability by applying the variance-based Structural Equation Modeling (SEM-PLS). SEM-PLS is recognized to estimate path coefficients in structural models [16]. We distributed questionnaires through an online survey to the gamer community. The questionnaire consisted of two parts. The first part contains the characteristics of 408 respondents. The second part is the main component of the questionnaire, which contains statements related to research variables. To improve data quality, we filtered responses that met the following criteria: (1) Eliminating the responses of respondents who did not play a mobile game in the past week and (2) Eliminating non-serious responses through data filtering on two verification questions.

Intention to play mobile games is measured by four items [17]. All items are measured on a 5-point Likert scale, ranging from extremely unlikely (1) to extremely likely (5). Attitude is measured on four semantic differential items [13] using a 5-point Likert scale, using the strongly disagree (1) to strongly agree (5). For subjective norm [13] with 3 item statements, the scale uses the scale of strongly disagree (1) to strongly agree (5). Three items of statements regarding perceived usefulness and two items of statements about perceived ease of use [18] employ the scale of strongly disagree (1) to strongly agree (5). In addition, the game features consist of 6 indicators [3] using a scale of not very important (1) to very important (5). For trust in the game developer is measured by three items statement [19] using the scale of strongly disagree (1) to strongly agree (5). The measurement variables were adopted from the literature, as shown in Table 1.

Table 1. Respondent demographic.

Variable	Description	n	%	Variable	Description	n	%
Gender	Male	308	75	The most often played game	PUBG	92	23
	Female	100	25		Age of empires	27	7
Income	< IDR 3,000,000	198	49		Mobile legend	86	21
	IDR 3,000,000 – IDR 5,000,000	136	33		Marvel future fight	52	13
	> IDR 5,000,000	74	18		Call of Duty	19	5
Frequency of playing	1 hour a day	141	35		Clash of Clans	14	3
	2 hours a day	133	33		Hago	12	3
	3 hours a day	72	18		Other	106	26
	4 hours a day	27	7	Experience	< 2 years	43	11
	5 hours or more	35	9		2 – 5 years	142	35
					> 5 years	223	55

3. Results

3.1. Measurement model

In evaluating the measurement model, it is necessary to estimate the accuracy of the measurement instrument in providing errors-free numbers and how far the scale reflects an actual gap between measured object and feature (convergent and discriminant validity) [16]. As shown in Table 2, all loading factors are significantly higher than 0.7. All composite reliability (CR) also meets the recommended level of 0.7. All average variance extracted (AVE) exceeds the recommended level of 0.5 [16]. Thus, convergent validity is accepted. Moreover, Table 3 shows that the diagonal square root of AVE of each construct is higher than the value of other construct correlations. Thus, discriminant validity is accepted [16]. Overall, the measurement models have met the criteria.

Table 2. Measurement items.

Constructs	Item	Loading	α	CR	AVE
Perceived ease of use	It is easy for me to play mobile games	0,847	0.700	0.833	0.714
	It is easy for me to master the rules of the games.	0,843			
Perceived usefulness	Playing mobile games makes my life different.	0,833	0.834	0.901	0.752
	Playing mobile games makes my life better.	0,828			
	Playing mobile games is useful to me.	0,936			
Game features	Chat room	0,849	0.912	0.932	0.696
	Stream quality	0,769			
	Commentary features	0,830			
	Player characteristics	0,759			
	Event attractiveness	0,879			
	Stream traits	0,908			
Trust to the game Developer	The game developer is trustworthy	0,798	0.806	0.886	0.721
	I believe in the information that the game developer provides	0,874			
	The game developer does what it says	0,874			
Attitude	Playing mobile games is good	0,740	0.773	0.854	0.595
	Playing mobile games is valuable	0,786			
	Playing mobile games is pleasant	0,751			
	Playing mobile games is Interesting	0,806			
Subjective norm	I want to play mobile games because I want to belong to the group	0,805			
	Playing mobile games reflects my personality toward other people	0,826			
	I want to play mobile games because people who are important to	0,811			
Intention to play online games	I intend to play mobile games in the future	0,778	0.834	0.889	0.668
	I intend to continue playing mobile games	0,810			
	I believe I will play mobile games in the future	0,869			
	The mobile game that I play right now is my first choice	0,808			

Table 3. Fornell-Larcker criteria (Discriminant validity).

