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Motives to Play a Mobile Location-Based Augmented-Reality Game of Non-Adopters: The Case of Pokémon Go

(Full Paper)

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ABSTRACT

The fast development of technologies such as Location-Based Service (LBS) and Augmented-Reality (AR) change the mobile game industry. Pokémon Go is a well-known location-based AR game. Few previous studies have studied the Pokémon Go's acceptance, but not with the non-adopters. The purpose of this paper is thus to apply the established theory, Technology Acceptance Theory (TAM), together with other potential determinants both the supporting and barrier factors to examine the intention to play the game of non-adopters. This work develops a research model including 6 factors: perceived enjoyment, subjective norms, privacy concerns, perceived ease of use, and perceived usefulness, and intention to play Pokémon Go and 12 hypotheses. Data were collected from 215 samples who were full-time students or full-time employees. Confirmatory factor analysis and structural equation modeling were applied to test the measurement model and proposed research model. Intention to play of non-players is directly enhanced by perceived enjoyment, perceived usefulness, and subjective norms. Privacy concerns indirectly influence intention to play via perceived usefulness. Subjective norms affect perceived ease of use, perceived enjoyment, and perceived usefulness respectively. Enjoyment and subjective norms also have indirect impacts on playing intention. The findings provide the guidelines to design for location-based AR game developers and the suggestions for the game providers. This study is one of few studies applying the TAM to location-based AR games and non-adopters. This work also incorporates meaningful factors that could explain the substantial changes in non-adopters' motives to play. Findings yield the contrary results in the context of Pokémon Go in Thailand, contributing to the literature of location-based AR games.

Keywords: Mobile gaming, augmented reality, location-based, Pokémon Go, technology acceptance theory, non-adopters, pre-adoption.

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INTRODUCTION

The development of mobile gaming technologies such as Augmented Reality (AR) and Location-Based Service (LBS) and the advance of wireless mobile networks enable opportunities for the mobile game industry (Ghazali, Mutum, & Woon, 2019). AR technology is a technique to show virtual content or objects superimposed upon the real world (Ghazali et al., 2019; Rauschnabel, Rossmann, & tom Dieck, 2017). In mobile games, it enables players to interact with physical environments during the gameplay (Jang & Liu, 2019). One of the new and disruptive markets is AR gaming (Lee, Chiang, & Hsiao, 2018; Rauschnabel et al., 2017). AR combines real and virtual objects in a real environment and runs them interactively to improve the user experience (Harborth & Pape, 2017; Rauschnabel et al., 2017; Shiau, Huang, & Cheng, 2017). LBS is another technology that applies location data from the Global Positioning System (GPS) to provide users various localized and personalized information services such as nearby places (Oh, Park, & Min, 2019). It changes gameplay from an indoor activity to encourage players to play outdoors, reinforce a player's sense of place, and create new social constructs for space, place, and territories (S. S. Wang & Hsieh, 2018). LBS offers convenience to users regarding customized information, but it can become a source of concern for new or experienced LBS users too (Oh et al., 2019). When AR is integrated with LBS, location-based AR games have the potential to immerse players into real environments by using their geolocation and mobility to fulfill local tasks (Jang & Liu, 2019; S. S. Wang & Hsieh, 2018). Unlike video games, location-based AR games enhance spatial exploration and interaction among players such as strangers or acquaintances (Jang & Liu, 2019; F.-Y. F. Wei & Wang, 2019).

Pokémon Go is a location-based AR game developed by Niantic for mobile devices. It has been adopted fastly by a vast number of players during the first two weeks after its launch in 2016 (Harborth & Pape, 2017; Jang & Liu, 2019; Shiau et al., 2017). It is also ranked as the most downloaded game app in Apple App Store and the Google Play Store in 2016 (Ghazali et al., 2019; Harborth & Pape, 2017; Lee et al., 2018; Shiau et al., 2017). Pokémon Go transforms places in the physical world such as landmarks into virtual places e.g. "PokeStops" and "Gyms". It is designed to encourage players to perform physical activities, for instance, catching creatures called "Pokémon" to complete the entries in the Pokedex or walking around the area to encounter randomly appearing Pokémon in real-world locations (Jang & Liu, 2019; Lee et al., 2018; Rauschnabel et al., 2017; S. S. Wang & Hsieh, 2018). However, public reactions to Pokémon Go are intense and mixed. Supporters mention the potential of the game to promote physical activities such as exercises, whereas critics raise fears of accidents or distractions when playing while driving and threats to users' privacy (Rauschnabel et al., 2017; F.-Y. F. Wei & Wang, 2019).

Recent AR games create worldwide interests in the opportunities of AR game type, but consumer research in this domain is scarce (Rauschnabel et al., 2017). Therefore, technology acceptance research is needed to foster an understanding of how AR could fit an individual's daily life (Harborth & Pape, 2017). The Technology Acceptance Model (TAM) is a model developed to explain an individual's acceptance of Information Technology (IT) in the information systems (IS) fields. It can also be applied to understand a user's motivation and purpose to accept entertainment technology such as online games and social games (Hasan, Linger, Chen, Lu, & Wang, 2016; Yoon, Duff, & Ryu, 2013). However, few studies have been extended the application of TAM to location-based AR games. Little research has explored technology acceptance factors of Pokemon Go (Harborth & Pape, 2017). Moreover, only TAM may not sufficient to explain usage behaviors in the LBS context. It is necessary to add factors suitable for this specific context (Oh et al., 2019).

Pokemon Go affects the cognition and emotions of users in various ways (Shiau et al., 2017). Yet, little attention has been paid to factors that might facilitate players' enjoyment (S. S. Wang & Hsieh, 2018). Perceived enjoyment has a large impact on online game users' intention/ behavior, but how to enhance users' enjoyment and use of games has not been investigated adequately, particularly the game enjoyment and the social perspective (Hasan et al., 2016). Both benefits, risks, and social influences should be evaluated from the view of AR game players. Established theories are limited in the application to AR games because most of them neglect the risks that consumers incorporate in their decision making such as privacy risks (Rauschnabel et al., 2017). Privacy concern also affects a user's intention to use LBS and location-based Social Networking Services (SNSs) (Zhou, 2013).

LBS has not been widely used by consumers (Zhou, 2013). Also, many of the existing AR studies have focused on the behavior of users interacting with the technology or user behavior at the early stage (Harborth & Pape, 2017; Jang & Liu, 2019), so most research is conducted with adopters (game players) rather than non-adopters. Focusing on AR game users, but not non-users is also one of the limitations mentioned in the previous AR study (Rauschnabel et al., 2017). Several Pokemon Go's players have been lost, showing the decline of the game after its one-year release (Jang & Liu, 2019; Lee et al., 2018). Thus, the success of existing mobile games such as Pokemon Go and future mobile games depend on engaging more (new) players (Ghazali et al., 2019). Besides, many AR studies have a common sample bias towards some user groups such as younger males with a high level of education or college students not across the general population (Harborth & Pape, 2017; Shiau et al., 2017).

