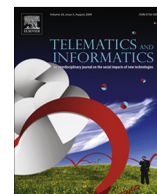




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## Extending the theory of planned behavior (TPB) to explain online game playing among Malaysian undergraduate students

Ahmed Ibrahim Alzahrani<sup>a</sup>, Imran Mahmud<sup>b</sup>, T. Ramayah<sup>c,d,\*</sup>, Osama Alfarraj<sup>a</sup>, Nasser Alalwan<sup>a</sup>

<sup>a</sup> Department of Computer Science, Community College, King Saud University, Riyadh, Saudi Arabia

<sup>b</sup> Department of Software Engineering, Daffodil International University, Dhaka, Bangladesh

<sup>c</sup> School of Management, Universiti Sains Malaysia, Minden, 11800 Penang, Malaysia

<sup>d</sup> UTM International Business School (UTM-IBS), Universiti Teknologi Malaysia Kuala Lumpur, 54100 Kuala Lumpur, Malaysia

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### ABSTRACT

As the world moves into the web 2.0 era, everyone can connect virtually, and online game playing has become a trend. Online games are played over computer networks, usually over the Internet. Online games entail a number of advantages, such as the ability to connect to multiplayer games, although single-player online games are also rather popular. This exploratory study focused on modeling the determinants of actual use of online game playing. Many researchers have shown perceived enjoyment and flow experience as important drivers of actual use of online game playing. The theory of planned behavior has been used in this study. Data were collected from 1584 Universiti Sains Malaysia students with different backgrounds using a structured questionnaire. The findings show that perceived enjoyment has the strongest influence on actual use. Other variables found to influence actual usage include the level of perceived behavioral control, subjective norms, attitude, perceived enjoyment, and flow experience. Implications of this research for future researchers will also be discussed. We hope this research will increase researchers' interest in further development in this sector and that the model will assist the games industry to identify factors that increase actual use by players.

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## 1. Introduction

Online games provide a virtual reality environment in which players are responsible for directing the game in the context of a number of different conditions. These conditions must be satisfied to move on to subsequent stages. Essential differences between digital and traditional games include the notion that a manual is not used for communicating the instructions. Rather, written code is utilized when the game includes a story line, navigation pointers, and other buttons that together contribute toward enhancing the game's appeal. It has been suggested by various studies that family-related items are not included in such games, whereas a number of different levels have been incorporated for adjusting to the requirements of the user (Oblinger, 2006). Currently, digital games are more than just entertainment; they have opened a wide area of research on education, training and human behavior. The term "game" must be defined to explore further potentials and

\* Corresponding author.

E-mail addresses: [ahmed@ksu.edu.sa](mailto:ahmed@ksu.edu.sa) (A.I. Alzahrani), [imranmahmud@daffodilvarsity.edu.bd](mailto:imranmahmud@daffodilvarsity.edu.bd) (I. Mahmud), [ramayah@usm.my](mailto:ramayah@usm.my) (T. Ramayah), [oalfarraj@ksu.edu.sa](mailto:oalfarraj@ksu.edu.sa) (O. Alfarraj), [nalalwan@ksu.edu.sa](mailto:nalalwan@ksu.edu.sa) (N. Alalwan).

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implications of our research. Games represent systems in which artificial conflict is performed by players, and eventually a substantive result occurs (Salen and Zimmerman, 2004, p 96). Various competitive activities are provided to players, and the game's storyline plays an imperative role in motivating and engaging the players. Zyda (2005) believes that computer games are not only limited to providing entertainment but also can involve different training pertaining to strategic communication, health, and education. Juul (2011) identified several criteria to describe a game:

- Rules
- Goals
- Emotional attachment
- Consequences of game play

Video games now constitute one of the world's premier cultural industries, with a global market of 80 billion dollars in 2011 (Interactive Software Federation of Europe, 2011). Since the initial commercial success of the game "Pong" in 1972, video games have been experienced by many different categories of players on a wide range of different platforms. Forty-eight percent of European adults 16 years of age or older and 58% of Americans said that they had played video games in 2012. Fifty-five percent of these were men, and 45% were women (Entertainment Software Association, 2013; Interactive Software Federation of Europe, 2012). Sixty-eight percent of American players played on game consoles, 63% on computers, 43% on smart phones, 37% on dedicated systems and 30% on wireless devices (Entertainment Software Association, 2013).

According to Lee (2015a,b), there remains no distinct definition established for online games. However, attributes provided by online games include higher learnability, a short periodic nature and playable for relaxation and fun (IGDA, 2009).

Online games are often contrasted with multiplayer online games because it allows connected software and computers to interact with one another. Local Area Networks (LANs) are also included in the overall process when internet technology is utilized. Thus, players can globally connect with one another via gaming, which is a form of communication between players. Because of advancements in technology and LAN capabilities, players now have a tremendous opportunity to play against players across the globe.

Online casual games are offered to game players on several different types of platforms such as web browsers on PCs (e.g., via online casual games portal sites and social networking sites), consoles, smartphones, and tablet PCs. This study focuses on online casual game portal sites because (1) online casual game portal sites provide a suitable context in which online friends' influence on game choices can be examined, (2) to access online games, the portals have developed one of the most generally used stage models (Liew, 2013), and (3) it is easier to collect the data required for this study from online casual game portal sites than from other platforms that host online casual games.

