

Using the Technology Acceptance Model to Evaluate Behavioural Intention to Use Mobile Games—A Case of *Pokémon GO*

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As the Internet and mobile devices have increased in popularity, mobile phone games have become a mainstream recreational activity. Among them, Pokémon GO received considerable attention worldwide, and people gain a pleasurable experience and sense of novelty from this game. The goal of this study was to use the technology acceptance model to evaluate the attitude toward use and behavioural intention of users regarding the mobile game Pokémon GO. A questionnaire was distributed to Pokémon GO users who had played it on their mobile phone, and 56 valid questionnaires were returned. Descriptive statistics, a reliability analysis, and a regression analysis were conducted. The results revealed that the players' perceived usefulness and perceived playfulness significantly affected their attitude of use regarding Pokémon GO. Social interaction with players, flow, and user attitude affected their behavioural intention. The research results may serve as a reference for mobile game producers and subsequent related studies.

Keywords: *Technology acceptance model; mobile game; flow; Pokémon GO*

1 Introduction

With the increasing prominence of the Internet and mobile devices, popularity of online entertainment, and improvement in multimedia research and development technology, online games have become a popular and indispensable form of entertainment for people in Taiwan. In 2019, worldwide app store consumer spend will grow 5x as fast as the overall global economy. Consumer spend in mobile gaming will reach 60% market share among all gaming platforms (Lexi, 2018). This shows that mobile gaming is more mature. According to a survey conducted in 2016 by the Market Intelligence & Consulting Institute, Institute for Information Industry on the application user behaviour of Taiwanese people, the five applications most frequently used by consumers belonged to the following categories: communication (73.3%), gaming (47.3%), photograph and video chat (17.6%), online shopping (15.5%), and music and sound effects (14.9%). Data have indicated that gaming has become the most prominent function of mobile devices, second only to communication. Therefore, many games are designed with short levels to enable players to experience a sense of entertainment and achievement upon finishing a level in a short time (Institute for Information Industry, 2016).

Pokémon GO, which triggered enthusiasm worldwide for catching Pokémon, is a location-based augmented reality game. It has been free to download from the Apple Store and Google Play since July 2016. The game enables players to use real life as a platform for catching, fighting, training, and trading virtual monsters (i.e., Pokémon). (Taiwan Pokémon Information Site, 2017). Players can even compete with each other, make friends, exchange gifts, trade Pokémon, Adventure Sync, Community Day, and play in AR+ mode (United States Pokémon Information Site, 2018). After the launch of Pokémon GO, a Pokémon hunt trend spread worldwide. Although its popularity has diminished, numerous faithful players are still playing. According to statistics from the market research company Sensor Tower, Pokémon GO has made US\$ 2.45 billion since its debut, and its revenue reached US\$ 57.4 million (approximately NT\$ 1.77 billion) in February 2019, indicating that users still demonstrate remarkably high levels of consumption (Mirror Media, 2019). In Taiwan, votes from Google Play users established Pokémon GO as one of the top five most popular games of 2018 (Chiao, 2018). Pokémon GO is first-to-market for a mainstream location-based AR mobile gaming experience, captured nostalgia within its target market and currently maintains a stronghold of active users. This popularity is attributable to the continual improvements that the official company has made to the game for maintaining novelty for the player, such as the additions of new characters and modes. The player can increase social interaction by sending Gifts or participating in a Raid or Gym Battle with others.

Information technology brings a lot of convenience to people, in order to understand the user's attitude and intention to use new technology, Davis, Bagozzi, and Warshaw (1989) proposed the technology acceptance model (TAM) on the basis of the Theory of Reasoned Action. The structure of TAM is as displayed in Fig. 1. In the model, the two constructs of perceived usefulness (PU) and perceived ease of use (PEU) are used to explain or predict the degree of acceptance or attitude toward using (AT) that a user has regarding a new technology. AT subsequently affects behavioural intention to use (BI). Furthermore, perceived usefulness and perceived ease of use are affected by several external variables. The TAM has been adopted by numerous empirical studies to determine whether a new technology system is accepted by users. It has also been integrated with different theories for expansion or application in various fields of research. Because TAM has evolved into a leading model in predicting and explaining an information systems acceptance, it is believed the TAM model is also appropriate to analyse the popularity of mobile gaming.