Therefore, the research purposes of this study are as follows. First, this study investigates the Pokemon Go non-adopters (non-players)' intention to play the game and their perceptions (perceived usefulness and perceived ease of use) according to the established TAM theory. Second, this study adds a social influence factor (subjective norms) and a risk-related factor (privacy concerns) to the TAM and examines the direct and indirect effects of these factors on non-players' intention to play the game. Third, this study includes an emotional factor (perceived enjoyment), investigates its direct and indirect influence on non-players' intention to play the game, and explores the impact of subjective norms and perceived ease of use on the perceived enjoyment, which has been relatively rarely investigated in the previous studies. Also, to decrease the bias of sample characteristics, this study collects data from non-players both in studying age and working age. Few studies explore the Pokemon Go adoption in Southeast Asian environments such as Thailand. To my knowledge, thus, this research is the first to investigate the location-based AR game adoption and corresponding perception of non-adopters of Pokemon Go in Thailand. The research findings could contribute new knowledge to the scant literature related to location-based AR gaming from Thai mobile users' perspectives.

LITERATURE REVIEW

Rauschnabel et al. (2017) developed a comprehensive framework incorporating Uses and Gratification Theory (U>), technology acceptance, risk research, and flow theory to explain the drivers of gaming continuance and willingness to conduct in-app purchases. Findings showed that hedonic, emotional, and social benefits, and social norms drove consumer reactions, but physical risks impeded consumer reactions (Rauschnabel et al., 2017). Harborth and Pape (2017) explored the technology acceptance factors of Pokemon Go in Germany. Results pointed out that hedonic motivation (fun and pleasure) was the strongest driver of behavioral intention to play the game. Effort expectancy and habit yielded medium-sized effects on behavioral intention (Harborth & Pape, 2017). Shiau et al. (2017) conducted the study on the cognition and the consistency between emotions and the integration of Pokemon Go and reality using the Stimulus-Organism-Response (S-O-R) model. Findings indicated that information quality and virtual features significantly impacted the cognitive and emotional fit of users. The emotional fit had a significant effect on user satisfaction (Shiau et al., 2017). Kim, Lee, Cho, Kim, and Hwang (2018) explored the playing of Pokemon Go and the increase in players' physical activity. Results showed that self-efficacy (the will to exercise) insignificantly affected attitude towards the game and playing the game enhanced physical activity subconsciously and effectively (Kim et al., 2018). S. S. Wang and Hsieh (2018) examined the complexity of the link between Pokemon Go playing experience and players' affection towards their physical surroundings. Findings showed that perceived realism in terms

of simulational realism, freedom of choice, integrated presence, and perceptual pervasiveness positively related to game enjoyment. Co-presence significantly increased game enjoyment, while perceived crowding decreased game enjoyment (S. S. Wang & Hsieh, 2018). Lee et al. (2018) examined the drivers of Pokemon Go's stickiness in Taiwan. A conceptual model to investigate its antecedents was developed based on flow theory and satisfaction. Results pointed out that flow and satisfaction had strong and direct impacts on the game's stickiness. Age, gender, platform, game experience, and in-app expenses also significantly influenced the stickiness. Telepresence, challenge, perceived control, curiosity, and concentration directly affected the flow, whereas perceived currency and responsiveness directly caused players' satisfaction (Lee et al., 2018).

Jang and Liu (2019) collected data from the Pokemon Go's players to explore the effects of gratifications and other contributing factors on continuance intention to play the game. Findings showed that content gratification in terms of catching Pokemon, process gratification in terms of entertainment, game knowledge, and achievement enhanced players' continuance usage intention (Jang & Liu, 2019). Ghazali et al. (2019) (tried to identify the antecedents of players' continuance intention to play Pokemon Go and their in-app purchases. Results from Malaysia showed that enjoyment, network externalities, community involvement, and the need-to-collect increased the players' continuance intention. Flow and nostalgia also indirectly drove their continuance intention, which finally influenced their purchase intention (Ghazali et al., 2019). K.-L. Hsiao, Lytras, and Chen (2019) investigated determinants of intention to purchase in Pokemon Go from players in Taiwan. The strong and direct predictors of in-app purchase intention were perceived value and satisfaction. Flow, design aesthetic, social self-expression, and good price directly impacted players' perceived value, while design aesthetic, reward, and the perceived value directly influenced their satisfaction (K.-L. Hsiao et al., 2019). F.-Y. F. Wei and Wang (2019) explored the relationships between the gaming activities of Pokemon Go's players, their willingness to communicate, and their likelihood to participate in exercises. Results pointed out that playing the game could increase the likelihood that players would engage in exercises. There was also a positive relationship between exercises during the gameplay and players' willingness to communicate with others (F.-Y. F. Wei & Wang, 2019). Shin (2019) explored the game-playing experience and its impacts on attitude towards AR games and satisfaction with the game. Findings showed that confirmation affected satisfaction together with hedonism and utility. Confirmation was driven by the quality factors that were immersion, flow, and presence (Shin, 2019).

HYPOTHESES AND RESEARCH MODEL

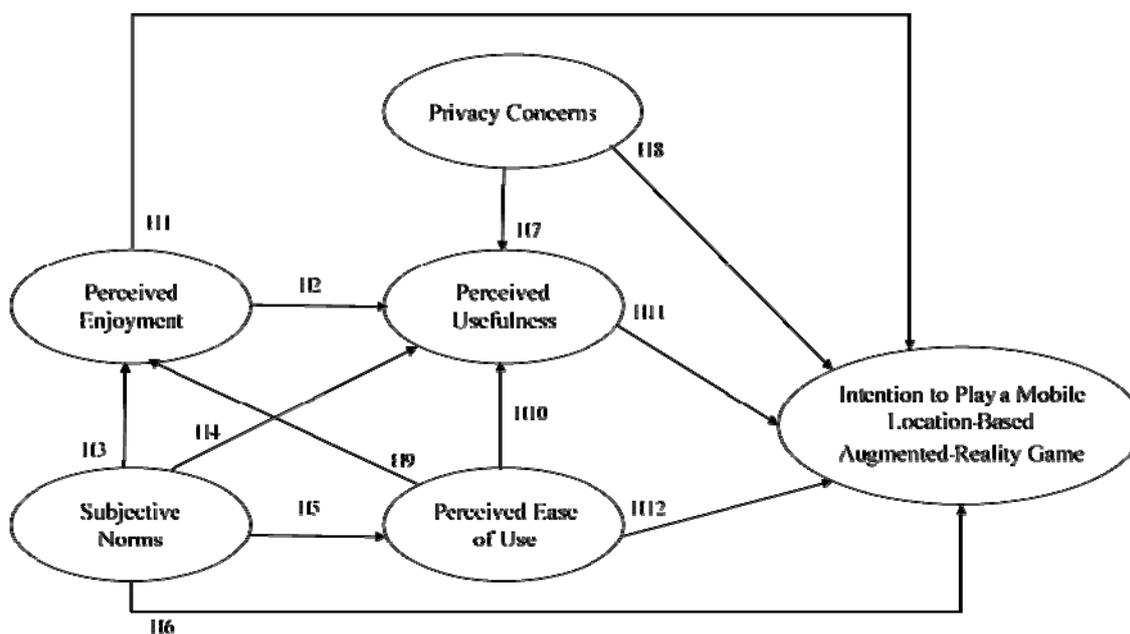


Figure 1: Research model

Figure 1 presents the research model and the proposed hypotheses.

