

Understanding Perceived Enjoyment and Continuance Intention in Mobile Games

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Abstract

Objective of the Study

Existing studies of consumer behaviours in mobile games have largely focused on pre-adoption phase while completely ignored the post-adoption behaviours. Additionally, while intrinsic factors such as perceived enjoyment is often reckoned as one of the most important factors affecting consumer behaviours in gaming context, little research has attempted to understand their antecedents. The present study aimed to fill these research gaps and its objective was twofold. Firstly, it examined the role of perceived enjoyment as the driver of mobile game's continual use. At the same time, it aimed to explore the antecedents of perceived enjoyment in mobile games. The present study limits its scope within the context of casual games only.

Methodology

Conceptually, the study examined design aesthetics, perceived ease of use, variety, novelty, perceived interactivity, perceived challenge, perceived control and their impact on perceived enjoyment which in turn affect continuance intention. Empirical data was collected using convenient sampling method through online survey, which was distributed on different mobile game forums and social networking sites. The survey resulted in a sample size of 220 valid responses. A two-step structural equation modelling (SEM) was employed as the analysis method for this study.

Findings

The study identified three key factors that drive perceived enjoyment in casual mobile games: design aesthetic, perceived ease of use and novelty. Together these constructs can explain 59% of variance for users' perceived enjoyment. Perceived enjoyment had significant effect on continuance intention, explaining 34% of variance in continuance intention.

Keywords Mobile game, Casual game, Post-adoption behaviour, Perceived enjoyment, Flow theory, Design Aesthetic

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1. INTRODUCTION

Mobile games refer to gaming applications designed to play on small handheld computing devices such as smart phones and tablets. Today this is the largest category of mobile applications across several measurements, such as number of applications available, number of times downloaded as well as revenues (Rosewood 2013). As the number of mobile devices increases, this creates the favorable platform for mobile games to grow as well. It is forecasted that mobile games will be a \$30.3 billion business in 2015, up from \$25 billion in 2014 (Takahashi 2014).

As a fast growing business, mobile game attracts intensive competition in which only a few games succeed and attract high numbers of downloads but most of the games fail. In fact, among all the mobile application categories, mobile games have the highest number of applications, which failed to attract users and have been removed from the application store (Adjust 2014). It is hence important for developers and businesses to understand which factors drive consumers to download the mobile game at the first place. Thus far, this is the main topic that has attracted most researchers when studying consumer behavior in mobile games (e.g. Ha et al. 2007, Zhou 2013b, Lee, Quan 2013, Okazaki et al. 2007).

Yet, attracting consumers to download and install the game is just the first step toward success; retaining them is another challenge. Quite often, the games are downloaded and then deleted after the first trial. It was reported that more than 60% of consumers delete applications within two weeks of download (PewInternet 2010). Particularly when there are new games published every day, players have a wide range of alternatives and can easily switch to a new game. Mobile games, which are available either free of charge or at a price of a few euro, make very small revenue stream to developers when users download a game. The main revenue flow comes from players who keep on playing the game and could potentially pay for upgrade, buy in-app purchases or bring indirect revenue through advertising (Brustein 2013). As the result, it is

important for developers and businesses to understand what factors influence users' decision to continue playing mobile games and thereafter can take measures to retain their customers.

However, the number of studies to understand drivers of consumers' behaviors in post-adoption phase is still rather limited. While reviewing the existing literature on mobile gaming, only two papers had this focus (Liang et al. 2013, Chinomona 2013). Even within the wider context of information systems (IS), there seem to be much less work in post-adoption consumer behaviors than the initial acceptance phase (Wu et al. 2010). This indicates that post-adoption behavior in mobile gaming is a possible field that needs more attention from academic research.

Going through literature in different IS contexts, various factors are found to influence consumers' behavior. Subjective norms (i.e. individual perception of social pressure from important referents to perform or not to perform the behavior), perceived value (i.e. individual evaluation of the benefits of a service) and quality of the service are some examples (Al-Debei et al. 2013, Kuo et al. 2009, Zhou 2013b). Among the constructs, intrinsic motive of enjoyment prevails as one of the most important factors within hedonic systems including mobile games (Chung, Tan 2004, Moon, Kim 2001, Lin, Bhattacharjee 2010). Yet, the concept of enjoyment has remained relatively under-researched and there has been few study on what makes mobile game enjoyable.

In bridging these research gaps, this study proposes a research model to examine the antecedents of enjoyment in mobile games, which in turn is hypothesized as the central driver of continual use. This study limits its scope to the context of casual games, which can be loosely defined as easy and simple-to-play games and is the dominant category of mobile games (Koivisto 2007, Entertainment software association 2014).

1.1. RESEARCH OBJECTIVES AND QUESTIONS

Addressing the under-researched area of current literature in mobile gaming, this study focuses on consumer behavior in post-adoption phase. The objective is firstly to examine the role of perceived enjoyment as the driver of mobile game's continual use. At the same time, it aims to explore the antecedents of perceived enjoyment in mobile games. By investigating the factors contributing to users' enjoyment in mobile games, the study hopes to shed light into how to drive continuous use through enjoyable gaming experience, particularly within casual gaming context.

Two main research questions are as follows:

- What factors influence perceived enjoyment in mobile gaming?
- To what extent can perceived enjoyment predict continuance intention?

Through literature review, a conceptual framework illustrating potential drivers of perceived enjoyment is proposed. The framework is then tested through empirical data, collected through survey of mobile game players. Details on the research model and research method are presented in chapter 4 and 5.

1.2. STRUCTURE OF THE STUDY

The study starts with defining and describing the mobile game context. The purpose is to establish an understanding on mobile game's key characteristics, key usage behaviors and how they differ from other gaming platforms. It then continues to present key models for examining individual-level technology adoption. This is necessary, as most studies on users' behaviors in mobile game context have applied these models. From understanding the key behavioral models and theories, the study presents a review of prior research on consumers' behaviors mobile games.

Chapter three contains the theoretical foundations on which the research model is built. Arguments for selecting the theories are presented, based on the context of casual mobile game.

Chapter four continues with the development of the research model. Each construct is presented and hypotheses are built based on existing literature.

In chapter five, the research methodology is presented. Method to collect data, sample size and demographics are described under this chapter. This chapter also presents and explains the method applied to analyze data.

Chapter six reports the results of empirical data analysis. It discusses the validity and reliability of the constructs as well as the model fit and whether the hypotheses are supported by empirical data.

In chapter seven, the key findings are discussed in relation to prior research. The chapter also presents the key theoretical and managerial implications. It continues with discussion of the limitations and suggestions for future researches.

Chapter eight concludes the study through summarizing the need for this study, what has been done and what are the findings.

2. LITERATURE REVIEW

This chapter starts by defining and describing the key characteristics of mobile games, setting the context of the study. It then moves on to review the key theories in IS adoption and post-adoption behavior, which is essential in literature of consumer behavior in IS context. In the next subsection, existing studies on consumer behaviors in mobile gaming are reviewed to identify what has been studied in the same research stream and at the same time establish the research gap and the need for this study.

2.1. MOBILE GAME DEFINITION AND CHARACTERISTICS

Mobile games can be defined as “*games conducted in handheld devices with network functionality*” (Jeong, Kim 2009). By this definition, mobile games refer to the games played in mobile devices such as cell phones and tablets that have wireless communication functionality.

Many consider Snake, a game launched by Nokia in 1997 as the original mobile game. It was a simple 2D game embedded into cellular handsets (Corbo 2011). As wireless application protocol developed, it enabled users to download games into their devices. However, the games were still relatively simple due to limited graphical and power capabilities of handsets (Feijoo et al. 2012). With the release of the first smart phone generations in 2007, the world of mobile gaming started to bloom. Thanks to advanced technical capabilities together with availability of cheap mobile data plans, not only mobile games can be easily downloaded to play off-line but they can also be played on-line in real time with network connection (Jeong, Kim 2009, Korhonen, Koivisto 2006). This has since unblocked the mobile gaming market, making it easily accessible to a wider range of users. One major difference between mobile and console games is that mobile games attract a slightly different demographic than traditional games. While most players of PC and console games are predominantly male, there are as many female as male players in mobile gaming (Information Solutions Group 2011).

Mobile games also differ significantly from games using other platform such as console and PC in terms of their mobility, accessibility, networkability and simplicity (Jeong, Kim 2009, Ha et al.

2007). The fact that individuals carry mobile devices with them most of the time (mobility), coupling with wireless connection (networkability) enable users play mobile games off-line and on-line anytime and anywhere such as waiting at bus stop or sitting on a couch at home. While this makes mobile games convenient and accessible, interruptions can happen anytime, making users to pause playing. Example of such interruptions may be the arrival of the bus or incoming calls. As a result, users usually tend to play mobile games for minutes instead of hours as in the case of console games (Pace 2013). Additionally, mobile game applications have to be in operating mode instantly, allowing users to start, stop and resume playing quickly in order to have a good gaming experience (Korhonen, Koivisto 2006).

Owing to mobility and accessibility, mobile games have attracted many light users who play simple games in a short amount of time to pass time or escape daily life, who are often referred to as casual gamers (Jeong, Kim 2009). Coupling with small screen sizes and relatively less powerful capacity of most mobile devices, this leads to the fact that most mobile games are simpler and easy to understand and navigate as compared to console games. These mobile games are generally categorized as “casual games”, including genres such as puzzle and simple arcade games (Koivisto 2007). There are of course other mobile game genres with more complicated design and gameplay¹ but from practical observation, “simplicity and mindless games do well” for mobile games (Marek 2005). Statistics also show that majority of mobile games played most often are casual games (Entertainment software association 2014). This is the reason why this study limits its scope to casual games only. However, it should be noted that mobile games have somewhat blurred the concept of casual gaming. Whereas one player plays a game casually, other players might play it fanatically. There is unfortunately not very clear definition of what makes a game / gamer casual or hardcore. This study follows a generally accepted definition of

¹ “Gameplay is the specific way in which players interact with a game. Gameplay is the pattern defined through the game rules, connection between player and the game, challenges and overcoming them, plot and player's connection with it”. Wikipedia.

casual games, which are “easy and simple to play” and are “typically played just for a while” (Koivisto 2007).

Additionally, small screen sizes make it challenging for mobile game designers to display sufficient amount of data and required commands (Korhonen & Koivisto 2006). At the same time, mobile game players tend to value beautifully designed user interface, perhaps because a large proportion of mobile game players are female and casual gamers (Information Solutions Group 2011). Hence, user interface design plays a significant role in the context of mobile games, particularly in casual games.

To sum up, mobile devices seem to drive entirely new kind of gaming experience as opposed to console or PC. Mobile game players would have different expectations and while there have been many studies on consumer behaviors in gaming, it is meaningful to examine users behaviors particularly in mobile gaming context.

2.2. KEY ADOPTION AND POST-ADOPTION THEORIES

This section reviews the key theoretical frameworks for studying individual-level technology adoption, which is the most dominant research stream within IS literature. An extensive number of studies has applied these key theoretical foundations to examine users behaviors in IS context. Hence, reviewing these frameworks is a necessary step in reviewing studies on users behaviors in IS, including mobile games.

Researches on IS adoption behaviors can be generally divided into two categories: pre-adoption and post-adoption studies (Wu et al. 2010, Bhattacharjee 2001). The focus of pre-adoption studies is to examine the factors influencing users to start using the system/service for the first time, whereas post-adoption studies attempt to understand what drive users to continue and repeat their usage (Zhou 2011). During post-adoption phase, users have gained experience with the services and their decision to continue or discontinue the usage is based on this experience.

For example, through studying the attitudes and beliefs of potential adopters and actual users Chang and Zhu (2011) found that adoption intention is driven solely by normative pressures while continue use intention is solely driven by users' attitude, i.e. "an individual's positive or negative feelings about performing the target behavior". That is, consumers' behaviors might be driven by different factors at these two stages.

Naturally, initial adoption is important first step for success of any product/service. However, post-adoption behaviors have decisive role in the viable long-term success of the service. Some of post-adoption behaviors include continual use, willingness to spread positive word of mouth, and increased purchase from the same company. Understanding what drive consumers' behaviors in both phases is equally important and hence there are a large number of IS studies and theoretical models along these lines. Though the post-adoption behavior is the focus of this study, this section will review the key frameworks and theories from both pre- and post-adoption studies. This is because many studies on post-adoption behaviors have applied the same set of pre-adoption models and variables (Bhattacharjee 2001).

The next sub sections will introduce the selected key adoption theories, which are Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). Although many other theories exist to explain and predict adoption behaviors, TPB, TAM and UTAUT are the most widely adopted models (Wu et al. 2010, Chuttur 2009). Besides, most of studies reviewed under next section utilize these frameworks and thus, it is essential to have an understanding of these models.