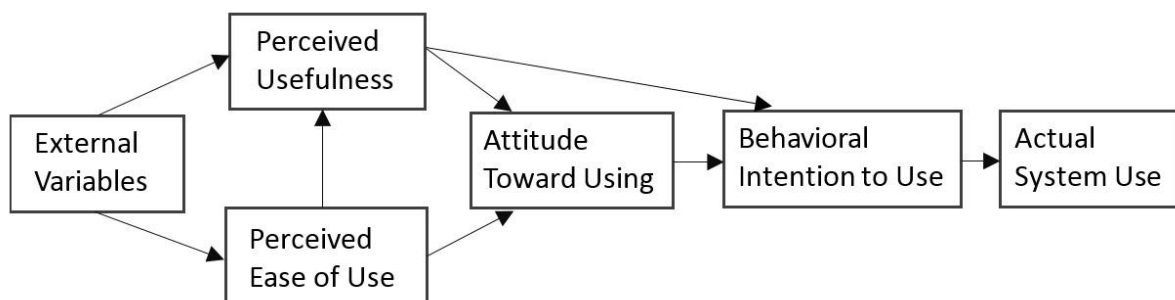


Figure 1. Theoretical framework of the TAM (Source: Davis, 1989)

Moon and Kim (2001) discovered that using only perceived usefulness and perceived ease of use could not fully explain and predict a user's motivation. Therefore, they included Perceived Playfulness (PP) into the TAM for discussion. They defined PP as "The extent to which the individual Perceives that his or her attention is focused on the interaction with the

World Wide Web; Is curious during the interaction; and Finds the interaction intrinsically enjoyable or interesting.” Peng (2017) used the TAM to discuss the use intention of augmented reality games, revealing that flow experience and perceived enjoyment have positive effects on intention usage. Perceived enjoyment (PE) is the extent to which an activity is perceived to be enjoyable without considering any performance consequences (Davis, Bagozzi, & Warshaw 1992). It is an intrinsic motivation referring to the pleasure and satisfaction from behavioural performance. Park, Baek, Ohm, and Chang (2014) proposed perceived enjoyment and usefulness as determinant variables of intention to use among players in mobile-social network games. Chen, Rong, Ma, Qu, and Xiong (2017) found that perceived enjoyment and perceived ease of use are the chief determinants of user attitudes to play mobile gaming.

The term flow was coined by Csikszentmihalyi in 1975. When people are focused on an activity, they filter out all unrelated sensory stimuli and transfer them into a shared model of experience without subjectively experiencing the passage of time, which is the state of flow. Csikszentmihalyi (1988) further proposed that flow experience occurs when an individual's skill and challenge are balanced. Individuals then act according to their psychological impulses. As the Internet has become more popular, flow theory has been used in computer and Internet research, which has indicated that the Internet use behaviour exhibits flow. Lee (2009) argued that the flow experience is a more important factor than perceived enjoyment in influencing customers' acceptance of online games and analysis reveals that gender is a key moderator of online game acceptance. The gaming industry has changed in response to the prevalence of the Internet. Games have developed from single or two player fighting games into online games that enable the interaction of multiple players. Choi and Kim (2004) classified the interactions engaged through computer games into two types: Users–system interactions (i.e., HI) and user–user interaction (i.e., SI). And proposed that if people achieve the optimal flow during the gaming process, they generate an intention to continue playing the game. Chang (2013) also affirmed that the interaction between users and social network games is an essential factor influencing user flow experience. When a game provides adequate goals and feedback and uses adequate tools to simulate interaction between the player and others, the player perceives a higher level of interaction with the game and can more easily achieve the flow state.