Perceived Enjoyment

Enjoyment refers to the degree to which conducting an activity is perceived as fun and pleasurable in its rights (Ghazali et al., 2019; Hasan et al., 2016). Perceived enjoyment is an intrinsic motivation for online game playing (C.-C. Hsiao & Chiou, 2012; Park, Baek, Ohm, & Chang, 2014; Xu, 2014). Intrinsic motivation is the pleasure and entertainment of conducting a behavior (Hasan et al., 2016). Entertainment is a part of process motivation. It is a strong determinant of intention to play online games and players' intention to continue playing Pokemon Go (Jang & Liu, 2019). Perceived enjoyment is a type of hedonic value influencing a person's attitude and intention to use IT. Hedonic experience is a significant driver of attitude towards playing an online game, Massively Multiplayer Online Game (MMOG), and SNSs (Hasan et al., 2016; C.-C. Hsiao & Chiou, 2012; H.-H.

Lin, Wang, & Chou, 2012). Hedonic outcome expectations e.g. enjoyment from use experience significantly raise continuance intention to play online games (Chang, Liu, & Chen, 2014). Enjoyment is also a part of the flow, which happens when individuals are fully immersed in an activity and enjoying the experience, e.g. flow experience from social media usage (Lee et al., 2018). Flow significantly increase the confirmation of AR games (Shin, 2019). According to literature studies, perceived enjoyment is a strong predictor of users' behavioral intention in various online environments such as blog usage, users' engagement in m-commerce activities, online games (Ghazali et al., 2019) and a determinant of playing loyalty in the mobile game context (Lee et al., 2018). Perceived enjoyment significantly influences attitude towards the mobile game and online games, which significantly positively drive its intention/ actual behavior to play the games (Alzahrani, Mahmud, Ramayah, Alfarraj, & Alalwan, 2017; Hamari & Keronen, 2017; Liu & Li, 2011; Yoon et al., 2013). Perceived enjoyment of mobile gaming from students in South Africa is significantly related to their attitude towards mobile gaming that later significantly impacts students' mobile gaming continuance intention (Chinomona, 2013). It also significantly enhances attitude towards playing Mobile Broadband Wireless Access (MBWA) games (Ha, Yoon, & Choi, 2007). Perceived enjoyment has a significant positive effect on attitude towards mobile AR gameplay, which has a significant and positive effect on the intention to continue playing AR games (Rauschnabel et al., 2017). Perceived enjoyment has a significant and positive effect on a user's intention to use advanced mobile services (Verkasalo, López-Nicolás, Molina-Castillo, & Bouwman, 2010). It also increases users' intention to play games (Hamari & Keronen, 2017), physical tennis games (H.-H. Lin et al., 2012), online game (Yoon et al., 2013), social games (Hasan et al., 2016), Social Networking Games (SNG) (Park et al., 2014; Xu, 2014), and mobile games (Merikivi, Tuunainen, & Nguyen, 2017). Enjoyment significantly positively affects continuance intention to play Pokemon Go, which significantly positively impacts in-app purchase intention (Ghazali et al., 2019). Perceived enjoyment significantly enhances actual online game playing as well (Alzahrani et al., 2017). Thus, the following hypothesis is formulated:

Hypothesis 1. There is a positive relationship between perceived enjoyment and intention to play a mobile location-based augmented-reality game.

Emotional fit has a significant impact on game players' satisfaction (Shiau et al., 2017). The pleasure of using AR games significantly improve users' satisfaction (Shin, 2019). Perceived enjoyment has been found to be a significant determinant of various IT innovations such as mobile games. It is also an important driver of the use of hedonic systems (Liu & Li, 2011). Enjoyment and perceived usefulness are strongly related in various game contexts (Hamari & Keronen, 2017). Literature research found that perceived enjoyment as an intrinsic motivation has a positive impact on perceived usefulness as an extrinsic motivation (Liu & Li, 2011; S. S. Wang & Hsieh, 2018). Perceived enjoyment significantly increase perceived usefulness in mobile games under the mobile broadband wireless access environment (Ha et al., 2007). It significantly enlarges the perceived usefulness of mobile games as well (Liu & Li, 2011). Thus, the following hypothesis is offered:

Hypothesis 2. There is a positive relationship between perceived enjoyment and perceived usefulness.

Subjective Norms

Social factors profoundly affect users' behavior. Social influence is vital for shaping an individual's behavior. For example, social norms as one of the social influences affect players' attitude and intention in online games. Social influence is proposed as a moderator of the association between player-technology fit and enjoyment (Fang & Zhao, 2010). Social norms are also called as subjective norms or social influence (Verkasalo et al., 2010). Subjective norms are an influential person supporting or objecting behaviors, which impacts an individual's cognition (H.-Y. Lin & Chiang, 2013). Social norms have a significant and positive impact on perceived enjoyment in advanced mobile services (Verkasalo et al., 2010). Social interaction is a factor determining the enjoyment of players, which in turn significantly affects players' intention to play (Ghazali et al., 2019). Social supports in SNG help players fulfilling their needs and allowing good times to be shared with others. This could increase the players' enjoyment. Social interaction significantly positively impacts enjoyment received from Pokemon Go (Ghazali et al., 2019) and social games (Hasan et al., 2016). Accordingly, the following hypothesis is proposed:

Hypothesis 3. There is a positive relationship between subjective norms and perceived enjoyment.

An individual's behavior is driven by the extent to which he/ she believes other people's opinions that he/ she has to, will be, and able to use technology (Verkasalo et al., 2010). Social value significantly influences the overall perceived value in Pokemon Go (K.-L. Hsiao et al., 2019). According to literature research, social norms or subjective norms have a direct influence on perceived utility. In TAM-II, they are also assumed to have a direct impact on Perceived Usefulness (PU) and an indirect impact on people's intention via PU, for instance, in the context of advanced wireless Internet (H.-Y. Lin & Chiang, 2013; Verkasalo et al., 2010). Social norms are proposed to positively relate to perceived usefulness in online games (H.-Y. Lin & Chiang, 2013). They also significantly increase the perceived usefulness of advanced mobile services (Verkasalo et al., 2010) and online games (Fan, Gu, Suh, & Lee, 2012). A person's behavior and thinking are influenced by others such as

friends, family, and colleagues. An individual who has less knowledge and experience about specific technology would more heavily rely on people around them (Fan et al., 2012). According to the Diffusion of Innovation (DOI) theory, early majority adopters could be persuaded to use an innovation by providing them the evidence of the system's effectiveness and success stories from opinion leaders. Late majority adopters believe when many people have tried and used an innovation successfully, while laggards need the demonstration of innovation and pressure from their peers and other adopters (Stair & Reynolds, 2017). Hence, the following hypotheses are examined:

Hypothesis 4. There is a positive relationship between subjective norms and perceived usefulness.