2.2.1. Theory of Planned Behavior

The Theory of Planned Behavior (TPB) was developed by Ajzen (1985) as an extension from Theory of Reasoned Action (TRA) (Fishbein, Ajzen 1975) which is one of the most fundamental and influential theories of human behavior (Venkatesh et al. 2003)

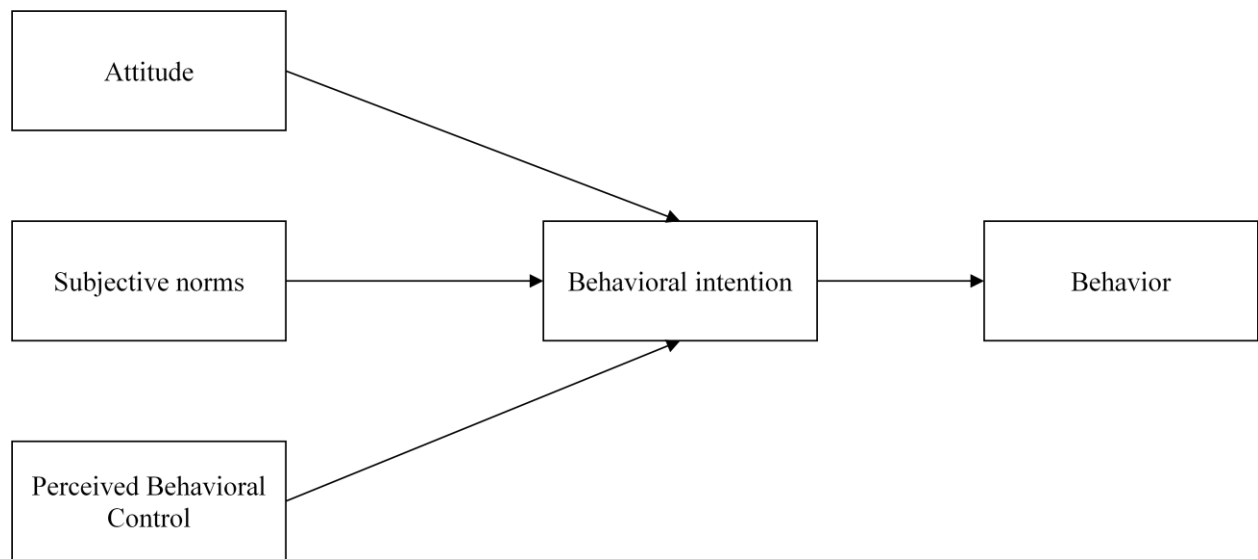


Figure 1 Theory of Planned Behavior (Ajzen 1985)

Original TRA posits that Attitude towards behavior and Subjective norm are the main predictors for a wide range of behaviors. Attitude is defined as “individual positive or negative feelings about performing the target behavior” (Fishbein, Ajzen 1975). Subjective norm refers to “the person’s perception that most people who are important to him think he should or should not perform the behavior in question”(Fishbein, Ajzen 1975). The TPB extended TRA by adding Perceived Behavioral control as an additional determinant of behavioral intention and actual behavior (Venkatesh et al. 2003). Perceived behavior control is the user’s perception of whether it is easy or difficult to perform the behavior (Chuttur 2009).

TPB has been applied successfully to predict individual adoption of many different technologies (e.g. Karjaluoto et al. 2008, Nysveen et al. 2005, Xu et al. 2008, Hung et al. 2003). It is valued for taking into account the social influences and perceived behavioral control in users’ intention and behavior. It also states that behavioral beliefs have indirect link to users’ intention, as mediated by attitude. This is, however, also the model’s weakness as “the mediation effect of attitude has been somewhat debatable in the literature” (Mäntymäki 2011)

2.2.2. Technology Acceptance Model TAM

Also drawing upon the theory of reasoned action (TRA), Davis (1985) first developed TAM to explain for individual technology adoption decisions in organizational context. Through further developments, the final TAM model consists of PEOU, PU, Behavioral intention to use and Actual use as shown in Figure 2 below (Chuttur 2009).

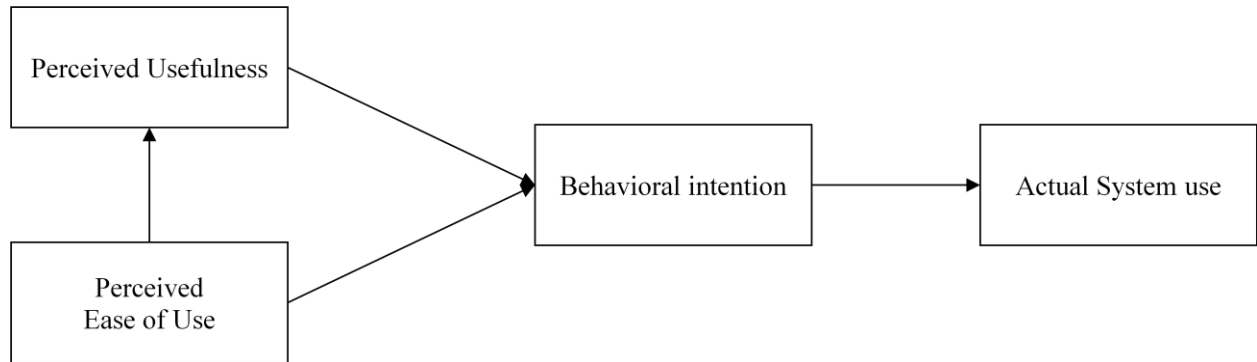


Figure 2 Technology Acceptance Model (Venkatesh, Davis 1996)

Table 1 Definitions of TAM constructs (Davis 1989, Venkatesh, Davis 1996)

Construct	Definition
Perceived usefulness (PU)	"the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989)
Perceived Ease of Use (PEOU)	"the degree to which a person believes that using a particular system would be free of effort" (Davis 1989)

As seen in Figure 2, TAM posits that individual intention to use technology is directly driven by user's perceptions of the utilitarian benefit (PU) and effort needed to use the system (PEOU), without the mediating effect of attitude. In other words, PU and PEOU are the two main driving forces behind users' initial adoption of technology, particularly in work related context.

While many models exist to study user acceptance of technology, such as TPB and UTAUT in the next section, TAM has been the most widely applied theoretical model (Lee et al. 2003). One of the key reasons for the popularity of TAM over other frameworks is in its simplicity and ease of implementation (Chuttur 2009). Though originally developed for organizational IS context, the constructs PU and PEOU are fairly general and can be applied to individual IS contexts (Nysveen et al. 2005, Doll et al. 1998). However, this is also the drawback of TAM as many significant factors are not included in the model. Hence, quite often researches extend TAM by including other variables that are relevant to the different settings such as use context for mobile ticketing (Mallat et al. 2009), perceived trust for mobile portals (Serenko, Bontis 2004), social influence for multimedia messaging service (Hsu et al. 2008) and perceived security for mobile payment service (Schierz et al. 2010).

2.2.3. Unified Theory of Acceptance and Use of Technology (UTAUT)

The third theoretical framework UTAUT is a unified model of user acceptance based on the review of eight key technology acceptance models, among which are TAM and TPB (Venkatesh et al. 2003). The model is presented in Figure 3 and definitions of its constructs are summarized in Table 2.

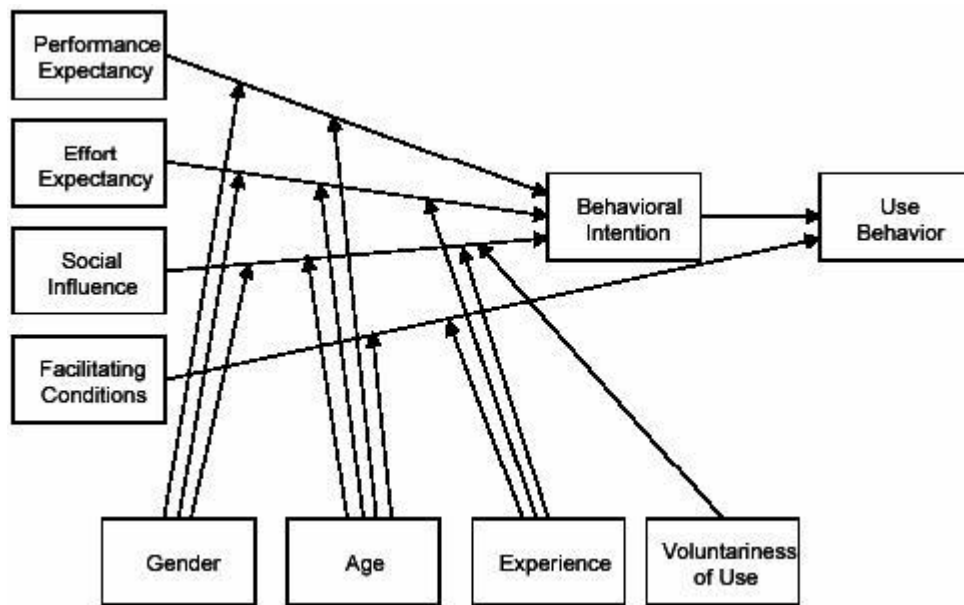


Figure 3 UTAUT framework (Venkatesh et al. 2003)

Table 2 Constructs of UTAUT framework (Venkatesh et al. 2003)

Construct	Definition
Performance expectancy	“the degree to which an individual believes that using the system will help him or her to attain gains in job performance”(Venkatesh et al. 2003)
Effort expectancy	“the degree of ease associated with the use of the system” (Venkatesh et al. 2003)
Social influence	“the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al. 2003)
Facilitating conditions	“the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al. 2003)

This framework holds that user acceptance and usage behavior are driven by Performance expectancy, Effort Expectancy, Social influence and Facilitating conditions. Further, the

relationship is moderated by Gender, Age, Experience and Voluntariness of use. Through their empirical study, Venkatesh (2003) showed that UTAUT model has substantially greater power (70% of the variance in usage intention) in explaining usage intention than other models including TAM and TPB.

Similar to TAM, UTAUT was originally developed to explain IS adoption in organizational context but has also been applied in non-organizational context such as mobile technology in China (Park et al. 2007) and mobile location based services (Xu, Gupta 2009). However, given its original organizational context, the model leaves out many other drivers that are particularly relevant to consumer context (Venkatesh et al. 2012).

2.2.4. IS continuance model

Moving from pre-adoption to post-adoption stage, Bhattacharjee (2001) develops IS continuance model specifically to understand why an individual continues IS usage. This is indeed among the pioneer models that particularly take into account the distinctions between adoption and continuance behaviors. The model and definitions of its constructs are shown in Figure 4 and Table 3 respectively.

Table 3 Definitions of constructs from IS continuance model (Bhattacharjee 2001)

Construct	Definition
IS continuance intention	Users' intention to continue using IS
Satisfaction	Users' affect with (feelings about) prior IS use
Perceived usefulness	Users' perception of the expected benefits of IS use
Confirmation	Users' perception of the congruence between expectation of IS use and its actual performance.



Figure 4 IS continuance model (Bhattacharjee 2001)

The framework posits that individual's continue intention is primarily determined by users' satisfaction with their prior IS use. Users' satisfaction is driven by users' perceived usefulness and confirmation of expectations following actual use. Following TAM, PU is also considered as a direct predictor of IS continuance (Bhattacharjee 2001). Empirical data from surveying online banking users showed that the model has a strong predictive power, explaining 41% variance in continuance intention (Bhattacharjee 2001). User satisfaction in particular is the strongest predictor of users' continuance intention followed by a significant but weaker effect from perceived usefulness.

This model has been widely cited by studies focusing on users' post-adoption behaviors in various IS contexts (Hong et al. 2008, Thong et al. 2006, Chen et al. 2012, Ng, Kwahk 2010). Quite often, researchers modify the model to include constructs that are relevant to the particular IS settings. Thong et al. (2006) for example add perceived ease of use and perceived enjoyment as two additional constructs to the model when studying users' continuance intention of mobile internet services. All hypotheses are supported by empirical data, that is, users intend to continue using the service if they find it to be useful, easy to use and enjoyable (Thong et al. 2006). The revised model also has higher predictive power; Satisfaction, PEOU, PU and PE together yielded an explanatory power of 57.6% of continued usage intention. Arguing that quality strongly influences customer satisfaction and that consumer-oriented services such as mobile applications

have strong hedonic value, Chen et al. (2012) incorporate hedonic value and DeLone & McLean's model to explain for continuance intention with mobile apps. Empirical result shows a significant predicting power of IS continuance intention (89%).

To sum up, this section has reviewed the most commonly used frameworks in studying consumers behaviors in IS. This knowledge is essential when moving on to the next section that reviews adoption studies in mobile gaming context as large number of studies have been built upon these theoretical frameworks.

2.3. ADOPTION STUDIES IN MOBILE GAMING

The literature review is now continuing to narrow down and focus specifically into studies of consumer behaviors in mobile game context. The purpose is to get insights into what have been studied in the same research stream and at the same time to identify the research gap.

In order to find the most relevant and significant prior researches, this paper adopts a systematic approach as suggested by Webster and Watson (2002). According to Webster and Watson (2002), “major contributions are likely to be in the leading journals” and therefore, systematic literature review should start with them. Specifically, Webster and Watson (2002) recommend the following three steps:

1. Search from top journals for most important articles.
2. Go backward by checking references in papers found in step 1. Identify earlier papers that are relevant to this study.
3. Go forward by using Web of Science to identify other articles that cite the key articles identified in step 2.