Psychologist Andrew Przybylski at the Oxford Internet Institute has studied what attributes are essential for games to have the chance of being successful. And noted that the key to establishing a fun experience for players of mobile games lies in providing the player with a sense of confidence and exploration as well as a platform with which to interact with other players. When a game satisfies these three criteria, the sense of fun experienced by the players of the game increases, and the game achieves market success (Baraniuk, 2016). Su, Chiang, Lee, and Chang (2016) proved that human-computer interaction (HI), social interaction (SI), skill (S), and challenge (C) independently positive influenced flow experience, and further positively influenced the player loyalty (PL) of mobile game users. In particular, the challenges and social interactions offered by a game increase player loyalty. In recent years, mobile gaming feature real-time discussion platforms, including in-game guilds, Facebook fan pages, and other online communities. Because it provides a social tie that enables them to build close relationships with other players. Pokémon GO can be considered the game that most satisfies the demands of the social media era. It encourages face-to-face social interaction as well as that between a virtual network environment and the

real world (Baraniuk, 2016). Mobile gaming is a new platform for people to play games with other friends. Because of the interactivens of the game, players have mutual topics to discuss and can form a social space. Social interaction is an indispensable element in social mobile games.

The aim of this study was to integrate research in technology and psychology to investigate the user attitude and behavioural intention of domestic players toward Pokémon GO. The research goals were as follows:

1. Understand players' use behaviour of the mobile game Pokémon GO.
2. Investigate factors related to the behavioural intentions of Pokémon GO players.

2 Research method

On the basis of the results of the literature review, this study proposed an extension of the conventional TAM model including traditional factors such as Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Using (AT), and Behavioural Intention (BI). Moreover, mobile gaming is a kind of social platform for users to share enjoyment and other experience. We also added several additional variables, such as Social Interaction (SI), Perceived Enjoyment (PE), and Flow (FL) to enhance the understanding of user's intention to play mobile games. Specifically, we adopted the degree of use of the mobile game Pokémon GO of individual players to investigate the correlations among the following research variables: SI, PE, FL, PEU, PU, AT, and BI. The research conceptual framework is depicted in Figure 2.

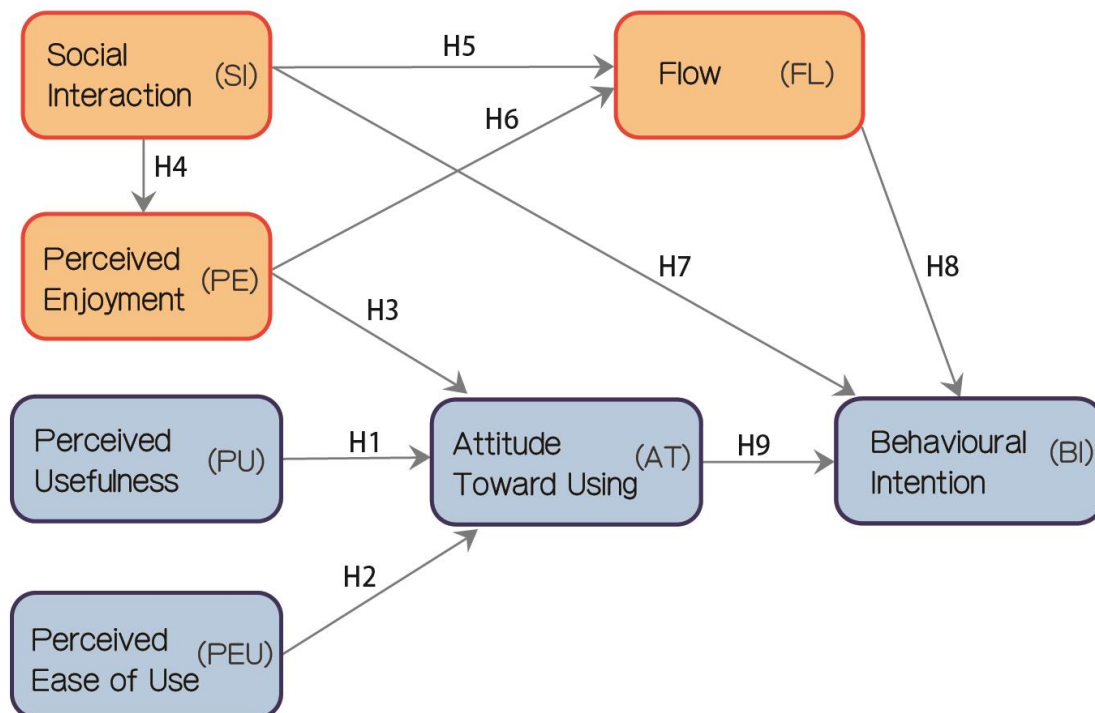


Figure 2. Research framework of this study

Based on relevant research, we developed the following hypotheses for the constructs in this study:

- H1: PU significantly and positively influences the AT of Pokémon GO players.
- H2: PEU significantly and positively influences the AT of Pokémon GO players.
- H3: PE significantly and positively influences the AT of Pokémon GO players.
- H4: SI significantly and positively influences the PE of Pokémon GO players.
- H5: SI significantly and positively influences the FL of Pokémon GO players.
- H6: PE significantly and positively influences the FL of Pokémon GO players.
- H7: SI significantly and positively influences the BI of Pokémon GO players.
- H8: FL significantly and positively influences the BI of Pokémon GO players.
- H9: AT significantly and positively influences the BI of Pokémon GO players.

A questionnaire was conducted. The survey tools referred to domestic and foreign literature and questionnaires, and items were closed questions. The questionnaire was designed to collect demographic information and was also divided into seven perception scales: social interaction (SI), perceived enjoyment (PE), flow (FL), perceived ease of use (PEU), perceived usefulness (PU), attitude toward using (AT), and behavioural intention (BI). A 5-point Likert scale was used to evaluate the degree to which the participants agreed or disagreed with each item, from *strongly disagree* (1) to *strongly agree* (5). The questionnaire content was based on relevant literature. Experts were invited to review the questionnaire and thus increase expert validity.

The research participants were Pokémon GO players in Taiwan. Purposive sampling was used, and all questionnaires were distributed online. A total of 64 questionnaires were returned, 56 of which were valid, yielding a return rate of 87.5%.

3 Research results and discussion References

Regarding the sample (N = 56), men comprised 46.4% (N = 26), and female comprised 53.6% (N = 29). Most players were between 20 and 29 years old (46.4%), and the smallest proportion was 60 years or older (3.6%). Regarding motivation for downloading the game, 46.4% of participants stated that they did so because “my friends or family members were playing it,” followed by “I was curious about it.” Regarding with whom they played the game, 33.9% played it with “no one in particular,” followed by “by myself” (32.1%). The largest proportion of participants (32.1%) reported a usage time of less than 30 minutes each time they played the game, and 60.7% of participants reported playing the game every day. Table 1 presents the detailed results.

After the questionnaire responses were retrieved, we conducted a Cronbach’s α analysis on all constructs to assess their internal consistency. Guelford (1965) maintained that when a Cronbach’s α is greater than 0.7 for constructs to be considered as showing an acceptable level of convergent validity. The results of the present study revealed that the Cronbach’s α of the constructs of PEU, PU, SI, PE, FL, AT, and BI were all 0.812 or greater, as indicated in Table 2, demonstrating that the questionnaire items we revised according to the TAM were of high internal reliability and able to support the results of this study.

Table 1 Descriptive statistics of the sample structure.

Control variables	Questionnaire item	Counts	Percentage (%)	Ranking
Gender	male	26	46.4%	2
	female	30	53.6%	1
Age	20–29	26	46.4%	1
	30–39	8	14.3%	3
	40–49	12	21.4%	2
	50–59	8	14.3%	3
	60–69	2	3.6%	4
Why did you download Pokémon GO?	My friends or family members were playing it.	26	46.4%	1
	It was on the news all the time.	6	10.7%	3
	I was curious about it.	14	25.0%	2
	I like virtual games integrated with reality.	3	5.4%	5
	I play it as a form of exercise.	2	3.6%	6
	Other	5	8.9%	4
With whom do you usually play Pokémon GO?	By myself	18	32.1%	2
	With my family	6	10.7%	4
	With friends	13	23.2%	3
	With no one in particular	19	33.9%	1
How long do you play the game each time?	Less than 30 minutes	18	32.1%	1
	30–60 minutes	12	21.4%	3
	1–2 hours	10	17.9%	4
	2–3 hours	2	3.6%	5
	3 hours or more	14	25.0%	2
How often do you play the game each week?	1–2 days	7	12.5%	3
	3–4 days	9	16.1%	2
	5–6 days	6	10.7%	4
	Every day	34	60.7%	1