Hypothesis 5. There is a positive relationship between subjective norms and perceived ease of use.

According to the Theory of Reasoned Action (TRA), a person's intention is influenced by his/ her subjective norms and attitude (Harborth & Pape, 2017; Hasan et al., 2016). A large number of literature studies confirm that social norms positively affect the use of technology and media (Rauschnabel et al., 2017). Most Pokemon Go players (74 percent) prefer playing the game with others such as friends or acquaintances more than playing alone, so social gratification of a mobile AR game is proposed to positively impact players' intention to continue playing the game (Jang & Liu, 2019). Social norms are proposed to have a positive effect on behavioral intention in the context of Pokemon Go (Harborth & Pape, 2017). Social norms have significant influences on intention to use LBS (Mao & Zhang, 2014; Zhou, 2012), behavioral intention to play online games (H.-Y. Lin & Chiang, 2013), user's intention to play online games (Fan et al., 2012), continuance intention to play online games (Chang et al., 2014), continuance intention to play SNG (Xu, 2014), user's intention to play social games (Hasan et al., 2016), intention to continue playing Pokemon Go, in-app purchase intention (Rauschnabel et al., 2017), mobile SNS continuance usage in China (Zhou & Li, 2014), actual online game playing (Alzahrani et al., 2017). Therefore, the following hypothesis is offered:

Hypothesis 6. There is a positive relationship between subjective norms and intention to play a mobile location-based augmented-reality game.

Privacy Concerns

The perceived risk significantly negatively associates with the perceived usefulness of LBS (Oh et al., 2019). Privacy risk is the potential losses from personal information disclosure by third parties without users' knowledge. Privacy risk could affect perceived usefulness and lower users' expectations toward future outcomes, decreasing perceived utility. Literature research indicates that perceived risk decreases the performance expectancy of mobile banking. Privacy risk significantly negatively impacts the perceived usefulness of LBS (Zhou, 2013). Perceived privacy in terms of collection, error, unauthorized second use, and improper access is related to the perceived usefulness of LBS (Junglas & Spitzmuller, 2005). Many mobile and online games force their players to disclose personal information before gameplay and collect meta-information such as the IP address of players. Location-based mobile games are susceptible to fear of privacy risks. Accessing personal and meta-information could induce privacy concerns among users and negatively affect the value of games (Hamari, Malik, Koski, & Johri, 2019). The majority of Internet users (more than 50 percent) express their concerns with information privacy (Mousavizadeh & Kim, 2015). Privacy concerns represent an individual's perception of how his/ her personal information is being used. Privacy concerns have an indirect effect on user behavior through perceived usefulness as a mediator (Ofori, Larbi-Siaw, Fianu, Gladjah, & Boateng, 2016). Based on the preceding supports, the following hypothesis is presented:

Hypothesis 7. There is a negative relationship between privacy concerns and perceived usefulness.

Privacy risk is proposed to negatively affect attitude towards playing Pokemon Go (Rauschnabel et al., 2017). Privacy risk significantly negatively associated with the continuous usage intention of LBS because disclosing personal information by LBS could bring users uncertainty and potential losses (Zhou, 2013). Literature studies indicate that privacy concerns are one of the biggest obstacles to Internet use (Zhao, Lu, & Gupta, 2012). Privacy concerns are proposed to be negatively related to usage intention of LBS (Zhou, 2012) and the reuse intention of Pokemon Go (Hamari et al., 2019). Specific Concerns for Information Privacy (CFIP), general CFIP, and perceived privacy risk are proposed to have a negative impact on the intention to provide information for transactions (Li, 2011). Concerns for information privacy is proposed to negatively affect intention to use LBS (Mao & Zhang, 2014). Privacy concerns significantly negatively link to disclose location-related information in LBS usage (Zhao et al., 2012), continuance usage of mobile SNS (Zhou & Li, 2014), and continuance usage of LBS (Zhou, 2016). Hence, the following hypothesis is given:

Hypothesis 8. There is a negative relationship between privacy concerns and the intention to play a mobile location-based augmented-reality game.

Perceived Usefulness And Perceived Ease Of Use

Perceived ease of use is the degree that a user of a specific technology feels free from engaging in mental and physical efforts. Literature research supports the positive relationship between perceived ease of use and enjoyment such as in the contexts of mobile services, mobile games, and Internet services. There is also a positive association between intrinsic motivation i.e. enjoyment and perceived ease of use in the self-efficacy theory (Park et al., 2014). Self-efficacy indirectly affects perceived enjoyment through perceived ease of use (L. Wei & Zhang, 2008). Perceived ease of use is strongly related to the enjoyment of games (Hamari & Keronen, 2017). Perceived ease of use significantly positively impacts perceived enjoyment of the Internet (L. Wei & Zhang, 2008), Mobile Social Networking Games (M-SNGs) (Park et al., 2014), mobile games (Ha et al., 2007; Merikivi et al., 2017), and Pokemon Go (Kim et al., 2018). Mobile games, which are perceived as difficult to use, could make a user's time does not pass enjoyable (Ha et al., 2007; Merikivi et al., 2017). Students feel less enjoyment if using the Internet is too difficult for them too (L. Wei & Zhang, 2008). Moreover, perceived ease of use has a positive influence on perceived enjoyment in hedonic systems and physical tennis games (H.-H. Lin et al., 2012). Therefore, the following hypothesis is developed:

Hypothesis 9. There is a positive relationship between perceived ease of use and perceived enjoyment.

Attitude towards playing Pokemon Go and behavioral intention to continue playing the game and conduct in-app purchases are expected to be driven by benefits such as hedonic benefit and emotional benefit (Rauschnabel et al., 2017). Utilitarian outcome expectations significantly increase continuance intention to play online games (Chang et al., 2014). Utility while using AR games significantly enhances players' satisfaction (Shin, 2019). Users with high cognitive absorption may agree with the positive association between technology usefulness and willingness to engage in new technology (Chang et al., 2014). Perceived usefulness significantly positively affects attitude towards playing online games, which significantly positively impacts the intention to play online games (Yoon et al., 2013). Playing intention of games such as online games is significantly driven by perceived usefulness (Fan et al., 2012; Hamari & Keronen, 2017; H.-Y. Lin & Chiang, 2013). Perceived usefulness significantly positively affects intention to use LBS (Mao & Zhang, 2014), continuance usage of LBS (Zhou, 2013), and LBS app connectedness (Oh et al., 2019). Students' perceived mobile games easy to play are significantly positively related to their continuance intention to play mobile games in South Africa (Chinomona, 2013). Perceived ease of use is proposed to positively influence attitude towards playing online games (Yoon et al., 2013). Perceived ease of use of M-SNGs and mobile game significantly raise users' attitude towards the games, which later significantly enhance users' intention to use the games (Liu & Li, 2011; Park et al., 2014). Perceived ease of use directly influences behavioral intention to play online games (Fan et al., 2012; H.-Y. Lin & Chiang, 2013) and location-based services (Mao & Zhang, 2014). According to TAM, behavioral intention is influenced by an individual's attitude towards using technology, perceived usefulness, and perceived ease of use. Subjective perceptions regarding a system's ease of use directly influence a person's overall attitude and perceived usefulness as well (Harborth & Pape, 2017). Perceived ease of use is proposed to be a positive driver of the perceived usefulness of mobile games (Liu & Li, 2011) and online games (Yoon et al., 2013). Perceived ease of use is significantly positively related to perceived usefulness of online games (Fan et al., 2012; H.-Y. Lin & Chiang, 2013), mobile games under Mobile Broadband Wireless Access (MBWA) environment (Ha et al., 2007), and LBS application (Oh et al., 2019). Perceived ease of use has a high path coefficient between it and perceived usefulness (Hamari & Keronen, 2017). As such, the following hypotheses are posited:

Hypothesis 10. There is a positive relationship between perceived ease of use and perceived usefulness.