### 1.1. Online games culture in Malaysia

It is difficult to find accurate statistics in the literature about online gamers. According to a survey of the Malaysian Communications and Multimedia Commission (2014), 66% of Malaysians have an internet connection. Among these, 73% of users use a smartphone for internet usage. Concerning users' ages, 24.2% are from 20–24 years of age and 19.3% are from 25–29 years of age. Despite having the potential fun elements to play online games, only 62.3% of users in Malaysia use the internet for leisure purposes.

The top 10 games according to Google Malaysia are listed below (see Table 1).

At present, approximately 1.2 billion individuals are involved in online gaming, a number that is based on a report provided by Spil Games. Of these individuals, approximately 700 million represent approximately 44% of online participants across the globe.

**Table 1**  
Top 10 online games in Malaysia.

Name	Genre	Developer
Clash of clans	Action and Strategy	Supercell
Monument Valley	Puzzle	ustwo
2048 Number puzzle	Puzzle	Estoty Entertainment Lab
Fifa 15 Ultimate Team	Sports	ELECTRONIC ARTS
Kim Kardashian	Fashion	Glu
Farmville2: Country escape	Family, Simulation	Zynga
Boom Beach	Action and Strategy	Supercell
Clumsy Ninja	Action, Adventure	NaturalMotionLab Ltd
Cut the rope: 2	Puzzle	ZeptoLab
Cars: Fast as Lighting	City building	Gameloft

Source: Google Malaysia (2014).

## 1.2. Research reasoning

Online gaming involves the integration of broadband Internet technologies together with other networked gaming technologies via various web-based applications. With the passage of time, online gaming has drastically increased in importance in the context of the video gaming industry. The last decade has witnessed significant improvements in bandwidth, Information Technology (IT) infrastructure, user devices, and user interfaces (Choi and Kim, 2004).

Recent research suggests that playing video games, even for a relatively short period, improves performance on a number of tasks that measure visual and attentional abilities (Boot et al., 2008). In experimental settings, the same authors determined that an experimental group with game playing experience experienced improvement in cognitive ability and short-term memory.

Felicia and Pitt (2009) reported that digital games have implicit educational benefits. They allow players to develop cognitive and motor skills, which in turn assist in the improvement of students' mathematics skills. Previously, Becker (2007) believed that there was an intersection between the traits of a digital game player and a motivated learner.

According to the South East Asian games market, total revenue from Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam was 1413 million US dollars. Among these countries, Malaysia contributed 19% of the total revenue. In 2014, Malaysia contributed 20%, and New zoo forecast that by 2017, revenue would be increased to a total of 2216 million US dollars, but the contribution of Malaysia would decrease to 17%. Malaysia's contribution to the games industry appears to be falling behind compared with other ASEAN countries. More than 1.2 billion people are playing games (Newzoo report, 2015).

However, limited research was available concerning online gaming adoption (Weiss and Loebbecke, 2008). Despite the notion that the market share of a firm grows due to successful new launches, online companies have been encountering challenges with respect to acquiring new players. From a marketing point of view, understanding the behavior of online gamers can significantly contribute toward the success of such games (Wang, 2014). Malaysia entertainment and media (E&M) outlook (2015) reported that consumer expenditure on online video games will rise 7.4% by 2019 which is the fourth highest expenditure on entertainment and media segment.

Thus, there is a need to measure the factors that cause Malaysian people to play games to facilitate online game developer companies' increasing their contributions to the South East Asian games market. We develop a model of individual actual use of games based on the theory of planned behavior by Ajzen (1991) and replace the dependent variable of behavior intention to use with actual playing of games to measure the resulting behavior.

The objective of this research is to investigate actual online game-playing behavior by students. The research examines the theory of planned behavior, flow experience, interaction and perceived enjoyment in terms of actual usage by measuring frequencies of playing time by players. Moreover, a research model is developed aimed at extending understanding of the factors that influence people to play games by providing theoretical foundations and empirical evidence. Using the proposed model, the paper intends to answer the following research question:

### **What factors affect the actual online game playing behavior?**

To answer our research question, the remainder of this paper is structured as follows. First, the theoretical background of the theory of planned behavior (TPB), flow experience, interaction and perceived enjoyment will be shown. Second, a measurement model will be developed to measure actual usage of online games. Third, the developed research model will be evaluated using data collected from the university students.

## 2. Literature review

### 2.1. Theory of planned behavior

Several theories stress the importance of interpersonal influence on a person's adoption of a product. Examples include the diffusion of innovation theory (Rogers, 2003), theory of planned behavior (Ajzen, 1991), two-step flow theory (Katz, 1957; Lazarsfeld et al., 1944), and peer influence theory (Deutsch and Gerard, 1955).

The TPB focuses on the behavior of individuals in cases in which complete control over behavior is not inherent (Ajzen, 2002). In our case, the model being utilized by the study incorporates the TPB as its basis (Ajzen, 1991). The TPB (Ajzen, 1991) is often considered to be an augmentation of the theory of reasoned action (TRA), which was established to address various TRA limitations (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980).