Table 2 Reliability analysis of the research variables

Construct	Reliability (Cronbach's α)
Perceived Ease of Use (PEU)	0.854
Perceived Usefulness (PU)	0.933
Social Interaction(SI)	0.939
Perceived Enjoyment(PE)	0.893
Flow(FL)	0.886
Attitude Toward Using (AT)	0.888
Behavioural Intention (BI)	0.812

Note: Cronbach's $\alpha > 0.7$ indicates high reliability.

This study used the Pearson correlation coefficient to analyse the correlation among the seven constructs, namely Social Interaction (SI), Perceived Enjoyment (PE), Flow (FL), Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Using (AT), and Behavioural Intention (BI). A large coefficient indicated a strong correlation between variables. Table 3 presents the correlations among the variables. We adopted the evaluation standards proposed by Gaski and Nevin (1985), which were that the value of the correlation coefficient between any two variables should be less than 1 and that between any two constructs should be less than the value of the individual Cronbach's α . Table 3 reveals that the Cronbach's α values in the diagonal line of each construct were larger than the correlation coefficient of each construct. Therefore, these test results indicate that the constructs of this study exhibited favourable validity.

Table 3 Discriminant validity analysis

Construct	PEU	PU	SI	PE	FL	AT	BI
PEU	0.854						
PU	.698**	0.933					
SI	.692**	.881**	0.939				
PE	.650**	.798**	.687**	0.893			
FL	.581**	.824**	.700**	.808**	0.886		
AT	.640**	.883**	.769**	.853**	.853**	0.888	
BI	.688**	.793**	.739**	.787**	.788**	.815**	0.812

*Note: The diagonal values are the Cronbach's α of each construct, and ** denotes $p < .01$.*

To determine whether the variables in the research framework could effectively reveal the BI of gamers, we used a path analysis to examine the explanatory power of independent variables on dependent variables. A regression analysis was conducted to determine whether the path coefficients reached the significant level. In each regression analysis, all variance inflation factors were no greater than 10, and the conditional indices were no greater than 30. Therefore, no multicollinearity between variables in the regression was observed. The results of the data analysis are provided in Fig. 3.

First, PEU, PU, and PE were employed as independent variables and AT was set as the dependent variable. The results of the path analysis revealed that only PU ($\beta = 0.569$, $p < .001$) and PE ($\beta = 0.418$, $p < .001$) significantly affected AT. $R^2 = 0.841$ ($F = 91.362$, $p < .001$), thus explaining the AT of 84.1% of the participants who played Pokémon GO. However, PEU has no significant impacts on AT in this study.

The path of SI to PE was significant ($\beta = 0.687$, $p < .001$), and $R^2 = 0.471$ ($F = 48.145$, $p < .001$), meaning that SI explained the PE of 47.1% of the participants. Then, PE and SI were employed as independent variables and FL was set as the dependent variable. Both PE and SI significantly affected FL ($\beta = 0.620$, $p < .001$ and $\beta = 0.274$, $p < .05$, respectively), and $R^2 = 0.693$ ($F = 59.778$, $p < .001$), meaning that they explained the FL of 69.3% of participants.

Finally, when SI, FL and AT were set as independent variables and PL was the dependent variable. Regarding the effects of SI, FL, and AT on BI, a path analysis revealed that SI ($\beta = 0.244$, $p < .05$), FL ($\beta = 0.302$, $p < .05$), and AT ($\beta = 0.370$, $p < .05$) all had a significant effect on BI; moreover, $R^2 = 0.720$ ($F = 44.492$, $p < .001$), revealing that these three

variables explained 72.0% of the BI of participants. Therefore, this study confirmed that multiple factors simultaneously affect each dependent variable.