Hypothesis 11. There is a positive relationship between perceived usefulness and intention to play a mobile location-based augmented-reality game.

Hypothesis 12. There is a positive relationship between perceived ease of use and intention to play a mobile location-based augmented-reality game.

METHOD

Research Instrument Development

A survey was conducted to test the proposed model since the survey method is best for obtaining personal and social facts, beliefs and attitudes, and could expand the application of research findings (Kerlinger, 1973). An online questionnaire, written in Thai, was developed to collect data. The questionnaire contained the following sections: a section describing about the target samples and the definitions of LBSs and the description about Pokémon Go, a section exploring game perceptions i.e. perceived enjoyment, subjective norms, perceived usefulness, and perceived ease of use, a section investigating privacy concerns, and a section about participants' demographic characteristics, the frequency of using mobile Internet, and game preferences. Measurement items were adapted from previous research to measure the constructs to enhance the validity of the construct measures. Some items were reworded to fit the mobile location-based AR game (Pokemon Go) context. The example of measurement items and sources for each construct were described in Table 1. All items were assessed using a five-point

Likert scale. Generally, other variables such as age, gender, education, and so on were measured using a single-item measure. According to the initial assessment of the measurement model e.g. factor analysis, two items were used to measure each construct. Ultimately, twelve items were retained for further analysis with good internal consistency. All factors' Cronbach's α were ranging from 0.857 to 0.970.

Table 1: Construct and sources.

Construct	Example Item	Sources
Perceived enjoyment	Please rate your perceptions regarding these sentences (1 – strongly disagreed 5 – strongly agreed): I would have fun playing this game.	(Chong, 2013; H. -Y. Wang, Liao, & Yang, 2013)
Subjective norms	Please rate your perceptions regarding these sentences (1 – strongly disagreed 5 – strongly agreed): People or peers important to me would support my play of this game.	(Hsu, Chang, Lin, & Lin, 2015; Pihlström, 2008; H. -Y. Wang et al. , 2013)
Privacy concerns	In general, please indicate your concerns regarding that your personal information can become available to someone without your knowledge. (1 - not at all concerned 5 - extremely concerned)	(Ho, Chen, & Luo, 2015; Krasnova & Veltri, 2010)
Perceived usefulness	Please rate your perceptions regarding these sentences (1 – strongly disagreed 5 – strongly agreed): I would find this game useful in my life.	(Chong, 2013; Oghuma, Libaque-Saenz, Wong, & Chang, 2016; H. -Y. Wang et al., 2013)
Perceived ease of use	Please rate your perceptions regarding these sentences (1 – strongly disagreed 5 – strongly agreed): I would find it easy to control this game to do what I want it to do, not require a lot of effort.	(Huang & Liao, 2015; Yongqiang Sun, Wang, Shen, & Zhang, 2015; YY Sun, Zhao, Jia, & Zheng, 2015)
Intention to play	Please rate your perceptions regarding these sentences (1 – strongly disagreed 5 – strongly agreed): I have the intention to play this game in the future.	(Ho et al., 2015; Pihlström, 2008; Turel, Serenko, & Bontis, 2010)

Data Collection And Samples

This study is a sub-project of a project titled POKEMON GO. The data were gathered using a non-probability quota sampling method using an online survey. The online survey was deemed appropriate to access the target samples because of the nature of online mobile games (Ghazali et al., 2019). As this study concerns the perceptions of non-adopters, the targeted respondents were current non-players of Pokemon Go. Harborth and Pape (2017) emphasize that several AR studies include only students as participants or young males with a high level of education. This could limit the validity of the findings and generate drawbacks. To decrease a common sample bias of AR studies in the literature and to increase the generalization of findings to various non-adopter groups, this study collected data from both full-time students (age less than or equal 25 years old) and full-time employees (age more than or equal 20 years old) who did not play Pokémon Go. The online survey was distributed to participants by the research assistant team. A total of 215 questionnaires were collected (108 full-time students and 107 full-time employees as non-adopters) and were ready for further analysis. The sample size was exceeded than the rule of thumb of 5 respondents per variable (Bentler & Chou, 1987).

RESULTS

Demographics Of The Respondents

Descriptive statistics of respondents are presented in Table 2. For gender breakdown, 43.3 percent of the respondents were male and 56.7 percent were female. For the studying-age non-players, 46.3 percent of them were male, whereas 53.7 of them were female. For the working-age non-players, 40.2 percent of them were male, while 59.8 percent of them were female. The average age of all respondents was 26 years old. The average age of the non-playing student group was 21 and the average age of the non-playing employee group was 31. The gender breakdown was different from the study of Ghazali et al. (2019), Shiau et al. (2017), and Lee et al. (2018) regarding Pokemon Go in terms of the proportion of males and females, but the respondents' ages were quite similar to the study of Ghazali et al. (2019) and Lee et al. (2018) in terms of overall samples and the study of (Shiau et al., 2017) in terms of non-player student group. The distribution of gender in this study was also conformed to the study of Harborth and Pape (2017) regarding Pokemon Go, which the players in their study were mainly women. In the study of Harborth and Pape (2017), the age distribution of players was quite skewed, with more younger users, but the age of respondents was quite distributed from studying age to working age in this study. All respondents in this study

mainly received or studied in the Bachelor's degree (74.9 percent of all non-players, 93.5 percent of studying-age non-players, and 56.1 percent of working-age non-players, conforming to the study of Lee et al. (2018) particularly the student group. Non-players used mobile Internet normally 8 hours per day and averagely 6-7 days per week. The most favorite game type that overall non-players playing was Action/ Adventure/ Arcade (40.9 percent). Top-three game types played by full-time students were Action/ Adventure/ Arcade, Educational, and Role Playing/ Simulation/ Strategy respectively, whereas top-three game types played by full-time employees were Action/ Adventure/ Arcade, Role Playing/ Simulation/ Strategy, and Sports/ Racing.

Table 2: Participants demographics.