Web of Science is used as the starting point as this is a search platform that performs multidisciplinary searches across top journals. Using keyword “mobile gam*” in Web of Science gives a result of 46 articles. In addition, the same keyword is searched in top IS journals, namely: MISQ Quarterly, European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of Information Technology, Journal of Management Information Systems, Journal of Strategic Information Systems, and Journal of the Association for Information Systems. Another search from ABI Inform database is conducted using the same keyword, limited to Scholarly Journals only.

All the abstracts are then reviewed to identify relevant literature. The author then performs step 2 and step 3 as described above to identify other significant contributions. Examples of prior studies in mobile games are described in Appendix 1, which include studies on other research

streams, in addition to the consumer behavior studies. Existing studies on users' behaviors in mobile games are shown in Table 4.

Table 4 Summarizes of prior studies on consumer behaviors in mobile gaming

Author	Methodology	Theoretical foundations & Constructs studied	Main Findings
(Ha et al. 2007)	SEM (n = 1011)	TAM, Flow.	<u>PE</u> has greatest effect on attitude toward playing mobile games. <u>PEOU (simplicity) and Attractiveness (visual and acoustic)</u> are prerequisites of enjoyment.
(Penttinen et al. 2010)	Principal component analysis (n=714)	Consumer values	Four fundamental groups of values: satisfaction of quality expectation, Gaming experience, Ease and Quickness of setup, Social aspects. Different groups of mobile game players value different features of games. For ex. Casual game players want to play socially while demanding gamers value audiovisual stunning games.
(Zhou 2013a)	SEM (n=231)	TAM, Flow	<u>Flow and Social influence</u> are determinants of usage intention of mobile game. PEOU, Content quality, and connection quality are drivers of flow.
(Okazaki et al. 2007)	SEM (n=599)	TAM Novelty seeking, Social norms, Fun, PEOU, Efficiency, Attitude, Intention to play	Cross-cultural exploration of factors influencing mobile gaming adoption among the youth in USA, Japan, Spain and Czech.

(Liu, Li 2011)	SEM (n=267)	TAM Use context, PEOU, PU, PE, Cognitive concentration, Attitude, Intention	Intention to adopt mobile games is directly driven by <u>Attitude, Use context and Cognitive concentration (flow)</u> . <u>PU and PE</u> have direct influence on Attitude, but not on behavioral intention.
(Lee, Quan 2013)	Empirical (n=536)	TAM Self-efficacy, Innovativeness, Self-expressiveness, Visibility, Incentives	<u>Incentives and PE</u> are direct determinants of intention to use. Drivers of PE include self-expressiveness, visibility, incentives and PEOU.
(Kleijnen et al. 2004)	Conjoint analysis (n=99)	Roger's Adoption of Innovation framework Perceived risk, relative advantage, comparability, complexity, communicability, critical mass, navigation, payment options	<u>Perceived risk, complexity, and compatibility</u> are three main factors driving mobile gaming adoption.
(Liang, Yeh 2011)	SEM (n= 390)	TAM, TPB Playfulness, PEOU, Attitude, Subjective norm, Contextual factors, Continuance intention	Contextual factors have significant moderating effect on intention to play mobile games. PEOU has direct significant effect to continuance intention and Playfulness. Playfulness only drives attitude, but not continuance intention.
(Okazaki 2008)	Exploratory factor analysis (n = 164)	Experiential value (Mathwick et al. 2001)	Develop a theoretical framework identifying seven factors that can be explained by a single second-factor, experiential value, which in turn affects intention to download mobile games.

(Nysveen et al. 2005)	SEM	TAM, U&G Perceived expressiveness, PE, PU, PEOU, Normative pressure, Behavioral control, Attitude, Intention to use	A cross-service comparisons of intentions to use mobile services. PU, PE and Perceived expressiveness are strong predictors of intention to use mobile services. PE appears to be particularly important as a driver for using gaming services.
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As can be seen, the number of studies is still limited and most of them focus on the pre-adoption phase. Objectives of earlier researches mainly are to examine the factors driving users to start playing mobile games. Reviewing of literature also shows that TAM has been clearly the most used theoretical framework and it has been extended with other factors that are relevant to gaming settings. These are the intrinsic factors such as enjoyment, playfulness and flow (Liu, Li 2011, Ha et al. 2007, Zhou 2013a, Lee, Quan 2013, Liang, Yeh 2011).

The construct perceived enjoyment in particular has been added to almost all the research models. It has been found as being the most important determinant of mobile games adoption (Lee, Quan 2013, Nysveen et al. 2005). Liu and Li (2011), on the other hand, found that PE had a significant impact on attitude, but not directly on behavior intention. Additionally, attitude has also been found to be a strong predictor of use intention (Okazaki et al. 2007, Liang, Yeh 2011)

Recently, Zhou (2013) also applied Flow theory to study user adoption of mobile games. In this study, flow is viewed as a combination of enjoyment, immersion and control. The author found that flow experience had strong significant effect on usage intention. That is, when users experience flow and have great enjoyment in playing mobile games, they have higher intention to play the games.

In addition to IS perspective, one study by Okazaki (2008) applied Value Perception Theory to explain for online mobile gaming adoption. Arguing that experiential value is the key driver of users' intention to adopt mobile games, Okazaki conducts an explanatory study to identify the factors contributing to experiential value, which in turn drive mobile gaming adoption. Through

an empirical study of 164 users of mobile gaming in Japan, the author identified seven factors that have direct influence over users' perception of experiential value. The seven factors include both hedonic and utilitarian values: intrinsic enjoyment, escapism, efficiency, economic value, visual appeal, perceived novelty, and perceived risklessness. Enjoyment (intrinsic factor), efficiency (extrinsic factor) and perceived novelty are the strongest drivers among the seven factors found.

Also from the same research stream, Penttinen et al. (2010) conduct an exploratory study to identify the key values and objectives that mobile gamers look for, which in turn drive their adoption behavior. The values found are divided into fundamental and means values. Fundamental values are direct drivers of adoption behaviors whereas mean values refer to antecedents of fundamental ones. The four fundamental groups of values include satisfaction of quality expectations (e.g. good game design, high quality, good price/quality ration), gaming experience (similar to Flow), ease and quickness of setup (similar to PEOU) and social aspects. The seven means objectives relate to the following attributes: audiovisual effects, shopping and services, customer support, product information, trust and triability.

There has been only one paper focusing on the post-adoption behaviors, i.e. continuance intention of mobile games (Liang, Yeh 2011). Liang and Yeh draw upon TRA, TAM and context factors to build their research framework. Contextual factors refer to “the physical place where a game is to play and the psychological factor whether the user has another task on hand” and it is hypothesized to have moderating effect on a user's intention to continue playing mobile games. Survey of 390 users in Taiwan indicated that continuance intention is directly driven by attitude and PEOU while contextual factors have significant moderating effects on continuance intention to play.

As a conclusion for this chapter, the review of literature in mobile game reveals a number of research gaps. First, the limited number of prior researches together with the dominant use of TAM in understanding consumer behaviors in mobile games indicates a research area at its early

stage that needs further investigation. Second, existing studies largely focused on understanding the antecedents of intention to adopt at the pre-adoption phase while completely ignored the post-adoption behaviors, which is critical for the long-term success. Third, while intrinsic factors such as perceived enjoyment is repeatedly confirmed as having greatest effect on consumer behaviors in both gaming in general and mobile gaming specifically (Shin, Shin 2011, Pihlström, Brush 2008, Lee, Quan 2013, Nysveen et al. 2005, Fang, Zhao 2010, Wu, Liu 2007), little research has been done to understand their antecedents. This study posits that understanding the antecedents of perceived enjoyment is valuable as it will help to better address customer retention and continued usage of mobile games.

3. THEORETICAL BACKGROUND

From the result of literature review, this study chooses to focus on understanding the drivers of perceived enjoyment, which in turn is assumed to drive continued usage of mobile game. This chapter continues by reviewing the key theories, which together form the foundation for assumptions of the research model.

3.1. PERCEIVED ENJOYMENT

Following Davis et al. (1992), enjoyment is defined as the intrinsic reward derived through the use of the technology. Unlike extrinsic motivation such as perceived usefulness which is based on achievement of specific goals or rewards, intrinsic motivation refers to the pleasure of doing an activity itself. Davis et al. (1992) added perceived enjoyment to the original TAM and found that it has significant effect on adoption intention in word-processing program.

The central assumption of this study is that enjoyment would directly determine continued usage in mobile gaming. This is founded from the work of Davis et al. (1992) as well as the empirical results as discussed in section 2.3. Furthermore, the main purpose of playing mobile games for pleasure (Lee, Tsai 2010) and hence individuals are likely to continue to play because it is enjoyable.

In addition to perceived enjoyment, flow and perceived playfulness are the two other most important intrinsic constructs affecting adoption behaviours in hedonic environments such as mobile games. In the existing literature, these constructs appear to have considerably overlapping definitions. Flow is often viewed as synonymous to playfulness which comprises of four key dimensions, namely attention focus, curiosity, intrinsic interest and control (Webster, Ho 1997, Agarwal, Karahanna 2000, Moon, Kim 2001). Sherry (2004) also states that perceived enjoyment has many of the same aspects of flow. However, excitement is highlighted as a distinct emotion of enjoyment (Sherry 2004, Boyle et al. 2012).

This study chooses to study perceived enjoyment as this construct has been widely applied and proven as the key determinant in mobile gaming. Its measurement scales seem to be more consistent and well established than the other two constructs particularly flow as will be discussed in the next section.

3.2. FLOW THEORY

Flow is a concept originally developed by Csíkszentmihályi to describe the emotional state in which a person is fully immersed into an activity (Boyle et al. 2012). This emotional state is so satisfying that one is intrinsically motivated to repeat the activity for its own sake. According to Csíkszentmihályi, the characteristics of flow include intense concentration, a loss of self-consciousness, a sense of being in control, and a distortion of time (Sherry 2004). People experience flow in a wide variety of daily activities such as playing sports, listening to music, dancing and drawing.

Flow has also been studied in IS context and has been suggested as an important theory for understanding consumer behaviors (Hoffman, Novak 2009a). However, there are numerous views on conceptualizing and measuring flow. Some authors define flow as a unidimensional construct which is directly measured with a set of instruments. Skadberg and Kimmel (2004) for example measure flow in terms of time distortion and enjoyment while Shin and Shin (2011) measure flow in terms of immersion. This approach is criticized for having a “major definitional problem” as different researchers interpret and include different items in the measuring scale (Hoffman, Novak 2009).

To overcome this problem, other authors view flow as multidimensional construct defined by a set of other constructs. Instead of combining all measures into a single construct of flow, these authors define and measure each constructs separately. Huang (2003) for example, views control, attention, curiosity and interest as the four dimensions of flow experience while browsing a website. Instead of measuring flow, Huang (2003) measures these four constructs and evaluate

their impacts on users' evaluation of a website's utilitarian and hedonic performance. Similarly, Koufaris (2002) measures five constructs related to flow (control, enjoyment, concentration, perceived usefulness, and perceived ease of use) but bypasses measuring flow altogether (Hoffman, Novak 2009b). However, similar with unidimensional approach to flow, there seem to be numerous ways to define the constructs of flow among the researches with multidimensional view of flow. In fact, Koufaris (2002) is of the opinion that the construct of flow is indeed "too broad and ill-defined".

It is suggested that psychological experience of gaming is consistent with the characteristics of flow experience as described by Csíkszentmihályi (Weibel et al. 2008) and thus flow theory provides a useful theoretical foundation to study consumer behaviors in gaming context (Ting-Jui Chou, Chih-Chen Ting 2003, Hernandez 2011, Shin, Shin 2011, Huang, Hsieh 2011, Hsu, Lu 2004). Since mobile gaming experience, particularly in casual games, is characterized by mobility and possible interruptions, flow or immersion when playing is particularly meaningful to user's experience in this context. The faster and the more immersed users feel while playing mobile games, the better the experience is. This study will employ flow theory as one of the theoretical foundations to build up the research framework. According to Sherry (2004), enjoyment in media, including gaming is the result of flow experiences. Weibel et al. (2008) are also of the same opinion and prove that flow leads to enjoyment through empirical study of computer game players. Following these literature, this study also assumes that flow determines enjoyment in mobile gaming.

However, for the above disadvantage of flow being an "ill-defined" concept without any consistent way to conceptualize, this study will not measure flow as a construct but will employ and measure the key dimensions of flow, namely challenge, control, interactivity, ease of use and variety/novelty (Huang, Hsieh 2011, Novak et al. 2000, Webster, Ho 1997). This is similar to the approaches applied by Huang (2003) and Koufaris (2002), which bypass measuring flow construct, instead measuring its components. Rationale for selecting the dimensions of flow will be elaborated in chapter 4, where the research framework is introduced.