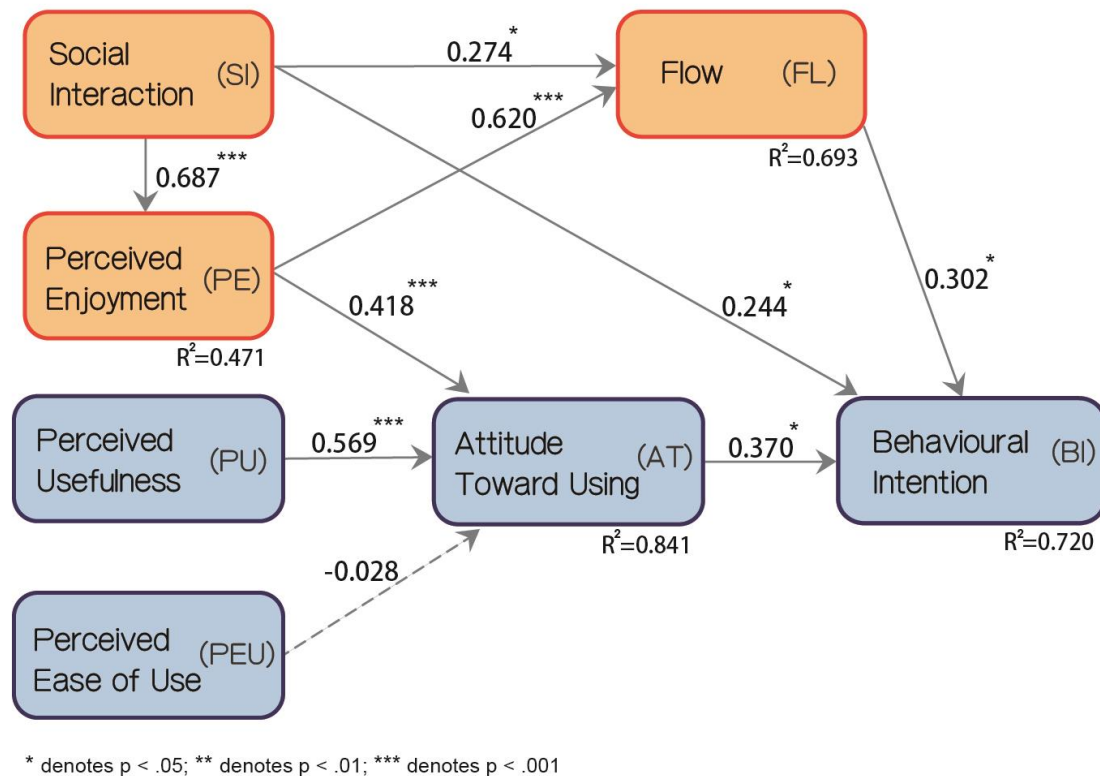


Figure 3. Path analysis of the research framework

Table 4 Research hypotheses and verification results

Research hypothesis	Construct relationship	β coefficient	t value	p value	Verification result
H1	PU→AT	0.569	5.692	<.001	Accepted
H2	PEU→AT	-0.028	-0.355		Rejected
H3	PE→AT	0.418	4.368	<.001	Accepted
H4	SI→PE	0.687	6.939	<.001	Accepted
H5	SI→ FL	0.274	2.615	<.05	Accepted
H6	PE→FL	0.620	5.924	<.001	Accepted
H7	SI→BI	0.244	2.107	<.05	Accepted
H8	FL→BI	0.302	2.128	<.05	Accepted
H9	AT→BI	0.370	2.334	<.05	Accepted

Using path coefficients (β) and the coefficient of determination (R^2), we verified the study hypotheses as well as the predictive power of this model. Figs. 3 and Table 4 present the path analysis results, which indicate that eight out of the nine hypotheses (H2 excluded) reached the significance level $p < .05$ (t value > 1.96).

H1 and H3 were accepted, revealing that PU and PE significantly affected the AT of Pokémon GO players, and their explanatory power for the total model was $R^2 = 0.841$. H4 was accepted, indicating that SI significantly affected the PE of players, and the explanatory power for the total model was $R^2 = 0.471$. H5 and H6 were accepted, suggesting that SI and PE significantly affected the FL of players, and their explanatory power for the total model was $R^2 = 0.693$. H7, H8, and H9 were accepted, revealing that SI, FL, and AT significantly affected the BI of players, and the explanatory power for the total model was $R^2 = 0.720$. The results indicated that the TAM exhibited favourable explanatory power and is worthy of reference.