Demographic Characteristics	Full-time Students	Full-time Employees	All Participants
	N (%)	N (%)	N (%)
Gender			
Male	50 (46.3%)	43 (40.2%)	93 (43.3%)
Female	58 (53.7%)	64 (59.8%)	122 (56.7%)
Total	108	107	215
Average Age	21	31	26
Education (Studying/ Received)			
Lower than Bachelor Degree	7 (6.5%)	7 (6.5%)	14 (6.5%)
Bachelor Degree	101 (93.5%)	60 (56.1%)	161 (74.9%)
Master Degree	0 (0.0%)	39 (36.4%)	39 (18.1%)
Doctoral Degree	0 (0.0%)	1 (0.9%)	1 (0.5%)
Total			
Average Amount of Using Mobile Internet (hours/ day)	8	8	8
Average amount of Using Mobile Internet (days/ week)	6	7	7
Other Game Types Playing			
Action/ Adventure/ Arcade	40 (37.0%)	48 (44.9%)	88 (40.9%)
Board/ Card/ Casino	7 (6.5%)	21 (19.6%)	28 (13.0%)
Educational	38 (35.2%)	20 (18.7%)	58 (27.0%)
Music	12 (11.1%)	15 (14.0%)	27 (12.6%)
Sports/ Racing	32 (29.6%)	26 (24.3%)	58 (27.0%)
Role Playing/ Simulation/ Strategy	33 (30.6%)	38 (35.5%)	71 (33.0%)
Trivia/ Word/ Puzzle	31 (28.7%)	24 (22.4%)	55 (25.6%)
Total	108 (100.0%)	107 (100.0%)	215 (100.0%)

Confirmatory Factor Analysis

Table 4 presents the means and standard deviations of the constructs. Privacy concerns had the highest mean, whereas perceived usefulness had the lowest standard deviation. Because the respondents were non-adopters, intention to play had the lowest mean. In terms of supporting factors, perceived ease of use, subjective norms, and perceived enjoyment had greater means and higher standard deviations, compared to perceived usefulness. This showed that non-players had a lower interest to play the game, although they perceived that the game was easy to play. Non-players were concerned about privacy as well. The data were firstly processed by evaluating internal consistency, reliability, convergent validity, and discriminant validity and conducting a confirmatory factor analysis to validate the measurement model.

In terms of internal consistency and reliability, Internal Consistency Reliability (ICR) (measurements which were Cronbach's α and the Composite Reliability (CR) were assessed. The value of both measurements should be above the acceptable reliability threshold of 0.7 and 0.8, satisfying ICR (Fornell & Larcker, 1981; Harborth & Pape, 2017). As shown in Table 3, Cronbach's alpha values and CR values of all constructs were above the acceptable thresholds. Considering convergent validity, it showed the effectiveness of questionnaire items that reflected corresponding factors (Lee et al., 2018). Factor loadings of all indicators were greater than 0.8, exceeding the ideal threshold of 0.7 (Fornell & Larcker, 1981; Hair & Tatham, 1998; Shiau et al., 2017). The Average Variance Extracted (AVE) of all constructs were ranging from 0.751 to 0.942. They had higher values than the acceptable threshold of 0.5, which indicated that the construct explains at least half of the variance of the indicators, ensuring convergent validity (Fornell & Larcker, 1981; Harborth & Pape, 2017; Lee et al., 2018). Discriminant validity was evaluated by the approach that the square root of the AVE of a single construct should be larger than the correlation with other constructs (Fornell & Larcker, 1981). Table 3 showed that all values of the square root of the AVE on the diagonal were larger than the correlations with other constructs, demonstrating discriminant validity. Confirmatory factor analysis was applied to test the measurement model to assess the model fit of the research data. The following fit indicators were explored: the ratio of Chi-square statistics to degree of freedom (χ^2/df), Goodness of Fit (GFI), Adjusted Goodness of Fit (AGFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized (Root Mean Square Residual) (SRMR). Table 5 presented the test results, which demonstrated that all fit indices exceeded the suggested thresholds. Therefore, it could be concluded that the model fitted the data well.

Table 3: Results of the confirmatory factor analysis.

Construct	Average Variance Extracted	Composite Reliability	Cronbach's Alpha
Perceived enjoyment	0.877	0.934	0.932
Subjective norms	0.769	0.869	0.862
Privacy concerns	0.916	0.956	0.954
Perceived usefulness	0.768	0.869	0.866
Perceived ease of use	0.751	0.858	0.857
Intention to play	0.942	0.970	0.970

Table 4: Correlation matrix for latent constructs.

Construct	Mean, SD	ENJOY	SN	PRIVACY	PU	PEOU	INT_PLAY
Perceived enjoyment	2.27, 1.16	0.936					
Subjective norms	2.50, 1.23	0.543	0.877				
Privacy concerns	3.42, 1.33	0.167	0.326	0.957			
Perceived usefulness	1.96, 0.94	0.690	0.511	0.039	0.876		
Perceived ease of use	2.98, 1.14	0.616	0.566	0.306	0.531	0.867	
Intention to play	1.72, 1.05	0.685	0.567	0.132	0.672	0.383	0.971

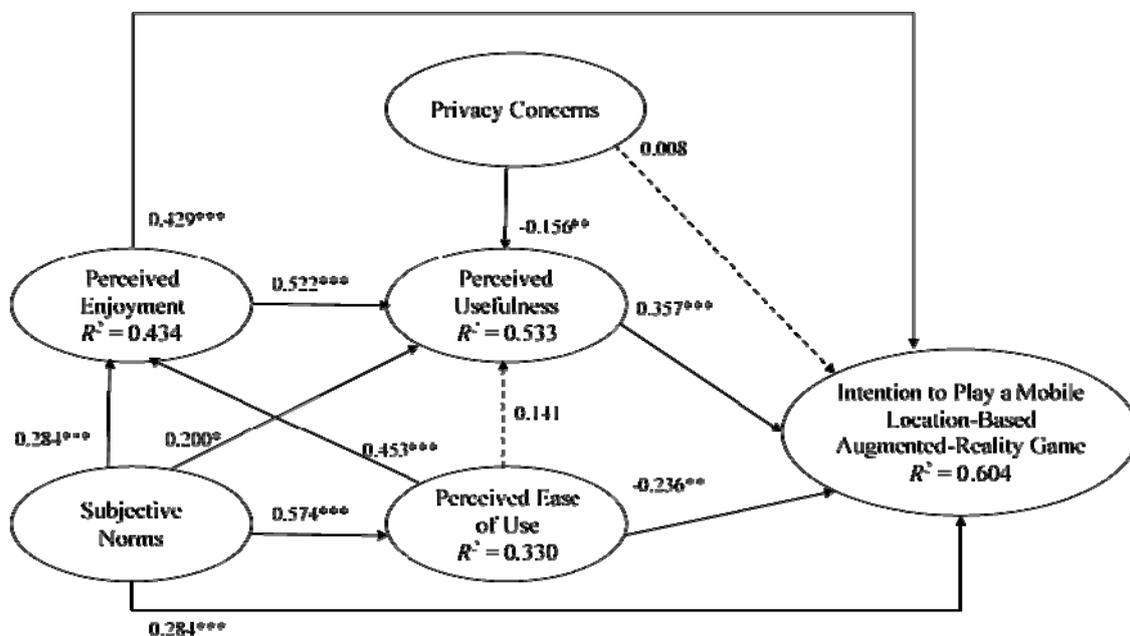
Fit Measure	Good Fit Criteria (Parry, 2017; Schermelleh-Engel, Moosbrugger, & Müller, 2003)	Indicators Confirmatory factor analysis	Indicators Structural equation modeling
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χ^2/df	$\chi^2/df \leq 2$	1.360	1.414
Goodness of Fit (GFI)	GFI ≥ 0.95	0.962	0.958
Adjusted Goodness of Fit (AGFI)	AGFI ≥ 0.90	0.923	0.920
Normed Fit Index (NFI)	NFI ≥ 0.95	0.976	0.974
Non-Normed Fit Index (NNFI)	NNFI ≥ 0.97	0.989	0.988
Comparative Fit Index (CFI)	CFI ≥ 0.97	0.994	0.992
Root Mean Square Error of Approximation (RMSEA)	RMSEA ≤ 0.05	0.041	0.044
Standardized Root Mean Square Residual (SRMR)	SRMR ≤ 0.05	0.0197	0.0283

Table 5: CFA and SEM: Model fit.