3.3. DESIGN AESTHETIC

In addition to flow constructs, this study also hypothesizes that visual design plays a key role in enjoyment and users' behavior in casual mobile games. This assumption is firstly drawn upon practical observation that user interface decides success of mobile applications (Brian 2011) and that increased play of mobile game has been driven by improved design (Information Solutions Group 2011). Secondly, this is based on literature in the psychology, marketing and to a certain extent, IS research (van der Heijden 2003).

In the psychology literature, effect of aesthetics on human behaviors has been recognized and studied extensively. Back in the 70s, Dion et al. posits that an individual physical appearance influences his/her other aspects of social interaction (Lavie, Tractinsky 2004). In particular, socially desirable traits are associated more with physically attractive individuals than with physically unattractive individuals (van der Heijden 2004). Alice et.al (1991) confirm through a meta-analysis that good physical appearance induce strong preferences about social as well as intellectual competence.

In marketing literature, aesthetics is found to play an important role in new product development and marketing strategies. Indeed, as put by Bloch (1995), "physical form or design of a product is an unquestioned determinant of its marketplace success". Through an experimental study, Veryzer and Hutchinson (1998) find that changes in product designs results in strong responses from consumers, which in turns affect actual purchase behavior (Bloch 1995).

In the context of mobile applications, Chang and colleagues (2012) conduct a survey and find that consumers often mention user interface as among the key reasons affecting their adoption decisions. Another survey by Information Solutions Group (2011) finds that mobile game users increase playing games because of improved graphic designs.

Based on practical observation as well as the established literature, this study posits that it is meaningful to study the construct of design aesthetic in casual mobile game context. Additionally, Holbrook and Zirlin (1985) suggested that aesthetic aspects of a product are a

potential source of pleasure for the consumer (as cited by Veryzer, Hutchinson 1998), which leads to the assumption about the effect of design aesthetic on enjoyment in mobile games.

4. RESEARCH HYPOTHESES AND MODEL

4.1. RESEARCH MODEL

The present study focuses on understanding the determinants of perceived enjoyment and to which extent perceived enjoyment drives continuous mobile game use, which is the main interest from a managerial viewpoint. Respectively, perceived enjoyment and continuous use intention are modeled as the two dependent variables. This is because individuals tend to behave in accordance with their intention as suggested by TPB, TAM and UTAUT. Furthermore, using behavioral intention to explain actual behavior has sufficient empirical support across academic disciplines (Venkatesh et al. 2003, Lin, Bhattacharjee 2010).

The constructs of flow theory and design aesthetic are assumed to drive perceived enjoyment as explained in previous chapter. The research model and hypotheses are graphically presented in figure 5 below.

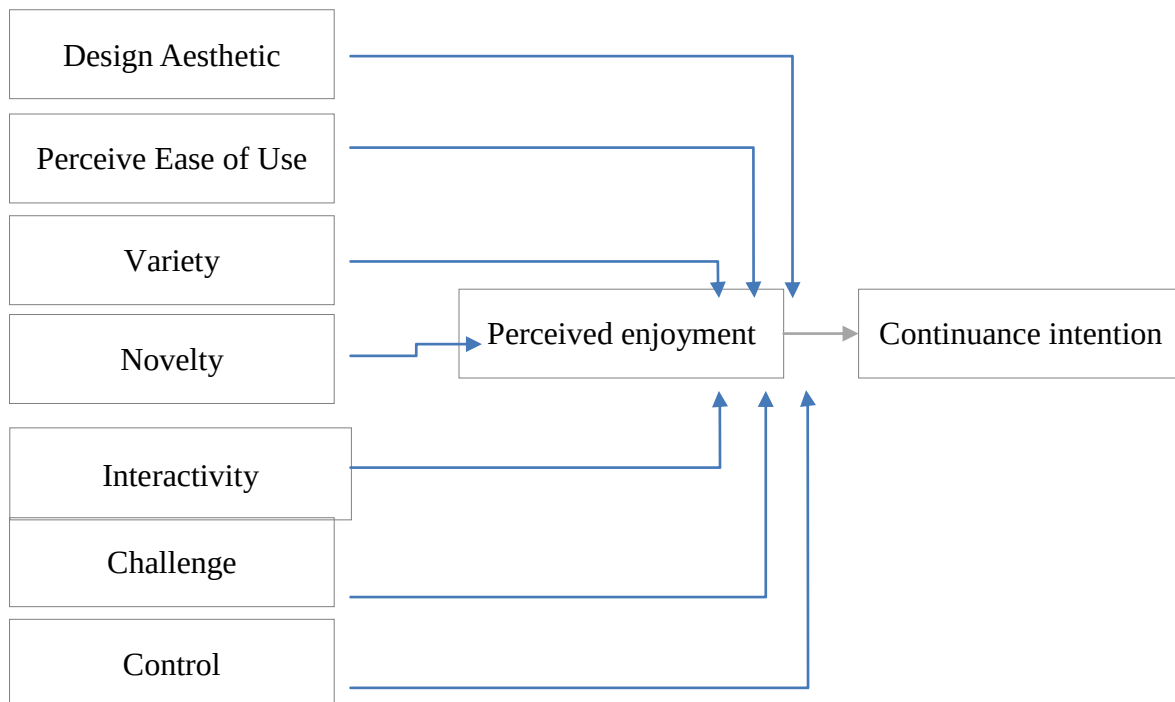


Figure 5 Research model

As the focus of this study is on understanding determinants of perceived enjoyment, only the links between first order factors to perceived enjoyment are hypothesized. However, it should be noted that there might be possible relations between these constructs and from these constructs to continuance intention. Next, the research hypotheses are explained.

4.2. HYPOTHESES DEVELOPMENT

4.2.1. Design Aesthetics

Design aesthetic refers to “the balance, emotional appeal, or aesthetic” of a mobile game (Cyr et al. 2006), which is an important feature that influences users perception of a mobile game. Factors such as colors, shapes, font type, music or animation are elements of interface design (Cyr et al. 2006).

In extant literature, van der Heijden (2003) introduced and studied the impact of perceived visual attractiveness on users’ perceptions of website’s usefulness, enjoyment and ease of use. Perceived visual attractiveness is defined as “the degree to which a person believes that the website is aesthetically pleasing to the eye”, which refers to the same characteristics as design aesthetics as defined above. Three dimensions measuring users’ impressions of website attractiveness are overall site attractiveness, site layout and colors used on the site. Empirical result showed that attractiveness has great impact on user’s feeling of usefulness, ease of use and above all, enjoyment. In fact, perceived visual attractiveness has much stronger impact on enjoyment than usefulness (van der Heijden 2003).

In mobile commerce literature, applications with beautiful design have been increasingly found to create more positive attitude towards using a mobile app. Chang et al (2013) for example survey 68 users in an experimental study and establish that interface design influenced the users’ decision to take well-being apps into use or not. Cyr et al. (2006), on the other hand, receive empirical support that design aesthetics have significant impact on users’ perception of mobile website usefulness, ease of use as well as enjoyment. Similar to findings by van der Heijden

earlier in 2003, Cyr and colleagues (2006) also find that design aesthetics have much stronger explanation role to users' perception of enjoyment than usefulness and ease of use.

As mentioned earlier, mobile gamers highly value the visual design of mobile games. According to a recent consumer research by Information Solution Group (2011), nearly half of mobile gamers cited improved game graphics as influencing their increased mobile game play. For some mobile gamers, particularly casual players, attractive visual design is possibly the main reason why they enjoy the game. Hence:

H1: Design aesthetics of a mobile game will positively influence perceived enjoyment.

4.2.2. Perceived Ease of Use (PEOU)

PEOU is defined as “the degree to which a person believes that using a particular system would be free of effort” (Davis 1985). It is suggested that IT systems that are easy to use will be less threatening to user and hence encourage enjoyment (Moon, Kim 2001). The effect of PEOU on PE has been also proven in empirical studies in mobile commerce (Cyr et al. 2006), social virtual world (Mäntymäki, Salo 2011), online game communities (Hsu, Lu 2007), Twitter (Agrifoglio et al. 2012) and hedonic system (van der Heijden 2004).

Within the context of casual mobile games, since most users play game in short sessions while on the move or while doing other tasks at the same time, it is suggested that PEOU has a critical role in creating good gaming experience. Mobile game should be easy to use so that player can fully concentrate on playing rather than dealing with any user interface issue, particularly since mobile games are constrained by the small screens and mobile device's keypad. Additionally, many mobile game players are casual users who play mobile games to pass time or escape daily life. If the games are difficult to use, users might not enjoy playing. Consequently, the following hypothesis is formed:

H2: Users' PEOU of mobile games will positively influence their perceived enjoyment.

4.2.3. Variety / Novelty

Both constructs “variety” and “novelty” seem to refer to the same attribute of IS. Webster and Ho (1997) first introduce the construct “variety” while studying user engagement in multimedia presentation. They view variety as “novel, surprising, and complex stimuli” that can be used to increase users’ engagement in multimedia. In the experimental study, the authors increase variety by incorporating new sound effects and animation in a presentation. The two items used to measure variety are “changing presentation styles” and “variety of presentation formats”.

Later on, while studying flow experience in websites, Huang (2003) uses the term “novelty” to refer to “the aspects of website attributes that users find unexpected, surprising, new, and unfamiliar”. This definition is considerably overlapping with how Webster and Ho (1997) defined variety as both are conceptualized as the opposite of familiarity. However, the measurement scales in the study encompass the dimensions of imaginative, surprising, innovative and new characteristics. In other words, the scale introduced by Webster and Ho (1997) refer more to the variations whilst that by Huang (2003) refer more to novelty.

Later studies by other authors which make reference to Webster & Ho’s and Huang’s work use the two terms interchangeably. Chung and Tan (2004), for example, define “variety” as user’s ability to gain variety from website, which incorporate items such as variation in information received and innovative features such as picture search. In other words, the scale included both dimensions of variation and novelty. However, this work is an exploratory study without measurement scale. O’Brien and Tom (2010, 2008) also used variety/novelty in their conceptual framework for user engagement with technology. Referring to both Webster & Ho and Huang, the authors define variety/novelty as “sudden and unexpected changes that occur on the interface that evoke a reaction from the user”.

The present study views variety and novelty as two variables representing different facets of the novel and surprising stimuli, like two perspectives of the same attribute. Both of them are important in keeping players enjoyed and engaged. This is because over time as people play a game, they will get familiar and even bored if there is nothing new or variation. Hence, to keep

users enjoyed, novel and surprising features must be added over time to bring variations in the game. For example, Angry Birds, one of the most successful mobile games, has introduced a variety of versions since its first launch with each version featuring new themes and game mechanics. Within one version, different levels also introduce different landscapes, challenges and new types of “birds” or game characters with varied capabilities, which keep players excited and could likely be one of the key reasons why players keep on playing the games. Furthermore, there is empirical support for the relationship between variety/novelty on users’ engagement (Webster, Ho 1997), perceived playfulness (Chung, Tan 2004) and flow experience (O'Brien, Toms 2010, Huang 2003).

Both measurement scales developed by Webster & Ho and Huang will be used and referred to as “Variety” and “Novelty” respectively. The following hypothesis is proposed:

H3: Variety in mobile games relate positively to users’ perceived enjoyment.

H4: Novelty in mobile games relate positively to users’ perceived enjoyment

4.2.4. Perceived interactivity

This construct refers to the system interactivity as experienced by the users (Huang, Hsieh 2011). It is widely viewed as one of the most important factors contributing to flow state. This is because high interactivity generally leads to continuous and immediate feedback and thus allows users to actively and seamlessly participate in the games (Huang , Hsieh 2011).

Establishing an operational definition for interactivity is challenging as there is no generally accepted definition (Wu 2006). The term is often viewed as a complex and multi-dimensional concept and hence there seems to be as “many definitions of interactivity as the number of researchers studying interactivity” (McMillan, Jang-Sun 2002, Wu 2006). Choi and Kim (2004) for example define interaction as “the behavior of communicating with two or more objects and affecting each other”. They divide interactivity into two types: (1) personal interaction between user and system and (2) social interaction between two or more users. These perceptions of

interactivity are the results of a combination of various factors such as clearly defined goal, timely feedback (eg. status, rewards, system response) and in-game communication tools.

A few other studies view interactivity same as feedback (Wang, Wang 2008, Chung, Tan 2004). Wang and Wang (2008) for example use the two terms interchangeably to indicate “the extent to which an individual perceives that playing online games has interaction between game players”. In other words, this definition appears to focus on the social aspect, i.e. interactions between players. They suggest that prompt feedback/interactive system facilitates cooperation between players to overcome game challenges and thus facilitates gamers’ playful experience. The measurement scales include overall users’ perceptions of interaction and cooperation with other players.

Arguing that continuous connection and quick system response to players’ actions are critical for good gaming experience, Huang and Hsieh (2011) evaluate interactivity in term of speed. The measurement scale include how fast the system responses to players’ actions or how fast the game loads. This operational definition is also in line the definition used earlier by Novak et al. (2000).