According to the theory of planned behavior, prediction of intention depends upon three different processes: 1) attitude, 2) subjective norm and 3) perceived behavior control. Attitude reflects how people think and believe, which relates to expectations of the behavior. Subjective norm relates to the support provided or not provided by an individual's family, friends or significant other who significantly influences that individual's behavior. Perceived behavior control refers to an individual's feelings about the ability to execute the designed behavior. Overall, the theory of planned behavior explains that when a person perceives an activity as enjoyable and providing good benefits, the person receives support and encouragement from others who are already engaged in that behavior, and the person makes assumptions concerning his or her own ability to accomplish the task. Then, there is stronger intention to perform that task, which leads to actual execution of that specific task.

## 2.2. Theory of planned behavior in information system (IS) research

Armitage and Conner (2001) examined 185 empirical studies that were performed before 1997. The authors discovered that approximately 39% and 27% of the variance pertaining to intention and behavior, respectively, was caused due to the TPB. Moreover, intention was found to predict behavior better.

The TPB is applied in various research areas of information technology to measure intention of users to use a particular technology. In online stock trading, this model fit completely in the research of Gopi and Ramayah (2007). A similar result was also found on intention to use mobile pc among students by Ramayah and Suki (2006). Previously, in the case of online bill payment adoption by consumers, all constructs of the TPB had significant relationships. Teo and Beng Lee (2010) applied the TPB to measure intention using technology of teachers and students but found perceived behavior control is not significant.

## 2.3. Literature overview of online games adoption using TPB

Although many researchers referred to the phenomenon of the TPB in different IS adoptions, very few researchers actually used the TPB on online games adoption. Lee (2009) explained players' behavioral intention using a quantitative research model by adding interaction, flow experience and perceived enjoyment within his research model. Lee (2009) observed a 75% variance in intention to play online games. His result also discovered a strong, significant relationship of flow experience with attitude and intention of playing games. Lee and Tsai (2010) attempted to integrate the technology acceptance model of Davis (1989) to measure continuance intention of playing online games. Among 678 respondents, Lee and Tsai (2010) identified significantly positive effects among the relationships, and  $R^2 = 0.700$  on continuance intention. Hong et al. (2011) extended the TPB model with parenting style and self-worth and found a significant relationship with players' intention to play online games.

Kartas and Goode (2012) adapted the TPB to investigate the role of software piracy in the decision to adopt a video game console. Among their hypotheses, they found no significant relationship between fear of obsolescence and perceived deterrence on perceived behavior control. Even in their research, they measured behavior intention of playing video games.

In the above literature, most empirical studies using the TPB and online games have focused on behavior intention of playing games. In this study, we examine the actual online game playing behavior. As Brown et al. (2002) explained, with mandated technology, users must use the system whether they want to use it, but they must use it with voluntary technology such as online games, and "actual use" is a crucial success factor (DeLone and McLean, 1992).

## 3. Construct identification and model development

### 3.1. Flow experience

Flow is defined as "the holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi, 1977 p. 39). When individuals enter the flow state, they tend to disregard any environmental changes while engaged in their current activity (Csikszentmihalyi and LeFevre, 1989). This particular theory has been utilized for addressing optimum user experiences with respect to personal computers (Finneran and Zhang, 2005). A number of different studies have utilized this theory, such as those concerning gaming, dancing, rock climbing, shopping, sports, etc. (Lu et al., 2009). On a similar note, the focus of this research is on how this particular experience influences the intention of engaging in online games.

Hsu and Lu (2007) explained flow as stimuli that engaged players with total involvement, interest and concentration along with enjoyable experience. A number of researchers have recommended utilizing the flow experience to understand better the behavioral intentions of online consumers. Lu et al. (2009) indicated that online instant messaging (IM) adoption is also significantly influenced by the flow experience. Moreover, Pilke (2004) suggested that online information technology utilization is also influenced by the flow experience. It is predicted that the higher the flow experience within the games, the higher the level of encouragement of individual keenness will turn into intention (Chang et al. 2014).

An online game consists of high quality graphics, challenge and motivational funware that attract players to play it. Lee (2009) and Lee and Tsai (2010) confirmed the relationship between flow experience and attitude toward game playing. Thus, we formulated the following hypotheses:

**H1.** Flow experience is positively related to attitude toward online game playing.

**H2.** Flow experience is positively related to actual online game playing.

### 3.2. Perceived enjoyment

Perceived enjoyment is defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, apart from any performance consequences resulting from system use" (Davis et al., 1992 p. 1113).

The perceived enjoyment of users is also considered an influence on the level of technology acceptance by users. This influence is particularly present for hedonic systems (Davis et al., 1992; Van der Heijden, 2003). It was reported by Liu

and Li (2011) that IT innovations are also influenced by the level of perceived enjoyment. Users are more open toward adopting a new technology if they consider it useful, pleasurable, and fun. Thus, the focus of this research is toward assessing the role of perceived enjoyment in determining how inclined users would be with respect to engaging in online games.