	1	2	3	4	5	6	7
1. Perceived ease of use	**0.845**						
2. Perceived usefulness	0.286	**0.867**					
3. Game features	0.302	0.256	**0.834**				
4. Trust to the game Developer	0.385	0.414	0.569	**0.849**			
5. Attitude	0.242	0.392	0.632	0.556	**0.771**		
6. Subjective norm	0.403	0.412	0.576	0.793	0.672	**0.814**	
7. Intention to play online games	0.334	0.317	0.674	0.815	0.674	0.806	**0.817**

3.2. Structural model

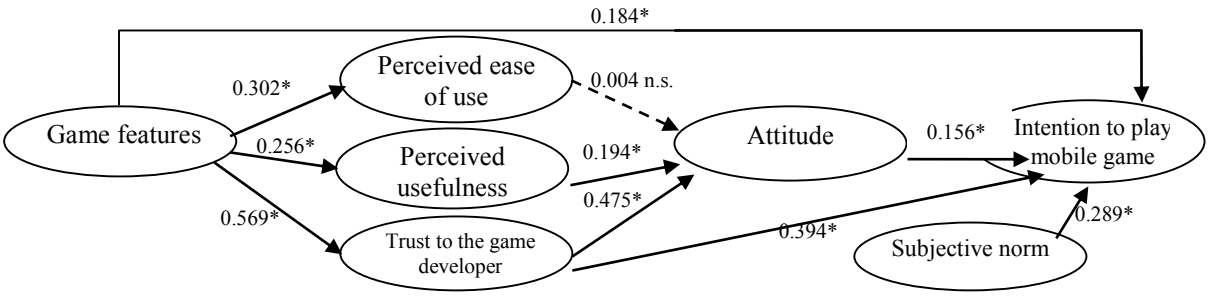
The next step is analyzing the structural model. Preceding the analysis is firstly analyzing R^2, F^2, and Q^2. In terms of R^2, perceived ease of use, perceived usefulness, and trust to the game developer can explain attitude at the moderate level (0.336); game features, attitude, and subjective norm can

illuminate intention to play mobile games at substantial level (0.782) [16]. Additionally, the significance of exogenous variables on attitude and intention to play mobile games is showed by f^2. The variable with a small effect (<0.02) toward attitude is perceived ease of use (0.000). Meanwhile, the variables with large effect (>0.35) on attitude are perceived usefulness (0.046) and trust to the game developer (0.257). The variables with large effect (>0.35) toward intention to play mobile games are game features (0.083), attitude (0.056), subjective norms (0.123), and trust to the game developer (0.253) [16]. In terms of Q^2, all dependent variables have a value greater than 0 which means the model has predictive power [16].

Moreover, the results of hypothesis testing shows that perceived ease of use does not affect attitude (β = 0.004), but perceived usefulness has a significant influence on attitude (β = 194). Intention to play mobile games is affected by Attitude (β = 0156), subjective norm (β = 0289), Trust to the game developer (β = 0394) and game features (β = 0184). Next, trust to the game developer has a significant influence on attitude (β = 0475). Game features significantly influences the perceived ease of use (β = 0302), perceived usefulness (β = 0256), and trust to the game developer (β = 0569). Therefore, all hypotheses are accepted except perceived ease of use on attitude. The highest effect is the game features on trust to the game developer.

Table 4. Hypothesis testing result.