This view of interactivity is suggested to be meaningful in the context of mobile games particularly due to its mobility, small screen design and the challenge of mobile network connection. As mentioned earlier, casual mobile games are typically played in short time intervals and when players are on the move or have small free time. It is important that the game is quick to start, stop and reload. Further, mobile games are highly interactive since users play using fingers on smart device screen. Any delay in the action as the users move the hand will certainly have an impact on users experience with the game. Thus, this study evaluates interactivity in terms of speed (Huang, Hsieh 2011, Novak et al. 2000, Bridges, Florsheim 2008)

The study posits the following hypothesis:

H5: Interactivity of the game relate positively to their enjoyment toward the game.

4.2.5. Perceived Challenge

This construct is defined as “a sense that one’s capabilities are being stretched” (Bridges, Florsheim 2008, Novak et al. 2000). It refers to the positive challenges, which are similar to those challenges presented while playing sports or games. These are different from negative challenges, which are those related to problems such as difficult navigation or slow download time (Koufaris 2002). Positive challenge is frequently recognized as among the most important predictors of flow and users’ enjoyment in various IS settings, particularly in hedonic environments (Hernandez 2011, Sweetser, Wyeth 2005, Kiili 2005, Hsu, Lu 2004). In online shopping for example, Koufaris (2002) find that challenge has significant direct impact on user’s enjoyment. This is because individuals experience these positive challenges as rewarding and feel exciting when these challenges match their skills (Ghani, Deshpande 1994, Hoffman, Novak 2009b).

This construct is expected to be highly meaningful in this context as well. Each mobile game typically presents a series of challenge or goal that players need to achieve or overcome before they can move on to the next level. Certainly, players will feel bored and loose interest in the game if the challenge is too easy. On the other hand, if it is too difficult to overcome the challenge, players will feel frustrated and anxious. Hence, an appropriate level of challenge is the key to keep gamers excited and engaged.

Drawing from the literature and the argument above, the study posits that challenge plays a key role in predicting perceived enjoyment in mobile games:

H6: Mobile gamers’ perceived challenge of the game relate positively to their enjoyment toward the game.

4.2.6. Perceived Control

“Control implies the freedom to act” (Huang 2003). When user is in control, he/she is in charge of the interaction and is not frustrated by the system (Chung, Tan 2004, Agarwal, Karahanna 2000, Sweetser, Wyeth 2005, Bridges, Florsheim 2008, Novak et al. 2000). Similar to challenge,

this construct is among the key elements of flow experience. Users' sense of control can be created by, for example, allowing users to customize, to turn the game on and off and to save and start the game in different states (Sweetser, Wyeth 2005). Players feel in control when they can play the game the way they want not the way the designer had intended. Though this sense of control depends a lot on a player's skill, game designers could also strengthen gamers' sense of control in designing phase such as allowing players to customize the interface and gameplay to fit their preferences (Huang, Hsieh 2011, Sweetser, Wyeth 2005). Increased control certainly allows users more freedom over what they want to do, increasing their feeling towards the system's hedonic performance.

The role of control in player's behaviors has been suggested by researchers within gaming context (Huang, Hsieh 2011, Sweetser, Wyeth 2005) as well as in other IS contexts such as online shopping (Koufaris 2002, Bridges, Florsheim 2008) and mobile applications (Yang 2013). Huang and Hsieh (2011) study the effect of control on customer loyalty toward online game. They find through empirical study strong direct effect between the two factors. On the other hand, both studies by Wang and Wang (2008) and Chung and Tan (2004) in online gaming context suggested that further study is needed to investigate the role of control as antecedents of perceived playfulness, which is another cognitive construct similar to perceived enjoyment. Following these calls of research as well as flow theory, it is proposed that:

H7: Mobile gamers' perceived control of the game relate positively to their perceived enjoyment with the game.

4.2.7. Perceived Enjoyment and Continuance intention

Perceived enjoyment refers to consumer's perception of the fun and pleasure derived from using the IS system (van der Heijden 2004). The key facets of enjoyment include entertainment, relaxation, excitement and fun (Nysveen et al. 2005, van der Heijden 2004, Lin, Bhattacharjee 2010).

While TPB and TRA hold that belief (perceived enjoyment) only indirectly influence intention through forming user's positive or negative feelings (attitude), many other researchers have

different opinion, suggesting that belief factors directly drive intention without the attitude construct (Venkatesh et al. 2003, e.g. Davis et al. 1992).

The direct link between enjoyment and usage behaviors has also been found through empirical studies in different context. Turel and Serenko (2012) for example find that perceived enjoyment could lead users to form habit as well as high engagement in social networking sites. Wu and Liu (2007) study the effect of perceived enjoyment, trust and subjective norms on intention to play online games and find that perceived enjoyment has the strongest direct link to intention to play. Wang and Wang (2008) find perceived playfulness (similar to perceived enjoyment) as direct predictor of behavioral intention in online games. Lee and Tsai (2010) conduct a longitudinal survey to test a model explaining why people continue to play online games. Perceived enjoyment directly and significantly influence continuance intention.

Certainly, mobile games must bring enjoyment and fun to the users as this is the whole purpose of playing games. It is likely that users will stop playing a certain game if they do not enjoy playing, particularly since there are a large number of options that the users can easily download. Furthermore, Based on this context and results of previous studies, this study postulates that perceived enjoyment directly drive continuance behavior intention in mobile gaming.

H8: Perceived enjoyment positively affects continuance intention of playing mobile games.

Table 5 summarizes the constructs of the research model, their operational definitions and references.

Table 5 List of constructs of the research model and their definitions

Variable	Definition	References
Design aesthetics	The balance, emotional appeal or aesthetic of interface design	Cyr et al. (2006)
PEOU	Extent to which a person believes that using a	Davis (1989)

	particular system would be free of effort	
Variety	Variations in visual or auditory effects	Webster & Ho (1997)
Novelty	Features of the interface that that “users find unexpected, surprising, new, and unfamiliar”	Huang (2003)
Interactivity	Speed of the mobile game in responding to players’ action.	Huang & Hsieh (2011); Novak et al. (2000)
Perceived challenge	A sense that one’s capabilities are being stretched	Bridges & Florsheim (2008); Koufaris (2002)
Perceived control	How in charge users feel over their experience with the system	Sweetser & Wyeth (2005); O’Brien & Tom (2010) ; Agarwal (2000); Ghani & Deshpande (1994)
Perceived enjoyment	The extent to which the activity of playing mobile game is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated	Van der Heijden (2004); Mäntymäki & Salo (2011); Nysveen et al. (2005)

5. RESEARCH METHODOLOGY

This chapter describes the methodology used in this study. It starts by presenting the method used in collecting data as well as description of the sample. Afterwards, method used for analyzing and testing hypotheses are discussed.

5.1. DATA COLLECTION

This study used online survey with convenience sampling approach where respondents choose to participate into the survey voluntarily. This approach allows the survey to reach a large number of target respondents. Using a random sampling method would be very costly and likely impossible as practically it would require a database of all mobile game players from which respondents are chosen randomly. Furthermore, since the target respondent of this study are mobile gamers, who can be considered to a certain extent as tech savvy and thus are easily reachable using online channels. In the development of the survey, the measurement items are adapted from literature (Appendix 2), which has already developed and tested these items in earlier empirical studies. This is to ensure the items' reliability and validity.

Since enjoyment and post-adoption behavior is the focus of this study, target group for surveying are individuals who have played mobile games so that responses are based on their experience. Particularly, respondents are asked to think about the mobile game that they are playing most often while answering the research questions. This ensures that the answers refer to only one mobile game, attributing to the reliability and validity of the responses. The complete questionnaire can be found in Appendix 3.

Before the survey is sent out, it was pilot-tested with seven mobile game players and one academic professional. Based on their feedback, some of the wordings and structure of the questionnaire are revised. Webropol, an online questionnaire service, is used to create the survey. Link to survey is distributed in several casual mobile game forums and social networks (Appendix 3). These sites are chosen simply because their members are mobile game players and hence the suitable target for this study. All participants are volunteers and there is no

compensation nor reward to the participants. In order to increase response rate, the author asks forum moderators for their support in promoting the survey. The survey is available online for three weeks from 13rd January to 02nd February 2014.

5.2. SAMPLE

In total, there are 549 visitors to the survey. Out of these, 288 responses are received, yielding a response rate at 53%.

A close examination of data collected from the surveys reveals some invalid responses. Those are from respondents who have never played mobile games before. Some respondents answer the surveys based on the games they play on laptops or computers. These responses are also considered as invalid and are thus removed from the sample. As such, the total sample consists of 224 responses based on mobile gaming experience. Table 6 summarizes the key demographics of the respondents.

Table 6 Demographic of respondents

Demographic variable	Frequency (n=224)	%	Cumulative %
Gender			
Male	74	33%	
Female	150	67%	
Age			
<15	4	1,8 %	1,8%
15-19	10	4,5%	6,3%
20-24	35	15,6%	21,9%
25-29	42	18,8%	40,6%
30-39	46	20,5%	61,2%
40-49	36	16,1%	77,2%
>50	51	22,8%	100,0%
Country			
USA	86	38,4%	38,4%
Finland	53	23,7%	62,1%

The UK	20	8,9%	71,0%
Canada	8	3,6%	74,6%
New Zealand	7	3,1%	77,7%
Vietnam	7	3,1%	80,8%
Others	43	19,2%	100%
Frequency of playing games			
Everyday	128	57,1%	57,1%
More than 2 times per week but not everyday	28	12,5%	69,6%
1-2 times per week	28	12,5%	82,1%
3-4 times per month	9	4,0%	86,1%
Occasionally use	31	13,8%	100%

Woman make up 67% of the sample size. When it comes to age group, the largest respondent group sits in 25-39 year-old range (close to 40%). Surprisingly, respondents who are over 50 made up also more than 20% of the sample size. However, this is supported by the reality that over 30% of mobile game players are over 45 years old according to a recent industry statistics (Thompson 2013). A large part of respondents live in the US (38%) and Finland (24%) and more than 57% of the respondents play mobile game every day.

Table 7 shows the list of mobile games played most often by the respondents. Top of the game list that respondents play most often are Candy Crush Saga (27%) and Angry birds (13%) which mirror the fact that these are the two most downloaded casual mobile games at the time of the survey according from Apple store (Graham 2013). These are also games with high percentage of female players, explaining the high number of female respondents for this survey. In a recent report by SponsorPlay, 72% of people playing Candy Crush Saga are female and 66% of the users are over 26 years old (Thompson 2013). Other game in the most often played list among the respondents were Plants vs. zombies, Clashes of clans, Pet rescue saga and Words with friends. These are mostly categorized as casual games by both Apple App store and Google Play.

Table 7 List of mobile games played most often by respondents

	Frequency (n=224)	Percent %
Game		
Candy Crush Saga	60	27 %
Angry birds	29	13 %
Plants vs zombies	11	5 %
Clashes of clans	8	4 %
Pet rescue saga	7	3 %
Words with friends	6	3 %
Others	103	46 %
Device		
Smartphone	159	71 %
Tablet	63	28 %
Ipod, Kindle	2	1 %

Data is then checked to remove any unengaged answers. These are answers that gave some responses to all questionnaire items, indicating that the respondent was not interested in the survey or the subject being studied at all and hence the answers are not valid for the study. The approach is to check standard deviation from the responses. One response with zero standard deviation is removed, the rest of the responses have standard deviation of .8 or more.

Missing data is also checked and it is seen that missing data occurred randomly and is less than 10% of observations. In this case, any of the approaches to handle missing data is appropriate (Hair et al. 2010, 660). To ensure the best quality of data, three responses that do not answer more than four questionnaire items are deleted. Thirteen responses with up to three missing values are imputed using the median as the missing values are ordinal variable, measured using a Likert scale. After removing unengaged response and missing values, the remaining sample contains of 220 responses, which is used for analysis purpose.

Next, data is checked for normality to confirm the choice of software used. The test for normality shows that the absolute value of skewness of only one observed variable (PEOU1) is slightly higher than 2.0. This means that the data is more or less normal. On the other hand, some observed variables have kurtosis value greater than 3, which indicates potentially problematic

kurtosis (Finney, DiStefano 2006). However, as Bollen (1989) and Hair et al. (2010, p.605) discussed, all normal distribution estimation methods still work even if the normality is moderately violated. Hence, it is still suitable to use maximum likelihood estimation (MLE) which is a normal distribution estimation method and is the method used by Amos software.

Additionally, the data is screened for potential non-response bias, which refers to the possible error resulting from respondents who did not participate in the survey. This is particularly important for convenient sampling method such as one used by this study. Non-response bias is tested by comparing the responses from the first and last ten percent respondents (Grover et al. 1993, Merikivi 2013). Result of t-test shows no significant differences between the two groups and it can be relatively safe to say that non-response bias does not affect the data.