The values in the diagonal row are the square roots of the average variance extracted, and the others are the correlation between constructs. The sample size is 215.

The Structural Equation Model Analysis



Note: *** Significant at $p < 0.001$ level, ** Significant at $p < 0.01$ level, * Significant at $p < 0.05$ level.

Figure 2: Structural path coefficients.

The next step was to explore the structural model fit by path analysis with latent constructs. The analysis results and the fit indices of the Structural Equation Modeling (SEM) were shown in Table 5. Ten of the twelve paths in the research model were significant, but nine of ten hypotheses were supported, as shown in Figure 2. The model accounted for 60.4, 53.3, 33.0, and 43.4 percent of the variances in intention to play a mobile location-based AR game, perceived usefulness, perceived ease of use, and perceived enjoyment orderly. All factors directly or indirectly contributed significant roles in persuading non-players to play a location-based AR game in the future. The coefficients of the model showed the positive relationships between non-players' perceived enjoyment for the game and their intention to play Pokemon Go in the future (H1: $\beta = 0.429$, $p < 0.001$) and perceived usefulness of Pokemon Go (H2: $\beta = 0.522$, $p < 0.001$). The model confirmed the importance of subjective norms by showing positive and significant relationships between subjective norms and perceived enjoyment (H3: $\beta = 0.284$, $p < 0.001$), perceived usefulness (H4: $\beta = 0.200$, $p < 0.05$), perceived ease of use (H5: $\beta = 0.574$, $p < 0.001$), and intention to play (H6: $\beta = 0.284$, $p < 0.001$). Moreover, a negative and significant relationship was found between privacy concerns and perceived usefulness (H7: $\beta = -0.156$, $p < 0.001$), but no significant relationship between privacy concerns and intention to play (H8). The model supported a positive relationship between perceived ease of use and perceived enjoyment (H9: $\beta = 0.453$, $p < 0.001$) and showed a negative relationship between perceived ease of use and intention to use (H12: $\beta = -0.236$, $p < 0.01$), but

no significant relationship between perceived ease of use and perceived usefulness (H10). Finally, a significant and positive relationship between perceived usefulness and intention to play the game in the future emerged (H11: $\beta = 0.357, p < 0.001$).

DISCUSSION

Table 6 presents a summary of the research results. Nine of twelve hypotheses are supported. The results harmonize with the assertions in the *Hypotheses and Research Model* section. However, this study yields different findings from some previous studies, presenting new knowledge in the context of location-based AR games in Thailand. For example, game enjoyment insignificantly associates with place attachment in the study of S. S. Wang and Hsieh (2018), but in this study perceived enjoyment plays important roles for both perceived usefulness and intention to play. This conforms to the study of Hamari and Keronen (2017) indicating that enjoyment is more significant for hedonic games rather than utilitarian games. Social influence insignificantly drives behavioral intention in the study of (Harborth & Pape, 2017) regarding Pokemon Go in Germany and the study of Zhang, Zhao, and Tan (2010) relating to online games, but subjective norms are fully supported their direct and indirect effects on intention to play Pokemon Go in this study. The effect of perceived usefulness on playing intention in this study is quite similar to the study of Hamari and Keronen (2017). Although perceived usefulness does not directly, but indirectly impact intention to play in other game studies such as online games, mobile games (Liu & Li, 2011; Yoon et al., 2013), perceived usefulness directly affects intention to play of Pokemon Go's non-adopters in Thailand. The insignificant relationship between perceived ease of use to perceived usefulness and the negative relationship between perceived ease of use and intention to play could be explain by the insignificant relationships between ease of use and usefulness and perceived ease of use and attitude to play in the study of Liu and Li (2011) and Yoon et al. (2013), the lower correlations or connections of perceived ease of use and players' attitude and perceived ease of use and perceived usefulness in hedonic games compared to utilitarian games (Hamari & Keronen, 2017), the insignificant relationship between ease of use and LBS app connectedness (Oh et al., 2019), and the insignificant relationship between perceived ease of use and attitude towards playing an online game (Zhang et al., 2010). The insignificant link between privacy concerns and intention to play a location-based AR game could be explained by the insignificant relationships of privacy concern and LBS satisfaction (Zhou, 2016), intention to use LBS (Mao & Zhang, 2014; Zhou, 2012), reuse intention and in-app purchase intention of Pokemon Go (Hamari et al., 2019).

Table 6: Summary of testing of hypotheses

Hypothesis	Supported/ Not supported
Hypothesis 1. There is a positive relationship between perceived enjoyment and intention to play a mobile location-based augmented-reality game.	Supported
Hypothesis 2. There is a positive relationship between perceived enjoyment and perceived usefulness.	Supported
Hypothesis 3. There is a positive relationship between subjective norms and perceived enjoyment.	Supported
Hypothesis 4. There is a positive relationship between subjective norms and perceived usefulness.	Supported
Hypothesis 5. There is a positive relationship between subjective norms and perceived ease of use.	Supported
Hypothesis 6. There is a positive relationship between subjective norms and intention to play a mobile location-based augmented-reality game.	Supported
Hypothesis 7. There is a negative relationship between privacy concerns and perceived usefulness.	Supported
Hypothesis 8. There is a negative relationship between privacy concerns and intention to play a mobile location-based augmented-reality game.	Not supported
Hypothesis 9. There is a positive relationship between perceived ease of use and perceived enjoyment.	Supported

Hypothesis	Supported/ Not supported
Hypothesis 10. There is a positive relationship between perceived ease of use and perceived usefulness.	Not supported
Hypothesis 11. There is a positive relationship between perceived usefulness and intention to play a mobile location-based augmented-reality game.	Supported
Hypothesis 12. There is a positive relationship between perceived ease of use and intention to play a mobile location-based augmented-reality game.	Not supported (significant but in a negative way)