Variable	β	t value	P values	Result
Perceived ease of use → Attitude	0,004	0,088	0.930	Rejected
Perceived usefulness → Attitude	0,194	4,015	0.000	Accepted
Attitude → Intention to play online games	0,156	4.212	0.000	Accepted
Subjective norm → Intention to play online games	0,289	5.509	0.000	Accepted
Trust to the game Developer → Attitude	0,475	8.075	0.000	Accepted
Trust to the game Developer → Intention to play online games	0,394	7.049	0.000	Accepted
Game features → Perceived ease of use	0,302	6,284	0.000	Accepted
Game features → Perceived usefulness	0,256	6,073	0.000	Accepted
Game features → Trust to the game Developer	0,569	11,541	0.000	Accepted
Game features → Intention to play online games	0,184	4,743	0.000	Accepted



Note. Significance *0.01; n.s. non-significant.

Figure 1. Model results.

4. Discussion

The results revealed that game features play an important role in the intention to play mobile games, which is also confirmed with the findings of some studies about the intention to play a game [17-20]. The mobile game application has several features, such as chat rooms, stream quality, commentary features, player characteristics, event attractiveness, and stream traits. These features give gamers a flexible way to play mobile games. The gamer can suspend the game for a while anytime and anywhere, and then restart later as desired. This flexible way allows gamers to comfortably play mobile games and provides a seamless experience when gamers switch between playing games and daily activities. It is what can affect the attitude and intention of playing mobile games.

The study proves that an intention to play mobile games is affected by several factors of the TRA variable; attitude and subjective norm. Attitude and subjective norm related to intention to play mobile games. This finding is in line with several existing empirical studies [2,13,18]. Gamers who consider playing mobile games as good, valuable, pleasant, and interesting usually have a positive attitude toward the intention of playing mobile games. The support of social factors (subjective norm) affects individual cognitive to play mobile games. Interaction between gamers and friends who also play mobile games can affect the intention to play a mobile game.

The direct effects of both perceived usefulness and perceived ease of use on attitude were observed in the TAM. Attitudes toward playing mobile games need to be a concern because every gamer has a different attitude for each different game. Many factors can influence attitude depending on the background of the gamer, the type of game played, the game console, experience in playing games, and other factors. When using technology is fun and pleasurable, gamers will be intrinsically motivated to adopt it [21]. A gamer's feelings in playing games such as feeling their lives become different, get better, and feel the benefits of playing games will tend to have a positive attitude to continue playing a game. These results provide evidence that the usefulness in playing games has a significant effect on attitude.

Perceived ease of use has no significant effect on attitude toward playing mobile games. This result is in line with the previous study [22]. A possible guess is that experienced gamers are familiar with the operation and interaction modes of mobile games, so it is not difficult for them to play mobile games. Therefore, every genre of game has different game characteristics, different difficulty levels, and different game features that are adapted to gamers. This fact causes "perceived ease of use" insignificantly contribute to the attitude in playing mobile games.

Trust to the game developer has a significant effect on attitude and intention to play mobile games. This finding is also in line with previous studies [4,23]. Trust to the game developers can be created from these well-known game developer brands. Game developers who have much experience by making various types of game genres become the attention of gamers to play the game. Game developers who are commonly known to have high-quality features will always be considered to produce quality games by many gamers. If a game developer makes a low-quality game, it will reduce the confidence of gamers. This fact will be effecting the attitude while playing mobile games.

5. Conclusion

The integrated model in this research successfully predicts mobile game adoption. The implementation of the TAM and TRA models has helped in exploring the game features factors that have an impact on the intention to play mobile games. Besides, trust to the game developers also affects the intention to play mobile games. This finding shows that the integrated model of TAM, TRA, game features, and trust to a game developer help predict gamers' intention to play mobile games. Therefore, future research can adapt our research model to investigate specific mobile game applications.

The findings of this study provide several important implications for practitioners of mobile game applications. This research revealed that game features are an important factor in game adoption. It is recommended that game developers need to pay more attention to the design of operations and user interfaces related to game features. It is required to make gamer interaction easier, smoother, and more efficient to improve the gamer's perception of the fun and convenience of playing mobile games. Other than that, game developers need to increase the trust of gamers. Game developers who have much experience with making various types of game genres can also affect the trust of gamers to play the game.

Acknowledgments

This research is partially supported by Politeknik Negeri Bandung.

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