5.3. ANALYSIS METHOD

A two-step structural equation modelling (SEM) is employed as the analysis method for this study. This method has been commonly applied by IS researchers as it allows researchers to statistically evaluate complex relationships among multiple variables. SEM also enables researchers to represent unobserved concepts in these relationships and accounts for measurement error in the estimation process. SEM is considered as a confirmatory procedure, in which a model and relationships between variables are drawn from strong theoretical foundations. Data is then collected to evaluate how well the model fits with empirical evidence. (Hair et al. 2010). Two common approaches of SEM are covariance-based and component-based (or Partial Least Square PLS), which are summarized in table 8.

Table 8 Comparisons of Covariance-based and Component-based approach (Gefen et al. 2000)

Issue	Covariance-based (Software: LISREL, Amos)	Component-based (Software: SmartPLS)
<i>Objective of Overall Analysis</i>	Show that the null hypothesis of the entire proposed model is plausible, while rejecting path-specific null hypotheses of no effect.	Reject a set of path-specific null hypotheses of no effect.
<i>Objective of Variance Analysis</i>	Overall model fit, such as insignificant χ^2 or high AGFI.	Variance explanation (high R-square)
<i>Required Theory Base</i>	Requires sound theory base. Supports confirmatory research	Does not necessarily require sound theory base. Supports both exploratory and confirmatory research.
<i>Assumed Distribution</i>	Multivariate normal, if estimation is through maximum likelihood. Deviations from multivariate normal are supported with other estimation techniques.	Relatively robust to deviations from a multivariate distribution.
<i>Required Minimal Sample Size</i>	At least 100-150.	At least 10 times the number of items in the most complex construct.

As seen in table 8 the two approaches differ significantly in many ways. Typically PLS is more suited when the sample size is small or when the variables are not normally distributed. Also, PLS is preferred when the model includes formative variables, i.e. observed variables that cause the latent (unobserved variables). (Gefen et al. 2000). The research framework of this study, on the other hand, comprised of only reflective constructs. Hence, it is more plausible to use covariance-based SEM (Gefen et al. 2000). Furthermore, the sample size of this study is relatively large enough for covariance-based approach. The Amos software package, which uses covariance-based approach, is used simply due to its availability. Additionally, data is normally distributed which made it also suitable for using Amos. This is discussed in details in the next chapter.

6. ANALYSIS

6.1. MEASUREMENT MODEL

The first step of the process is Confirmatory Factor Analysis (CFA), which seeks to test how well the theoretical model fits with empirical data (Hair et al. 2010, 707). This step includes testing for reliability and validity as well as examining overall model fit. Reliability measures the interrelation between items of the same latent construct (Hair et al. 2010, 636). In other words, it is an indicator of whether the items measure the same thing, i.e. the construct. Validity on the other hand indicates the degree to which an item accurately represents what it is expected to (Malhotra, Birks 2003).

Reliability of measurement items is first checked using Cronbach's alpha. Result of the test from SPSS shows high reliability of all items of the questionnaires: lowest Cronbach's alpha coefficient of all nine constructs is .728 (Interactivity).

As to evaluate validity, there are several assessments, among which the most widely used are content validity and construct validity. Content validity is a subjective method that measures how well the measurement items reflect the construct being studied (Malhotra, Birks, 2003, 314). In other words, it addresses whether all the relevant aspects of the construct have been taken into account in the empirical study (Mäntymäki 2011). In practice, researchers quite often use the items and scales that have been developed and proven through past literature to establish content validity. The same method is applied in this study. As explained earlier, measurement items are adapted from earlier research in IS. Hence, it would be relatively valid to say that the measurements adequately reflect the constructs.

Construct validity addresses the accuracy of measurement. It establishes whether the set of observed variables actually reflect the theoretical latent construct that it is supposed to measure (Hair et al. 2010, 708). There are several aspects of construct validity, including nomological, convergent and discriminant validity (Malhotra, Birks, 2003, 315) of which convergent and discriminant validity are frequently reported in IS research (Mäntymäki 2011). Convergent

validity measures the degree to which the items within a specific construct share a high proportion of variance in common (Hair et al. 2010, 709). Typically, convergent validity is estimated by three ways. Firstly, Factor Loadings should be statistically significant and its standardized loading estimates are .5 and ideally .7 or higher. Secondly, Average Variance Extracted (AVE) should be .5 or higher. Thirdly, Construct Reliability (CR) should be .7 or higher. (Hair et al. 2012, 709-710). Result of validity test of all questionnaire items shows several factors with poor loadings as well as some concerns with AVE and CR. This is possibly due to the reversed wording of the questions; all factors with poor loadings are opposite to the remaining items of the same construct. After removing these items from the measurement model, internal consistency is significantly improved, meeting the recommended value for AVE and CR, with the exception of control construct at .475 (see table 9 below). Indeed, as one of the measurement items (CON4) is removed, control construct's AVE goes above the threshold level of .5. However, CON5 loading drop to below .6 in this case. In addition, two-item model often proves to be instable and hence this construct is kept in the model. Besides it does not appear to significantly harm validity of the construct as both CR and discriminant validity meet recommended threshold. Also, the model fit indices that are to be discussed below are reasonably good. All remaining items in the measurement model meet the target loading of more than .7, except for CON4 (.6).

Table 9 Results of Validity and Reliability tests

VALIDITY & RELIABILITY	> 0.7	> .7	> 0.7	> 0.5
	Factor loading	Cronbach's Alpha	CR	AVE
Item				
DA1	0,841	0,949	0,949	0,790
DA2	0,863			
DA3	0,884			
DA4	0,921			
DA5	0,931			
PEOU1	0,775	0,889	0,889	0,667
PEOU2	0,802			
PEOU3	0,857			
PEOU4	0,831			

VAR1	0,813	0,797	0,803	0,577
VAR2	0,754			
VAR3	0,708			
NOV1	0,69	0,902	0,894	0,629
NOV2	0,752			
NOV3	0,813			
NOV4	0,857			
NOV5	0,915			
INTER2	0,75	0,823	0,831	0,623
INTER3	0,889			
INTER4	0,719			
CHA1	0,889	0,93	0,931	0,820
CHA2	0,963			
CHA3	0,861			
CON3	0,728	0,728	0,729	0,475
CON5	0,732			
CON4	0,6			
PE1	0,87	0,896	0,900	0,692
PE2	0,875			
PE3	0,832			
PE4	0,745			
CI1	0,864	0,961	0,962	0,863
CI2	0,936			
CI3	0,971			
CI4	0,942			

Extraction method:
Maximum Likelihood

Discriminant validity measures whether the observed variables uniquely measure the construct in question or other constructs (Mäntymäki 2011). In order to evaluate discriminant validity, the square root of AVE estimates for each construct should be greater than the correlation between that construct and any other constructs (Fornell, Larcker 1981). As can be seen in table 10 below, the diagonal values (square root of AVE) are greater than any value in the same column (correlations). It is thus concluded that all constructs demonstrates adequate discriminant validity.

Table 10 Results of discriminant validity test

	AVE	PEOU	Design	Challenge	Control	Interactivity	Novelty	Variety	PE	Intention
PEOU	0,667	0,817								
Design	0,790	0,310	0,888							
Challenge	0,820	0,014	0,251	0,905						
Control	0,475	0,412	0,087	-0,037	0,689					
Interactivity	0,623	0,383	0,480	0,263	0,246	0,789				
Novelty	0,629	0,068	0,506	0,436	-0,057	0,218	0,793			
Variety	0,577	0,077	0,434	0,351	-0,064	0,237	0,613	0,760		
PE	0,692	0,471	0,572	0,380	0,262	0,426	0,547	0,431	0,847	
Intention	0,863	0,414	0,337	0,350	0,214	0,321	0,265	0,191	0,572	0,928

The measurement model is then examined for overall model fit. This is one of the key steps of SEM to assess how well the hypothesized model fit with observed data (Hair et al. 2010, 665). There is a variety of measures that have been developed for this purpose, generally classified into three groups: absolute measures, incremental measures and parsimony fit measures. Table 11 below provides the definition and common fit indices of each group.

Table 11 Goodness-of-Fit indices (adapted from Hair et al. 2010, 665-670)

Group	Definition	Fit Indices
Absolute fit indices	direct measure of how well the model fit with observed data	Chi-Square GOF GIF RMSEA RMR, SRMR Normed chi-square (Cmin/DF)
Incremental Fit Indices	assess how well the estimated model fits relative to some alternative baseline model	NFI TLI CFI RNI
Parsimony Fit Indices	provide information about which model among a set of competing models is best	AGFI PNFI

A non-significant chi-square result has been considered as the most fundamental fit index (Mäntymäki 2011). However, larger number of indicator variables such as in this case tend to make it more difficult for the model to achieve a statistically insignificant value of chi-square and hence other indices have been developed (see table 11). Hair et al. (2010, 666) suggest that thresholds for these indices slightly vary according to different factors such as sample sizes and model complexity. Specifically simpler models and smaller samples should be subjected to stricter evaluation than more complex models and larger samples. Table 12 below summarizes the key goodness-of-fit statistics and their recommended values as suggested by Hair et al. (2010) for this specific case ($m > 30$, $N < 250$). Other indices (Cmin/DF, AFGI) that are not included in the list provided by Hair et al. (2010) are taken from other literature. As can be seen in the table, all fit indices of the measurement model meet the threshold, suggesting an acceptable fit for the CFA model. As all the constructs meet the validity and reliability requirement, it is now suitable to proceed to the next step, which is to build and examine the structural model.

Table 12 Fit Indices demonstrating Goodness-of-Fit (Hair et al. 2010)

Fit Indices	Recommended value	Measurement model	Structural model
Chi-square	Significant p-values expected	Chi-square = 710,9 df = 487 Probability= 0.00	Chi-square = 729,8 df = 494 Probability= 0.00
<i>Absolute fit indices</i>			
Cmin/DF	<3 (Bagozzi, Yi 1988)	1.46	1.477
RMSEA	<.08 (when CFI>.92) (Hair et al. 2010)	.046	.047
<i>Incremental fit indices</i>			
CFI	>.92 (Hair et al. 2010)	.962	.960
TLI	>.92 (Hair et al. 2010)	.956	.954
<i>Parsimony fit indices</i>			
AGFI	>.8 (Gefen et al. 2000)	.817	.814

m: number of observed variable; N: number of observations per group

Another test that is performed afterwards was to check for common method bias (CMB), which refers to error resulting from measurement method but not from the constructs. This is particularly relevant for studies with only one single method (i.e. online survey in this case), as

this could introduce systematic response bias that might inflate or deflate results. A study that has significant CMB is one which a majority of the variance can be explained by a single factor. CMB was first tested using Harman's one-factor approach which is perhaps the most widely used method for the purpose (Malhotra et al. 2006). Running Factor analysis with maximum likelihood method and none rotation in SPSS showed that ten factors are extracted while one factor extraction only explained 27.4 percent of variance. This indicates that common method bias is likely not the major concern (Malhotra et al. 2006, Liang et al. 2007). As the fit for the measurement model meets the criteria, the next step is to examine structural model.

6.2. STRUCTURAL EQUATION MODELLING (SEM)

The CFA model is transformed into a structural model, which is the research model of this study as shown in Figure 6. The purpose of SEM step is to first, establish SEM model fit and second, test hypothesized paths.

Table 12 above also shows the fit statistics of the SEM model. The model CFI is .966, TLI is .96, and RMSEA is .044. All of these values are within the range that is considered to represent good fit. It can also be seen that the overall model fit change very little from the CFA model.

Next, the hypothesized paths are tested. Among the eight hypotheses, six are statistically significant as shown in figure 8 below. Specifically, the results support the influence of PE on continuance intention (coefficient=.58 and $p<.001$), supporting H8. PE can explain 34% of the variance on users' intention to continue playing mobile game. PE is then driven by Design Aesthetic, PEOU, Novelty, and to a much lesser extent, Challenge and Control as shown by significant path coefficients of .21 ($p<.01$), .31 ($p<.001$), .31 ($p<.001$), .16 ($p<.01$) and .135 ($p<.05$) respectively. However, Chin (1998) suggests that standardized paths should be at least 0.2 to be considered meaningful. Hence, only H1, H2, and H4 are supported. Together, the model account for 58% of the observed variance in PE in mobile gaming.