IMPLICATIONS

From the theoretical aspects, this study contributes to the location-based AR game studies in several ways. First, it provides empirical support for an integrated model of the TAM constructs, TRA construct, and other motivational and barrier factors to understand the determinants of non-players' behavioral intention. One game type may be different from others such as social games and other online games (Hasan et al., 2016). Not so much studies in the location-based AR game literature incorporates TAM factors to study non-adopters' behavioral intention. Second, this study fulfills the gaming literature by exploring different sample groups i.e. non-players, studying-age and working-age non-adopters, which could improve literature knowledge about location-based AR games. Third, this study explores the relationships that have not been so much explored in the location-based AR games that are the relationships between enjoyment and usefulness, subjective norms and perceived enjoyment and perceived ease of use, privacy concerns and perceived usefulness, and perceived ease of use and perceived enjoyment. The empirical test shows the new roles that perceived enjoyment, subjective norms, privacy concerns, and perceived ease of use have in determining the intention to join games in the future. Exploring antecedents of perceived enjoyment helps to deeply understand the critical factors that enhance hedonic value and subjective norms are emphasized to be included when examining users' intentions (Hasan et al., 2016). This study shows the importance of these relationships in the context of Pokemon Go, which could be further applied to other game contexts. Fourth, this study presents the contrary results from the previous studies and the theory. In the context of Pokemon Go's non-adopters in Thailand, privacy concerns have only an indirect impact on intention instead of a direct impact. Due to the familiarity of mobile apps and the ease of use of mobile games, this study reveals a negative relationship between perceived ease of use and non-adopters' playing intention and an insignificant relationship between perceived ease of use and usefulness, which is consistent with some previous studies regarding mobile/ online games. Last, although Pokemon Go is in the popular game types that both full-time students and full-time employees playing, they may not adopt the game, indicating the need to understand non-adopters more and how to convert them to be adopters.

This research has several practical implications for future location-based AR game developers and the providers of location-based AR games, in creating new and pleasant game experiences and driving non-players' acceptance of these location-based AR games. Findings indicate that non-players will have the intention to play location-based AR games e.g. Pokemon Go in the future if they believe that they would have fun playing the game. If non-players perceive that the game could fulfill their needs or the game is useful for their lives, they may be will willing to play the game in the future. Non-players' intention to play the game will be increased if people around them support them to play the game or if they perceive that playing the game will make a good impression for others as well. Non-adopters' perceived usefulness could be increased by perceived enjoyment and the opinions of other people surrounding them. If non-adopters find that it is easy to control the game and play the game using less effort and other people persuade their gameplay, they will perceive high enjoyment from the game. Their beliefs about the game enjoyment could lead to the increase of perceived usefulness of other non-adopters close to them if they communicate their gratification. Moreover, the perception that the features such as map and AR in the game are clear and understandable could be raised by the peers of non-players. However, intention to play the game of non-players could be impeded by their concerns regarding that their personal information can become available to someone without their knowledge or used in a way that they do not foresee. Future location-based AR game developers should build the location-based AR games to include suitable game dynamics and mechanics such as collection, points, leaderboard, achievements and so on (González & Area, 2013) to increase perceived enjoyment for potential players. These game mechanics could help to make the game not to easy to win, but developers should maintain the interactions between users and game to be easy, to enhance the game enjoyment. Moreover, the game should utilize the distinctive points of LBS and AR technologies, for instance, nearby friends or simulating some online activities topping up on offline environments, to improve users' perceived enjoyment. Game developers should not collect unnecessary information from players and clearly announce the collected data, usage purposes, and the details of data transfer to other parties to users, to lower privacy concerns of potential adopters. Benefits such as social

benefits, emotional benefits, functional benefits, benefits for health, and so on should be added into the game since its design phase because potential users should feel that the game is useful, will complete their needs, or provide some benefits for their lives. The game should be designed to support social features such as playing with new friends getting more points, sharing new received rewards to others via the players' social media, or showing the summary of health benefits received from the game playing to other non-players. The game providers should promote these values to innovators and early adopters by having some marketing strategies to let them persuade others who are their friends, family, or peers. For instance, letting them make exclusive invitations to their friends or giving them special rewards e.g. Pokemon if they successfully invite their friends to join the game (to create early majority). For the group such as late majority or laggards, game providers should set some events that open to public (everyone) and also let existing players bring non-players (their family, friends, or acquaintances) to join. In these events, influencers should persuade potential users to try and give them more information e.g. the enjoyment and trialability of the game, and information about the game having no privacy invasion, simultaneously with conducting marketing promotions online through the game platform.

Conclusion, Limitation, And Future Research

The purpose of this study was to specify the antecedents of non-players' intention to play a mobile location-based AR game (Pokemon Go) in the future, mainly from the TAM constructs (perceived usefulness and perceived ease of use), a social factor (subjective norms), a promising factor in the game context (perceived enjoyment), and an obstacle (privacy concerns). The proposed research model was empirically tested based on 215 non-players of Pokemon Go in Thailand, who were in studying age or working age. Data were analyzed using descriptive statistics, confirmatory factor analysis, and structural equation modeling. The results pointed out that perceived enjoyment, perceived usefulness, and subjective norms directly positively affected intention to play Pokemon Go of non-adopters, whereas perceived ease of use could decrease their intention to play. Perceived enjoyment and subjective norms also indirectly influenced the intention to play. On the contrary, privacy concerns indirectly lowered non-adopters' intention to play in the future. Alzahrani et al. (2017), who studied online game playing among Malaysian undergraduate students, emphasized that future research should expand to different age groups rather than students and gameplaying mediums such as mobile devices. They also found insignificant effects of subjective norms on usage and suggested further analysis of social context. This study shows empirical evidence for an integrated model to understand determinants of non-adopters' intention to adopt a mobile location-based AR game and also complete past studies in terms of sampling both full-time students and full-time employees. Findings in this study compare and contrast results, showing the importance of subjective norms and the negative impact of perceived ease of use on the intention to play, which contributes knowledge in the location-based AR game literature.

There are some limitations, which should be considered in this study as follows. First, the samples were collected using non-probability sampling with students and employees in Thailand and the sample size was not large. Hence, the generalization of findings to other cultural environments may be limited. Future studies should collect more samples using quota sampling from other countries. Second, Vasseur and Kemp (2015) classified non-adopters as potential adopters and rejectors, but it was not categorized in this study. Thus, future research should gather data from various non-player groups, both potential adopters and rejectors, and compare and contrast between groups, to expand the research results. Third, perceived ease of use has a negative impact on the intention to play and has no impact on perceived usefulness. Although the insignificant effect is in line with some game studies, there is an avenue for future research using qualitative analysis to explore the reasons why it yields a negative impact or insignificant result. Fourth, this study focuses on intention to play the game in the future, future studies could deeply explore the levels of technology rejection and investigate barrier factors such as level of flexibility and risk factors such as (studying/ job) performance risk. In addition, future work should compare the benefit and risk factors influencing non-players and players, to enhance suggestions for location-based AR practitioners to develop different strategies and overcome obstacles for players and potential players. Future studies should add some control factors such as age and gender into the model to thoroughly understand the antecedents of users' intention to play. Last, this study focuses only on non-players of Pokemon Go, future research should replicate this study to other mobile location-based AR games such as Let's Hunt Monsters, Jurassic Park Alive, The Walking Dead Our World, Harry Potter Wizards Unite, and Ghostbusters World, which may have different design of game aesthetics, dynamics, and mechanics.

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