Because games are all about leisure, Hsu and Lu (2007) state that perceived usefulness is not a perfect measure for the online gaming context; therefore, they replaced this variable with perceived enjoyment, which will indicate liking or disliking such a game. We also believe features of games are an important tool to support decisions of the players concerning whether to play the games. Lee (2009) and Lee and Tsai (2010) identified a similar relationship between perceived enjoyment and attitude. Park et al. (2014) confirmed a significant relationship between perceived enjoyment and intention to play online games. Thus, our hypotheses are as follows:

**H3.** Perceived enjoyment is positively related to attitude toward online game playing.

**H4.** Perceived enjoyment is positively related to actual online game playing.

### 3.3. Interaction

One of the important features of digital games is interactivity (Lewinski, 2000). According to Laurel (1993), when two or more objects communicate and affect one another, interaction occurs at that moment. Choi and Kim (2004) explained that players interact with computers or other players by sharing resources with them, attacking them or defending them. Occasionally, games instruct players about new challenges and provide suggestions about the next play. Players can also communicate with other players to share resources, develop strategy and execute combine actions. This type of instruction increases the interaction both digitally and socially. Ducheneaut and Moore (2004) contend that interaction patterns of online games are more complex than traditional computer games. Research of Lee (2009) and Lee and Tsai (2010), classified interaction into two part: human-computer interaction (HCI) and social interaction.

#### 3.3.1. Human computer interaction

Interaction with human-computer interface was defined as the junction of contact between the application (system, apps, and games) and the end user, which enables the user and the computer to communicate with each other (Sheppard and Rouff, 1994). The interactive communication between users and online games takes place via computer/ mobile hardware and software interfaces. A player's acceptance or rejection of a game can be originate from a good HCI.

#### 3.3.2. Social interaction

Previous studies reported that if the platform of online games is considered a social place, then it assists players to make social relationships (Huang and Hsieh, 2011). Voiskounsky et al. (2004) indicated that many players enjoy the online games because they help them enhance their social contacts and give access to computer-mediated patterns of interactions with fellow players. Sweetser and Wyeth (2005) also suggested that social interaction can cause immersion in games. Lazzaro (2004) also indicated that players gain enjoyment that came from interaction with other people. Online multiplayer games enable players around the world to use their imaginations, socialize, and be entertained by using a single game server or a collection of networked game servers (Ang et al., 2007; Lee and Tsai, 2010). According to Liu and Chang (2016), players develop social relationships with their virtual identity in the game world.

Online social networking technologies changed the trend of digital games to social network-based online games (Park et al., 2014). Li et al. (2015) also discovered strong significant evidence about the relationship between social interaction and continuance intention. Aligned with this evidence, we also assume that this interaction increases social collaboration as well as the fun and flow. Similar findings were achieved by Lee (2009) and Lee and Tsai (2010). Thus, we formulated the following hypotheses:

**H5.** Human-computer interaction is positively related to the flow experience of online game players.

**H6.** Social interaction is positively related to the flow experience of online game players.

### 3.4. TPB and actual Use

The theory of planned behavior is the original theory of our research model. Ajzen (2002) suggests that an individual's attitude, subjective norm and perceived behavior control outline any individual's intention. Ajzen (1991) chose attitude as the first distinctive feature of an individual's attention for evaluation of any behavior. Mäntymäki et al. (2014) used TPB to measure the engagement of users with virtual worlds similar to games.

Lee (2009) and Lee and Tsai (2010) adopted TPB to measure intention of players to play any game. In our case, we agree with Azjen that if any person's attitude toward playing a game is positive, then it is possible that he/she will spends more time playing that game (Lee, 2009). Thus, we postulate the following:



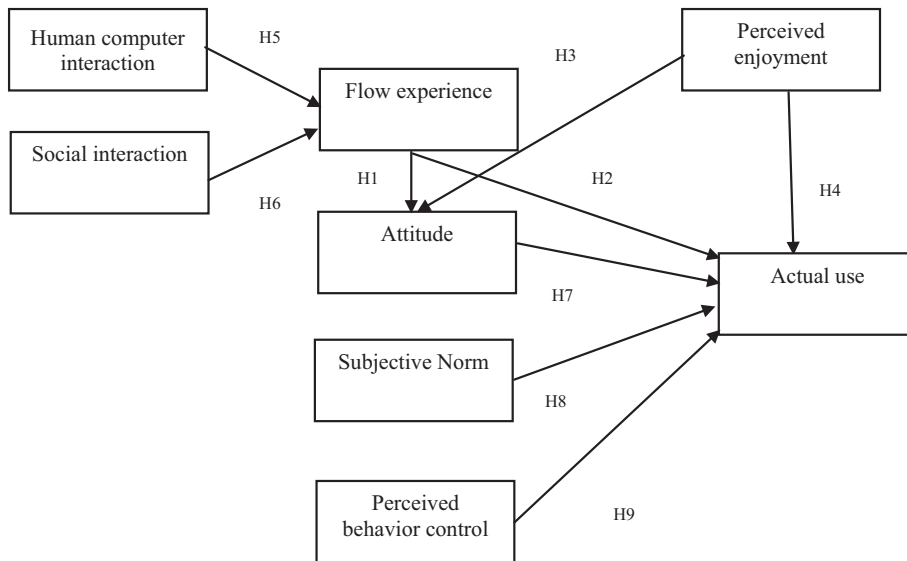


Fig. 1. Research Model.