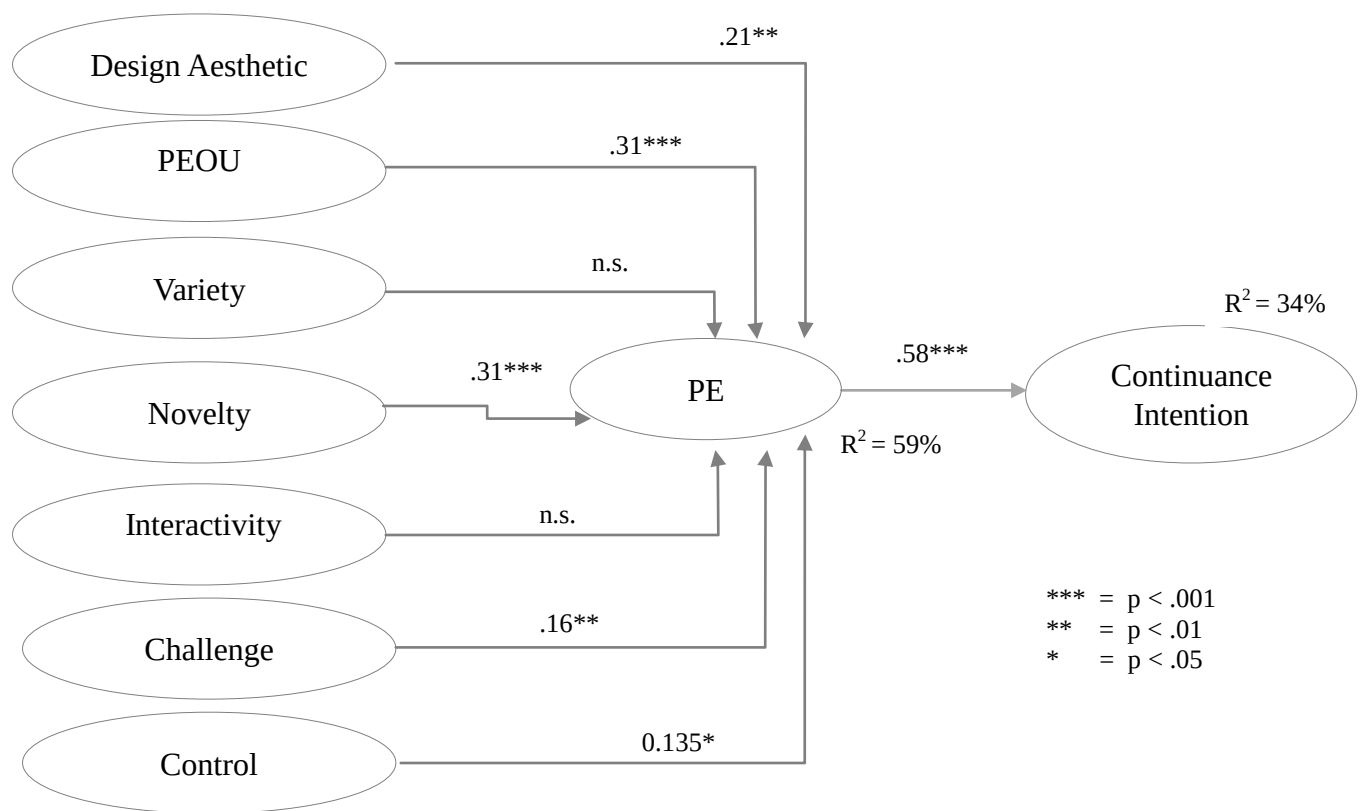


Figure 6 Results of SEM analysis

7. FINDINGS AND CONCLUSIONS

This chapter discusses the key findings of the research while relating them to prior literature. From there it continues to elaborate on the theoretical and managerial implications that could be withdrawn from the results of the study. Finally, the chapter concludes by suggesting possibilities for future researches.

7.1. KEY FINDINGS

The purpose of the present study is first, to explore the factors driving perceived enjoyment in mobile gaming and second, to explain to what extent users' perception of enjoyment drives their continuance intention. To achieve this, the study develops and tests a research framework based on theories of flow and design aesthetic. Test results are presented in table 13 and there are several findings as follows.

First, as hypothesized, designed aesthetic, ease of use and novelty influence perceived enjoyment in mobile gaming. Together these constructs can explain 59% of variance for users' perceived enjoyment. This is significantly higher than previous studies such as that of Wang and Wang (2008) who studied antecedents of perceived playfulness, which is another affective/cognitive experience similar to perceived enjoyment ($R^2 = 32\%$ for male and 12% for female). The model also has a rather convincing explanatory power for continuance intention (34%) given that it only has one second-order construct (perceived enjoyment). This confirms the role of perceived enjoyment in driving continuous use behaviors, particularly in mobile games.

Second, novelty is among the strongest source (together with PEOU) to generate users' enjoyment in mobile gaming. This is new information about the role of novelty. In the context of online websites, Huang (2003) found that novel elements could lead users to curiosity, which is a component of flow experience. However, it was found to undermine users' feeling towards the hedonic performance of the site, measured by the amount of fun, playfulness and pleasure users experience from the site. Another study by O'Brien and Tom (2010) found that novelty predicted felt involvement in online shopping, which includes overall assessment of the experience as

“fun”. Relatively few existing study, particularly in mobile game context has examined novelty as a direct determinant of perceived enjoyment as in this study. The finding indicates that in order to sustain players’ enjoyment, mobile game developers should frequently introduce new features and activities. High competition in mobile game industry makes it even more critical to keep the game fresh and exciting. New games are introduced daily and users pay almost nothing to try and switch to a new game.

Third, the results demonstrate that perceived ease of use is closely related to perceived enjoyment in mobile game. This is an interesting finding since it has been often suggested that the role of PEOU decreases once users gain experience with the system (Venkatesh et al. 2003; Lin, Bhattacharjee 2008). Data of this study is based on respondents’ experience with the mobile game they play most often and still PEOU has a significant role on enjoyment. This could be explained by the fact that most users play mobile games in short intervals; unless the user interface is easy to use so that users can pick up the game where it was stopped and continue playing, they might get frustrated and lose interest toward playing. Also, as new features being introduced frequently to keep the games exciting, they require users’ attention and thus it is important that the games and new features are easy to learn and to use in order for users to be engaged.

Fourth, users’ perceived enjoyment in mobile gaming is also driven by well-designed user interface. The result is in line with prior research on internet websites (van der Heijden 2003) and mobile website (Cyr et al. 2006), which found that interface design played a central role in the level of enjoyment experienced by users of the services. For mobile games that are challenged by small screens and various sizes of mobile devices, interface design is particularly a viable issue for mobile game developers. At the same time, a large part of mobile gamers are casual players and female, who to a certain extent pay more attention to aesthetic design.

Fifth, the elements of flow, namely control, challenge, interactivity and variety are not found to have significant effect on enjoyment. This is quite surprising, as the role of these constructs have been empirically proven in other hedonic environments. As an example, Huang (2003) found

that a user's sense of control over their interactions with the website had direct influence on the user's feeling that the system is entertaining. Others found that interactivity was the key to enhance user's evaluation of website's intrinsic value (interesting, fun to use) (Skadberg, Kimmel 2004, Huang 2003, Chung, Tan 2004).

One possible explanation is due to the type of games played most often by the sample group of this study. As reported earlier, a large number of respondents answered the questionnaire based on their experience with simple arcade games. For these game genres, the sense of control might not be as relevant as in for example strategy or role-playing games where there are more interactions with the game character and game world. In games such as Clash of Clans, player has different game characters, tools and strategies to deploy while in Angry Birds or Candy Crush Saga, gameplay is much simpler. The rate at which game characters respond to players' commands or how freely players can deploy their strategies might be much more relevant to user's enjoyment while playing Clash of Clans than Candy Crush Saga. Similarly, the pace of simple arcade game is typically slower than some other game genres and as a result, the rate at which the game characters respond to players' command might not be a major concern. This perhaps explains the insignificant role of interactivity in terms of speed on enjoyment in this context.

As for challenge, though its effect on perceived enjoyment is statistically significant, standardized path is lower than the threshold of .2 to be considered meaningful. It is difficult to interpret this result given that challenge is amongst the most important drivers according to flow theory, particularly in gaming context (Lucas, Sherry 2004). A closer look at answers to open questions reveals that many respondents often play mobile games while having nothing else to do or waiting for something. This in turn fits with the context of casual games (Koivisto 2007). The motive is therefore not looking for challenge, but more to pass time; and it is plausible that this motive undermines the role of challenge in this context.

On the other hand, the non-significant results might also indicate that lagging response during playing or difficulty of levels is not a problem for the respondents of this study. This is perhaps

due to simple or well-designed games, making the applications running smoothly and having levels and tasks suitable with player's skills. Hence, these constructs could even be the prerequisites for users' enjoyment; they do not show significant impact on enjoyment in this study as the respondents already take them for granted. The results therefore should be interpreted carefully.

While Wester and Ho (1997) posit that variety (e.g. changing presentation styles and formats) leads to users' engagement in multimedia environment, the present study finds that variety does not directly drive enjoyment in mobile gaming. Novelty, on the other hand, has significant impact on enjoyment as discussed earlier. This might indicate that although mobile game players appreciate novel stimuli, they are indifferent towards variety in game designs. In other words, quality of the stimuli is more appreciated than quantity. Novelty and variety indeed differs and play different roles in mobile gaming context.

To sum up, results of the empirical testing are shown in Table 13 below. Four hypotheses are supported. An enjoyable user experience, driven by beautiful interface design together with innovative yet easy to use features is likely to make users continue playing mobile games.

Table 13 Result of SEM

<i>H1: Design aesthetics of a mobile game will positively influence perceived enjoyment.</i>	Supported
<i>H2: Users' PEOU of mobile games will positively influence their perceived enjoyment.</i>	Supported
<i>H3: Variety in mobile games relate positively to users' perceived enjoyment.</i>	Not supported
<i>H4: Novelty in mobile games relate positively to users' perceived enjoyment.</i>	Supported
<i>H5: Interactivity of the game relate positively to their enjoyment toward the game.</i>	Not supported.
<i>H6: Mobile gamers' perceived challenge of the game relate positively to their enjoyment toward the game.</i>	Not supported
<i>H7: Mobile gamers' perceived control of the game relate positively to their perceived enjoyment with the game.</i>	Not supported
<i>H8: Perceived enjoyment positively affects continuance intention of playing mobile games.</i>	Supported

7.2. THEORETICAL IMPLICATIONS

Firstly, existing studies of user behaviors in mobile game context have mostly built on TAM model and focused on pre-adoption phase, i.e. the intention to adopt, leaving the post adoption behaviors relatively under researched. Addressing this research gap, the present study contributes to understanding of consumer behaviors in post adoption phase in casual mobile game settings by examining the role of intrinsic motivation on continuance intention. It is clear that enjoyment derived from usage directly drive continuous engagement with mobile games. While some researchers such as Liu and Li (2011) state that enjoyment fails to directly influence usage intention, this study presents a different result, contributing to the theoretical discussion on the role of perceived enjoyment.

Secondly, though prior researches have reckoned the important role of perceived enjoyment in mobile gaming, few researches have attempted to understand what factors contribute to enjoyment. Through reviewing literature, the study identifies and combines different factors into one research model to explain perceived enjoyment. This can be considered the main theoretical contribution of the present study.

In particular, the two most influential drivers of enjoyment in casual mobile games are novelty and perceived ease of use, followed by a third construct of design aesthetics. Despite the prevalence of mobile devices and experience users might have with mobile games, PEOU remains a central construct contributing to enjoyment. However, the role of PEOU might be signified within the context of this study which is casual game and which has a large proportion of older female respondents.

On the other hand, control, challenge and interactivity, have non-significant impact on enjoyment in casual mobile gaming. This is contradictory to the theory of media enjoyment (Sherry 2004) and GameFlow model (Sweetser, Wyeth 2005) which state that these factors are prerequisites of enjoyment in gaming. Then again, these theories are developed based on the

context of computer games. This confirms enjoyment in mobile gaming is driven by different factors than those in computer game environment. Then again, the result also implies possible moderating effect of game genres on the relationship between these constructs and enjoyment in mobile gaming. Within the context of other genres, these constructs might play a more important role.

Thirdly, this study contributes to the understanding of variety and novelty construct. Some of the earlier researches use the two terms interchangeably (O'Brien, Toms 2010, O'Brien, Toms 2008, Chung, Tan 2004) while the present study defines variety and novelty as two separate constructs. The measurement items are adapted from Webster and Ho (1997) and Huang (2003), which seem to be the earliest empirical studies measuring these constructs. As far as the author is aware, very few numbers of empirical researches has used these constructs in their studies. Within gaming context, none could be found. As such, the present study brings in new information of the two relatively under-researched constructs. They highly relate but differ from each other as demonstrated by high correlation yet adequate discriminant validity (table 10). Furthermore, whereas variety does not have impact on enjoyment, novelty is among the strongest predictor of enjoyment in mobile game settings.

7.3. MANAGERIAL IMPLICATIONS

The present study offers several practical implications to create an enjoyable experience and as a result, drive continuous use of mobile games.

Most mobile games nowadays follow freemium model, that is, it is free for users to download and play the games. Developers get money through advertisements, in-app purchases or players' upgrade to a paid version. These are possible only if players continue playing the game. This study firstly confirms that games have to be entertaining and fun, as this directly keeps users coming back. Developers could enhance users' feeling of enjoyment by frequently introducing new features and contents. In practice, these could be for example new items, new themes or

episodes. The key to success lies in the surprise factor, i.e. the new features should be fresh and innovative. Simply introducing a variety of features does not necessarily drive users' enjoyment.