4 Results and conclusion

Along with the development of technology and mobile devices, social network based mobile gaming has become wildly popular. This study investigated the user attitude and behavioural intention of users of the mobile game Pokémon GO. We used the TAM to identify factors influencing players' behavioural intentions to make practical contributions in the gaming industry. The demographic characteristics of the research participants indicated that most Pokémon GO players are female. This echoed the result from the online surveying company Survey Monkey (2016), which revealed that 63% of Pokémon GO players in the United States were women. This finding suggests that female players in the mobile game market should not be overlooked. The survey results revealed that most players were between 20 and 29 years old, which can be attributed to the fact that most individuals who grew up watching Pokémon on television were in this age group. Many Pokémon Go fans have fond memories of titles dating back to 1996, when the first instalments in the series were released. Even the very fact that people are talking about Pokémon more than usual again has prompted reminiscences among some older fans. The main reason for downloading this game was that family and friends were playing. We can thus infer that the players downloaded the game after discovering that family members or friends were playing in an effort to increase their interaction with others by identifying a topic of common interest. This echoes findings reported in the literature on social games that indicate that players continue to play social games both for entertainment and for socialisation (Choi and Kim, 2004; Baraniuk, 2016). Most users play the game with "no one in particular" because the game has a gym battle mode. Most of the participants reported playing the game daily. This popularity is attributable to the continual improvements that the official company has made to the game for maintaining novelty for the player, such as the additions of new characters and modes. In the contemporary setting in which most people own a mobile phone, playing mobile phone games has become a form of daily entertainment. Their prevalence also demonstrates the attachment players form with such games.

This study used a literature review, empirical data, and statistical analysis to infer and verify the research hypotheses. The results revealed that perceived usefulness and perceived ease of use affect the attitude toward using of players. This means that when users play a mobile game, they open a communication channel with friends and achieve a sense of happiness and satisfaction in the game during their interactions. Playing games is conducive to shaping an active and positive attitude toward using. The main purpose of mobile gaming is for entertainment and relaxation. And it provides a kind of social platform for users to share fun and other experience. The perceived ease of use of operating the game did not demonstrate a positive influence on attitude toward using.

In addition to attitude toward using, social interaction and flow also increased the player's behavioural intention, whereas social interaction and perceived enjoyment exhibited significant effects on flow. This is similar to the findings reported by Choi and Kim (2004) as well as by Su et al. (2016). A game has to remain over time entertaining and fun for the users to continue playing it. When players are engaged in mobile games, they can interact with others and find entertainment, which subsequently generates flow experiences that lead to behavioural intentions for entertainment and recreation and is conducive to users continuing to play the game. What is worth investigating is the fact that social interaction had a positive influence on behavioural intention. As the Internet and mobile devices have increased in popularity, mobile games have become a mainstream form of recreation and entertainment. Pokémon GO not only allows its users to collect Pokémon; it also offers a social platform for players to interact with their families and friends. Challenges at different levels enable the maintenance of relationships and the potential for developing new relationships, which promotes a player's behavioural intention to continue playing the game. Interactions in the game also enable players to discuss topics of mutual interest. These findings explain why social interaction is an indispensable element for social mobile games and can serve as a reference for mobile game producers to formulate marketing strategies.

Similar to other researches, there are several limitations in this study which deserve future effort to address. Regarding the application of new technology, there are still many constructs that may affect actual use behaviours that were not included in the present study. Future studies may include other influential factors for investigation. This study used an online questionnaire to conduct purposive sampling; therefore, the source of sample acquisition may be limited. Future studies can conduct research with samples that are larger in size and more random. They can also consider adopting qualitative methods such as observation methods and interviews to examine the associated topics to further elucidate player perceptions of mobile gaming. Furthermore, to discuss the behavioural intentions of different groups toward mobile games can make the research results more objective and comprehensive.

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