**H7.** Attitude is positively related to actual online game playing.

Similarly, the second factor Ajzen (1991) identified is subjective norm. Subjective norm is defined as a social influence that incentivizes others to perform a specific behavior. In the context of online communities, subjective norm plays a crucial role in boosting users' intention; subjective norm can even encourage other people to contribute in such communities (Hsu and Lu, 2007). Chang et al. (2014) discovered that subjective norm explained 63% the variance in players' continuance intention of playing video games. Many players invite their friend onto an online game platform to make a team or share resources; some games also provides score benefits or rewards if other players can bring more people into the community. Therefore, our hypothesis is:

**H8.** Subjective norm is positively related to actual online game playing.

Perceived behavioral control (PBC) narrates an individual's control belief, which is focused on action. Previous findings by Wang (2014) explained the mediating role of innovation trialability and intention to play online games. This factor relates to the perceived relative ease (or difficulty) of performing the monitored action. In this study, to play online games, players must have basic knowledge of the internet or apps, they need smart phones or computers with upgraded operating system and browsers, and occasionally, users must pay to play the game online or must register. These issues might cause discomfort to the players, who might lose their actual opportunity to play the game. For this reason, we see an issue concerning the effect of perceived behavior on actual playing of a game. Therefore, we hypothesized the following:

**H9.** Perceived behavioral control is positively related to actual online game playing.

The final research model is shown in Fig. 1.

#### 4. Research methodology

To decide on the sample sizes, we initially utilized the Gpower software to determine the optimum sample size. Because 5 predictors were allowed, the effect size was established at 0.02 (small), and the power required was established at 0.95. The sample size was equal to 995. Therefore, it was decided that data collection would be slightly greater than the number required. Using an intercept survey method, 1584 responses were collected from public universities in Malaysia using a structured questionnaire that was derived from the literature. In this research, we actually measured of actual usage of strategy game called "Clash of Clans", a video game which was developed and published by Supercell, a mobile game development company. The game was released for iOS platforms on 2 August, 2012, and on Google Play for Android on 7 October, 2013. As it was reported, the most popular game in Malaysia, so we considered only the gamers who play "Clash of Clan" as a sample.

Table 2 indicates the respondents' demographics, in which 39.3% of the respondents were male, and 60.7% of the respondents were females. The ratio is representative of the gender ratio usually found in public Malaysian universities. Most students played online games about one to three times a week. Approximately 29.5% of students played online games less than one hour per week, 34.1% played online games for 1–5 h per week, and the remainder used online games more than 5 h per a

**Table 2**  
Profile of Respondents.

	Frequency	Percent
<i>Gender</i>		
Male	622	39.3
Female	962	60.7
<i>Ethnicity</i>		
Malay	144	9.1
Chinese	126	8.0
Indian	1062	67.0
Others	252	15.9
<i>Time Spent per week</i>		
<1 h	468	29.5
1–5 h	540	34.1
6–10 h	288	18.2
11–15 h	162	10.2
16–20 h	54	3.4
More than 20 h	72	4.5
<i>Time play per week</i>		
Approximately once per week	558	35.2
2–3 times per week	342	21.6
Several times per week	306	19.3
About once per day	270	17.0
Several times each day	108	6.8
<i>Living Situation</i>		
On-Campus	1152	72.7
Off-Campus	432	27.3
<i>Stream</i>		
Arts	1134	71.6
Science	450	28.4

week. It was also found that most of the students, approximately 72.7%, were living on-campus, and most (71.6%) were doing Arts-based courses.

## 5. Data analysis

To analyze the research model, the Partial Least Squares (PLS) analysis was incorporated using the SmartPLS 3.0 software (Ringle et al., 2015). The measurement model was tested (validity and reliability of the measures) in line with the suggested two-stage analytical procedures of Anderson and Gerbing (1988). Subsequently, the structural model was examined (testing the hypothesized relationship) (see Alzahrani et al., 2012; Hair et al., 2014; Ramayah et al., 2011, 2013). Moreover, the bootstrapping method (5000 resamples) was utilized (Hair et al., 2014) to assess the loadings and path coefficients' significance.

### 5.1. Measurement model

We initially assessed convergent validity according to the suggestions by Hair et al. (2014) by examining the loadings, average variance extracted (AVE) and composite reliability (CR). Hair et al. (2014) suggested that the loadings should be >0.70, CR > 0.7 and AVE > 0.5. As shown in Table 3, the AVE was greater than 0.5 and the CR was greater than 0.7. All loadings were above the cut-off value except for PBC, which was 0.596. For the formative items, we followed the procedures suggested by Gholami et al. (2013) to assess the weights by examining the indicator significance and variance inflation factor.

We assessed discriminant validity following Fornell and Larcker (1981), who compare the AVE with squared correlations or alternatively compare the square root of the AVE with the correlations. As shown in Table 4, the square roots of the AVE (bolded) are all higher than the off-diagonal correlation values, suggesting that there is sufficient discriminant validity. Thus, we can conclude that the measures used in this study exhibit sufficient validity and reliability.

### 5.2. Structural model

Next, the hypotheses developed for this study were tested by running a bootstrapping procedure with a resample of 5000, as suggested by Hair et al. (2014). The result is presented in Table 5.