At the same time, developers should keep in mind that the games and its new features should be easy to learn. While frequently introducing new features, they should be easy and simple to learn, as these are equally crucial in maintaining users' enjoyment. New features should not change the interface or game play significantly, otherwise it risks making users struggling with the interface, the new features, feeling frustrated and eventually quitting. Indeed, it was specified by several respondents of the survey that the game *"keeps adding more things that don't work and I get real tired of this"* or I get frustrated because of *"new design that changes game play"*.

Additionally, responses to open questions of the survey suggest that mobile game developers should be cautious in utilizing in-app purchase. Many respondents state that they stop playing when they are asked to pay for the update or for continuing to next levels. In fact, industry figures show that even within top games, less than 10 percent of users make in-app purchase (Brustein 2013). Hence, developers should realize that it is challenging to generate revenue directly from users. Advertising on the side of in-app purchase can be a viable additional source of revenue.

7.4. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Although the study has several key contributions to the understanding of enjoyment in mobile game, there are limitations that need to be addressed. The first limitation relates to the sample of the study, which is collected using convenient sampling method. This method is often criticized for being a nonsystematic way to recruit respondents, who may not be the precise representation of the actual population (Liang et al. 2013). However, a randomized sample would have been impossible, as it requires a complete list of all mobile game players. At the same time, result from non-response bias test and demographic of respondents to this study shows that the finding is statistically reliable. Yet, results of the study should be interpreted with caution. Additionally,

the sample size is rather small given the big research model with many constructs. Though the statistical tests show satisfactory validity, reliability as well as model fits, larger sample size is needed in order to generalize the result of the study.

The study uses data collected at a single point of time to measure continuance intention, not actual use. Though discussions in existing literature agree that individual has a tendency to act as they intend, longitudinal studies with data collected at different time points will certainly add further understanding on the causality and interrelationships among enjoyment, continuance intention and the actual use.

Furthermore, the study limits its scope within casual game context only. Most respondents to the survey play relatively simple games such as Candy Crush Saga and Angry Birds. While this reflects practical observation that these are among the most downloaded mobile games at the time of the survey, there is a gender bias towards female in the sample as more women play these types of game than male. Additionally, females tend to use systems more for enjoyment (Richard et al. 2010), which might have signified the role of enjoyment on continuous use. Casual gaming environment might also undermine the role of control, interactivity and challenge. In this regard, a possibility for future research is to investigate whether the same results will be achieved in different game genre settings. Moderating effect of gender and age group could be also taken into consideration.

In addition to enjoyment, it is acknowledged that users also have other reasons and motives for playing games. Extrinsic benefits such as developing strategic thinking skills or creativity are often stated by respondents of the survey as other reasons that contribute to their continual use of mobile games. A line of future research could investigate what factors contributing to users perceptions of such extrinsic benefits and to what extent these drive continuous use of mobile game. Future work could also study which motives prevail in different game genres. Such understanding would assist businesses in delivering advertising message that is suitable with the game genres and their target group.

8. CONCLUSION

Intensive competition in mobile game industry coupling with research gap in mobile gaming literature, which has been mainly focusing on consumer behaviors at initial adoption phase, has given rise to the need to examine why individual continues playing a mobile game. Through literature review, it was noted that enjoyment prevails as the key motive for consumer behaviors in mobile gaming. The present study addressed the issue by decomposing factors driving enjoyment and at the same time examining the impact of enjoyment on continuous use intention. The study limited its scope to casual games only. Two research questions were posed:

- What factors influence perceived enjoyment in mobile gaming?
- To what extent can perceived enjoyment predict continuance intention?

Empirical result suggested that continuous use intention is directly and significantly driven by perceived enjoyment. Enjoyment in casual mobile games is the result of perceived ease of use, novelty and design aesthetics. This indicates that mobile game developers could build an engaging game through (1) frequently introducing novel and surprising features yet keeping the game simple and easy to play, and (2) ensuring attractive visual design with good graphic.

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APPENDIX 1 STUDIES IN MOBILE GAME CONTEXT

Topic	Author	Focus & Findings
Consumer adoption behaviors	Fife and Pereira 2006	Explain the different rate of adoption of online and mobile gaming in US and Korea. Social and cultural differences
	Ha et al. 2007	Determinants of adoption of mobile games. Perceived enjoyment has greatest effect on intention to play mobile games. PEOU, i.e. simplicity and Attractiveness, i.e. visual and acoustic are important prerequisites of enjoyment.
	Penttinen et al. 2010	Consumer values in mobile games. Four fundamental groups of values are satisfaction of quality expectation, Gaming experience, Ease and Quickness of setup, Social aspects.
	Zhou 2013	Determinants of adoption of mobile games. Flow has significant impact on mobile game users. PEOU, Content quality, and connection quality are drivers of flow.
	Okazki, Radoslav, & Grande 2007	Cross-cultural exploration of factors influencing mobile gaming adoption among the youth in USA, Japan, Spain and Czech.
	Liu & Li 2011	Impact of use context on mobile game adoption. Use context is the strongest predictor of mobile game adoption. Both perceived usefulness and perceived enjoyment have direct influence on Attitude, but not on behavioral intention.
	Lee & Quan 2013	Factors affecting Chinese mobile game use intention. Incentives and perceived enjoyment are determinants of the behavioral intention to use. Drivers of PE include self-expressiveness, visibility, incentives and PEOU.
	Kleijnen et al. 2004	Explain the adoption of mobile gaming based on Roger adoption theory. Perceived risk, complexity, and compatability are three main adoption factors of mobile gaming.
	Liang & Yeh 2011	Investigate the impact of context to user's decision to use mobile game. Contextual factors have significant moderating effect on intention to play mobile games.
	Okazaki 2007	Develop an instrument to measure experiential value in online mobile gaming adoption. which in turn affects intention to download mobile games.

Business & Marketing	Park & Kim 2013	Success factors of mobile games.
	Feijoo et al 2012	3 most crucial factors to mobile game success: targeting, awareness and consumers' willingness to pay. Industry challenge and implications for policy on mobile gaming.
Mobile game design	Korhonen & Koivisto 2006	Develop a heuristics model for mobile game evaluation: Game usability, Mobility, and Gameplay.
	Yahyavi, Pang & Kemme 2013	Solutions to improve mobile game security. A framework of stakeholders, consisting of game developers, game engines, operating system ecosystems and carriers to avoid cheating in mobile games.
	Kim & Lee 2012	This paper proposes a database-centred approach to the systematic development of new mobile service concepts, using mobile game as a case study.
Education	Siobhán 2006	a theoretical overview of pervasive games and pervasive and ubiquitous computing, looking specifically at the benefits these areas offer learning

APPENDIX 2 MEASUREMENT ITEMS

Construct		Measurement items	Source
Design Aesthetic	DA1	The screen design (i.e. colors, boxes, menus, etc.) is attractive.	Cyr et al. (2006)
	DA2	The mobile game I most often play looks professionally designed.	
	DA3	The game has good graphic design.	
	DA4	The game has visually appealing overall look and feel.	
	DA5	Overall, I find that the game looks attractive.	
PEOU	PEOU 1	Learning to use the game is easy for me.	Cyr et al. (2006); Davis (1989)
	PEOU 2	It is easy for me to perform the actions required to play the game.	
	PEOU3	My interaction with the game is clear and understandable.	
	PEOU4	I find the game easy to use.	
Variety	VAR1	The game has variety of themes or landscapes.	Webster & Ho (1997)
	VAR2	The game has a variety of visual or sound elements.	
	VAR3	The game has different themes in different levels.	
Novelty	NOV1	The game I most often play is: imaginative	Huang (2003)
	NOV2	The game I most often play is: surprising	
	NOV3	The game I most often play is: innovative	
	NOV4	The game I most often play is: new	
	NOV5	The game I most often play is: fresh	
Interactivity	INTER1*	Interacting with the game is slow.	Huang & Hsieh (2011); Novak et al. (2000)
	INTER2	The game usually loads quickly.	
	INTER3	The game gives a fast response to my action.	
	INTER4	The game rapidly generates the information I need.	
	INTER5*	I experience lagging response when playing the game.	

Challenge	CHA1	Playing the game provides a good test of my playing skills.	Koufaris(2002)
	CHA2	Playing the game challenges me to perform the best of my ability.	
	CHA3	Playing the game stretched my capabilities to the limits.	
Control	CON1*	I feel in control over my actions when playing the game.	Agarwal (2000); Ghani &
	CON2*	I feel calm when playing the game.	
	CON3	I feel confused when playing the game.	Deshpande (1994)
	CON4	I feel frustrated when playing the game.	
	CON5	I feel that I don't have control over my interaction with the game.	
Perceived Enjoyment	PE1	The mobile game I most often play is:enjoyable.	Mäntymäki & Salo (2011);
	PE2	The mobile game I most often play is:fun.	
	PE3	The mobile game I most often play is:entertaining.	Nysveen et al. (2005)
	PE4	The mobile game I most often play is:pleasant.	
Continuance Intention	CI1	I intend to continue playing the game rather than discontinue its use.	Bhattacharjee (2001)
	CI2	I will keep on playing the game in the future.	
	CI3	I would continue playing the game.	
	CI4	I believe I will continue playing the game.	

* deleted items

APPENDIX 3 SURVEY QUESTIONNAIRE

Questionnaire was distributed via the following sites:

1. Gamer Unite Facebook Fanpage
2. Angry Bird Nest forum
3. Reddit
4. IGDA Finland Facebook page
5. Play Finland Facebook page

BACKGROUND QUESTIONS

Gender	Male Female
Age	< 15 15-19 20-24 25-29 30-39 40-49 >50
I'm living in:	<i>[Please specify the country you are living in]</i>
On average, how often do you play mobile games (in general)?	<i>(Please choose only one)</i> Everyday 1-2 times per week More than 2 times per week but not everyday 3-4 times per month Occasionally use Never Others (please specify):
	In case you <u>have never played</u> mobile game before, please do NOT answer the next following questions.
The mobile game I play most often is:	<i>[Please give the <u>name</u> of the game, e.g. Angry Birds, Candy Crush Saga, etc.]</i>
I've been playing this particular game for:	<i>(Please choose only one)</i> less than 0.5 year 0.5- less than 1.0 year 1.0- less than 2.0 years 2.0- less than 3.0 years 3.0- less than 4.0 years 4 years or more

Now, please think of the mobile game you play most often. Then, please read and indicate your agreement with the next statements where 1 represents ‘strongly disagree’ and 5 represents ‘strongly agree’.

Design Aesthetic	1 “strongly disagree” 5 “strongly agree”				
The screen design (i.e. colors, boxes, menus, etc.) is attractive.	1	2	3	4	5
The mobile game I most often play looks professionally designed.	1	2	3	4	5
The game has good graphic design.	1	2	3	4	5
The game has visually appealing overall look and feel.	1	2	3	4	5
Overall, I find that the game looks attractive.	1	2	3	4	5
Perceived Ease of Use					
Learning to use the game is easy for me.	1	2	3	4	5
It is easy for me to perform the actions required to play the game.	1	2	3	4	5
My interaction with the game is clear and understandable.	1	2	3	4	5
I find the game easy to use	1	2	3	4	5
Variety					
The game has variety of themes or landscapes.	1	2	3	4	5
The game has a variety of visual or sound elements.	1	2	3	4	5
The game has different themes in different levels.	1	2	3	4	5
Novelty					
The game I most often play is: imaginative	1	2	3	4	5
The game I most often play is: surprising	1	2	3	4	5
The game I most often play is: innovative	1	2	3	4	5
The game I most often play is: new	1	2	3	4	5
The game I most often play is: fresh	1	2	3	4	5
Interactivity					
Interacting with the game is slow.	1	2	3	4	5
The game usually loads quickly.	1	2	3	4	5
The game gives a fast response to my action.	1	2	3	4	5
The game rapidly generates the information I need.	1	2	3	4	5

I experience lagging response when playing the game.	1	2	3	4	5
Challenge					
Playing the game provides a good test of my playing skills.	1	2	3	4	5
Playing the game challenges me to perform the best of my ability.	1	2	3	4	5
Playing the game stretched my capabilities to the limits.	1	2	3	4	5
Control					
I feel in control over my actions when playing the game.	1	2	3	4	5
I feel calm when playing the game.	1	2	3	4	5
I feel confused when playing the game.	1	2	3	4	5
I feel frustrated when playing the game.	1	2	3	4	5
I feel that I don't have control over my interaction with the game.	1	2	3	4	5
Perceived Enjoyment					
The mobile game I most often play is enjoyable.	1	2	3	4	5
The mobile game I most often play is fun.	1	2	3	4	5
The mobile game I most often play is entertaining.	1	2	3	4	5
The mobile game I most often play is pleasant.	1	2	3	4	5
Continuance Intention					
I intend to continue playing the game rather than discontinue its use.	1	2	3	4	5
I will keep on playing the game in the future.	1	2	3	4	5
I would continue playing the game.	1	2	3	4	5
I believe I will continue playing the game.	1	2	3	4	5