The  $R^2$  for flow experience was 0.200, for Attitude was 0.368 and for Actual Usage was 0.414, which were all acceptable based on the cut-off suggested by Cohen (1988). Human computer interaction ( $\beta = 0.230$ ,  $p < 0.01$ ) and Social Interaction ( $\beta = 0.263$ ,  $p < 0.01$ ) were positively related to Flow experience. Flow experience ( $\beta = 0.110$ ,  $p < 0.01$ ) and Perceived

**Table 3**  
Measurement Model.

Construct	Item	Loadings	AVE	CR
Attitude	ATT1	0.917	0.817	0.930
	ATT2	0.927		
	ATT3	0.866		
Flow	FLOW1	0.724	0.637	0.898
	FLOW2	0.775		
	FLOW3	0.801		
	FLOW4	0.858		
	FLOW5	0.828		
Human Computer Interaction	HCI1	0.850	0.683	0.896
	HCI2	0.774		
	HCI3	0.839		
	HCI4	0.842		
Perceived Behavioral Control	PBC1	0.842	0.636	0.835
	PBC2	0.918		
	PBC3	0.596		
Perceived Enjoyment	PE1	0.900	0.824	0.934
	PE2	0.909		
	PE3	0.915		
Social Interactions	SI1	0.818	0.718	0.910
	SI2	0.913		
	SI3	0.863		
	SI4	0.791		
Subjective Norms	SN1	0.889	0.807	0.926
	SN2	0.936		
	SN3	0.869		
		Weights	VIF	t-values
Usage	USEF	0.648	2.008	1.979*
	USEH	0.982	1.641	21.348**
	USET	0.736	2.304	3.563*

\* p &lt; 0.05.

\*\* p &lt; 0.01.

**Table 4**  
Mean, Standard Deviation and Discriminant Validity.

	Mean	Standard Deviation	1	2	3	4	5	6	7	8
1. ATTITUDE	4.317	1.326	<b>0.904</b>							
2. ENJOYMENT	4.692	1.165	0.599	<b>0.908</b>						
3. FLOW	4.457	1.079	0.368	0.473	<b>0.799</b>					
4. HCI	4.692	0.891	0.292	0.483	0.399	<b>0.827</b>				
5. PBC	4.646	1.107	0.306	0.237	0.236	0.338	<b>0.797</b>			
6. SI	4.533	1.162	0.424	0.495	0.412	0.643	0.624	<b>0.847</b>		
7. SN	3.342	1.362	0.538	0.294	0.239	0.072	0.214	0.214	<b>0.898</b>	
8. USAGE	3.483	1.292	0.503	0.495	0.321	0.276	0.395	0.368	0.454	<b>NA</b>

Note: Values in the diagonal (bolded) represent the square root of the AVE, whereas the off-diagonals are correlations.

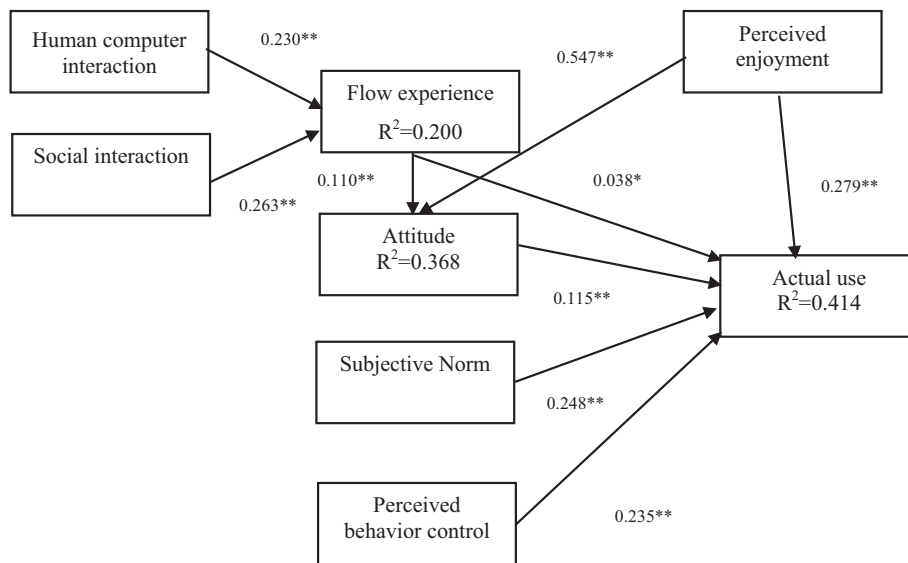
**Table 5**  
Hypotheses Testing.

Hypothesis	Relationship	Std. Beta	Std. Error	t-value	Decision	R <sup>2</sup>	Q <sup>2</sup>	f <sup>2</sup>
H1	FLOW → ATTITUDE	0.110	0.028	3.889**				0.030
H2	FLOW → USAGE	0.038	0.023	1.667*				0.022
H3	ENJOYMENT → ATTITUDE	0.547	0.023	23.989**		0.368	0.300	0.369
H4	ENJOYMENT → USAGE	0.279	0.025	11.173**				0.093
H5	HCI → FLOW	0.230	0.029	7.798**		0.200	0.128	0.038
H6	SI → FLOW	0.263	0.027	9.862**				0.052
H7	ATTITUDE → USAGE	0.115	0.025	4.564**				0.041
H8	SN → USAGE	0.248	0.029	8.613**		0.414	0.264	0.078
H9	PBC → USAGE	0.235	0.017	13.719**				0.085

\* p &lt; 0.05.

\*\* p &lt; 0.01.





\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Fig. 2. Hypotheses Testing.

Enjoyment ( $\beta = 0.0547$ ,  $p < 0.01$ ) were also found to be strong predictors of Attitude. Next, we examined the predictors of Actual Usage and found that all the predictors, that is, Perceived Enjoyment ( $\beta = 0.279$ ,  $p < 0.01$ ), Attitude ( $\beta = 0.115$ ,  $p < 0.01$ ), Subjective Norm ( $\beta = 0.248$ ,  $p < 0.01$ ), Flow experience ( $\beta = 0.038$ ,  $p < 0.01$ ) and Perceived Behavioral Control ( $\beta = 0.235$ ,  $p < 0.01$ ), had positive effects on Actual Usage. Thus, all hypotheses generated for this study (H1, H2, H3, H4, H5, H6, H7, H8 and H9) were supported. Interestingly, the results indicate that Perceived Enjoyment and Subjective Norm were stronger predictors of Actual Usage than Attitude.

The effect sizes ( $f^2$ ) all achieved at least the small effect size of 0.02, as suggested by Cohen (1988), whereas the  $Q^2$  values were all greater than 0, which suggests that there is predictive relevance (Hair et al., 2014; Fornell and Cha, 1994). Our final research model with explained variance and path coefficients is shown in Fig. 2.

Table 6  
Cross tabulation Analysis.

Variable		Usage Level		$\chi^2$
		Low	High	
Age	19	0.0	100.0	233.31**
	20	67.7	32.3	
	21	51.5	48.5	
	22	46.7	53.3	
	23	0.0	100.0	
Gender	Male	51.1	48.9	0.00
	Female	51.1	48.9	
Ethnicity	Malay	75.0	25.0	170.55**
	Chinese	57.6	42.4	
	Indian	14.3	85.7	
	Others	28.6	71.4	
Stream	Arts	55.6	44.4	30.76**
	Sciences	40.0	60.0	
Living	In Campus	53.1	46.9	6.40*
	Outside Campus	45.8	54.2	
CGPA	Low	44.4	55.6	29.16**
	High	58.1	41.9	

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

### 5.3. Additional analysis

Further to the model tested we did some further analysis by using the cross-tabulation analysis using the main demographic variables and the usage level (categorized as 1 = Low and 2 = High) and the results are presented in Table 6.

As shown in Table 6, there were significant differences for the variables of Age, Ethnicity, Stream of Study, Living location and CGPA while there was no significant differences for Gender. For age ( $\chi^2 = 233.31$ ,  $p < 0.01$ ) which shows that those who are 19 (just started university) and those who are older at 23 (the seniors) are the ones who play games at a higher level than those in between. This can be attributed to the fact that those who just joined are still not getting a lot of workload thus they have more time while the older ones maybe spending more time on playing as they are more stressed and try to relieve the stress by playing games. The male and female students did not differ at all on the level of games playing.

In terms of ethnicity ( $\chi^2 = 170.55$ ,  $p < 0.01$ ) there were significant differences for Indian and Others spent more time playing games as compared to the Malay and Chinese students whereas for the study stream ( $\chi^2 = 30.76$ ,  $p < 0.01$ ) it was shown that the students from the Science stream spent more time playing games as compared to the Arts students. This again can be mostly attributed to the issue of relieving stress among Science based students.

For living arrangement ( $\chi^2 = 6.40$ ,  $p < 0.05$ ) those living outside campus played games at a higher level compared to those living on campus which may be partly due to the fact that outside campus the Internet connection is much more faster and has no limit while on campus there are some limitations on bandwidth and speed. We also compared the academic performance of students using their CGPA's ( $\chi^2 = 29.16$ ,  $p < 0.01$ ), and not surprising that those who played more games had lower CGPA's as compared to those who played less games.

## 6. Discussion

The results show that all of the hypotheses are significant, which indicates that the developed model fits well with the collected data. The discussion section presents the results obtained from the empirical survey. Subsequently, we will discuss the importance of each factor observed in the data.

### 6.1. Flow experience

Flow experience is considered to have a positive effect that can increase attitude and actual online game playing. Those who do not play games consider games as not interesting. However, Chen (2007) claimed that flow is in between anxiety and boredom, which increases non-gamers' interest in playing games. Game modification also specifies the strictness and linearity of the game experience. Chang et al. (2014) acknowledged that flow will positively increase the relationship of utilitarian and hedonic values of continuance intention of playing online games. Therefore, H1 and H2 were significant. This result also aligns with the findings of Lee (2009) and Lee and Tsai (2010).

### 6.2. Perceived enjoyment

Vorderer et al. (2003) explained the reasons for the growing interest in digital games. They suggested that after achieving a certain stage, the achievement affects the emotional state of players and provides a high degree of excitement. The study found that H3 and H4 were significant; therefore, perceived enjoyment affected both attitude and actual usage. Previous findings of Lee (2009) and Lee and Tsai (2010) are in line with our findings. Perceived enjoyment has a large effect on attitude toward playing games by the respondents.

### 6.3. Interaction

The competition level of computer games ascends when another computer or another player is added, thus increasing social competition. Social competitions define a process that develops by reasonable actions performed by individuals or social entities to continue their own interests to the disadvantage of others. Again, social games extend the network exposure of any individual, increase playfulness, and add recognition in any given games society (Koivisto and Hamari, 2014). Social interaction and communication with players or computers cause gamers to experience a sensation of physical and mental connection with a games-based social network (Li et al., 2015). Thus, it is believed that this situation reduces the stress and frustration of players. Similar evidence was obtained from our result that H5 and H6 were strongly statistically significant, which supported previous findings of Lee (2009).

### 6.4. Attitude

Attitude toward playing had a significant relationship with actual game playing (H7). Our result shows a small effect size when  $f^2 = 0.041$ , which is slightly greater than the lowest effect size 0.02, as suggested by Cohen (1988). The relevant literature of TPB has repeatedly suggested that such factors affect the behavior of users, particularly in the field of IS, as supported in the results of this study. When the flow experience of games and enjoyment are high, students feel a favorable

attitude toward the game, and they spend more time. This result is consistent with de Leeuw et al. (2015) in the context of tertiary level students. Our finding is also consistent with the online game-playing behavior research of Hsu and Lu (2007), Lee (2009), Lee and Tsai (2010), Kaburuan et al. (2011) and Park et al. (2014).

### 6.5. Subjective norm

The relationship between subjective norm and actual usage is strongly significant; therefore, H8 is supported. This result is consistent with the findings of Hsu and Lu (2007), Lee (2009), Lee and Tsai (2010) and Kaburuan et al. (2011). Previous findings of Lee (2015a,b) suggest that gamers' frequency of playing games becomes parallel with their friends over time. Interestingly, among the constructs of the TPB, subjective norm has the highest path-coefficient with actual online game play, which causes us to conclude that the TPB reveals a strong significant effect on actual usage of games among players. Among the constructs of the TPB, subjective norm was found to have a greater effect size than attitude, with  $f^2 = 0.078$ . In an online community, people who are engaged together share a vision (Zhou, 2011), and that shared vision influences other friends to join and play.

### 6.6. Perceived behavior control

According to Mäntymäki et al. (2014), in an online virtual environment, PBC refers to self-efficacy and perceived ease of use of the system. This indicates that the easier it is to play the game, or if players believe in their ability to browse the internet, register and play online, players' playing time will be greater. Evidence from our research suggested that the relationship between PBC and actual usage is significantly positive and that our hypothesis H9 is supported. This result is aligned with the previous findings of Hsu and Lu (2007), Lee (2009), Lee and Tsai (2010), Kaburuan et al. (2011), Wang (2014) and Mäntymäki et al. (2014). Among all three constructs of the TPB, PBC has the highest effect size, with  $f^2 = 0.085$ . PBC is a result of control beliefs, which are perceptions about the presence of factors that facilitate or block the actual behavior (de Leeuw et al., 2015).

The result shows that to understand better the actual usage of games, the theory of planned behavior is necessary because the TPB and enjoyment explain 41% of the variance in actual usage. Among the constructs of a TPB-like attitude, subjective norm and perceived behavior control, strong evidence was found that all have significant relationships with actual usage of games, indicating that H7, H8 and H9 are significant and that all three constructs have a small but sufficient effect on actual behavior of playing online games. Therefore, the theory of planned behavior fits completely with our data. This research model and method have several implications for research and practice, which will be discussed in the following section.

## 7. Implications for practice

This research assists game developer companies to understand the factors that influence actual use of games by Malaysian customers. The role of enjoyment is very crucial for the attitude toward playing games. Even academia must understand the dynamics of enjoyment for the development of educational games. Therefore, if companies or universities want to develop a game, they should first concentrate on increasing the enjoyment elements within the game by increasing enjoyment elements with goals, strategy and funwaresuch as status, levels and points. Note also that online communities assist players to engage with actual usage of games. For that purpose, game developers should create web pages or Facebook pages to create communities in which players can discuss and share their ideas. Receiving points for adding friends within the game is also an enjoyment factor for game playing.

## 8. Implications for future research

Future research should first emphasize explanations for different age groups and gameplaying mediums, such as computers or mobile devices. Second, this research did not find the exact influence of usage in the social context; thus, it is suggested to break the components of subjective norm into parents, family, friends, teachers or others, as suggested by Laumer et al. (2010). Third, future studies can investigate system usage from the technostress perspective. In the case of Malaysia, it was reported that 88.3% of users use the Internet to acquire information. Thus, working with technology too much and the pace of change of digital games might lead to stress, which could also affect actual playing of games as advised by Lei and Ngai (2014). Fourth, our current study focused only on students, not on professionals. According to the Internet Usage survey, people aged 35–39 years and above comprise less than 10% Internet users in Malaysia. Consequently, the role of technostress on older people could be a vital factor to measure actual usage of older people or professionals.

## 9. Conclusion

This paper extends the existing literature of online games and the theory of planned behavior by measuring actual usage. This research provides support of the effect of flow experience, enjoyment, and interaction on online game players' attitude and actual usage. It confirms that enjoyment and social influence are strong predictors to measure actual game playing.

Therefore, game developer companies should take appropriate measurements on enjoyment elements and implement games on social platforms to increase actual usage.

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