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What drives in-app purchase intention for mobile games? An examination of perceived values and loyalty

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ABSTRACT

Despite the huge growth potential that has been predicted for in-app purchases and the mobile game market, little is known about what motivates game players to make such purchases. The purpose of this paper is to build a research model based on the loyalty literature and studies of value theory to identify the antecedents of in-app purchase intention in the context of mobile games. The proposed model was empirically evaluated using a web survey of 3309 mobile game players: 813 nonpaying players and 2496 paying players. Structural equation modeling was used to assess the research model. The results reveal that loyalty to the mobile game has significant influence on a player's intention to make an in-app purchase. The perceived values of the game (playfulness, connectedness, access flexibility, and reward) have direct influence on the loyalty of all players but appear to have relatively little impact on the purchase intentions of nonpaying players. Two values (loyalty and good price) were found to have a direct impact on a player's intention to make an in-app purchase. Specifically, our study revealed differences between paying users and nonpaying users. This study provides a better understanding of how the values influence loyalty among all players of the game, and the purchase intentions of paying and nonpaying players. Further insights into mobile game app marketing strategies are provided as well.

1. Introduction

The development of mobile Internet and mobile technology has significantly changed our behaviors and our daily lives. Mobile devices such as smartphones, tablets, and e-book readers are available anytime and anywhere for use in various activities and tasks. In particular, mobile phones have been recognized as a new, unique mass media channel. According to Gartner, Inc., sales of mobile devices were expected to reach 2.5 billion units in 2015, and to continue to do well thereafter (Gartner 2015). Market research company eMarketer (2014) predicted that mobile phone penetration will rise from 61.1% to 69.4% of the global population between 2013 and 2017. As they become more affordable, mobile devices are being used by more and more people. Advances in 3G and 4G networks are also driving demand for mobile applications and value-added services. Mobile apps are small software programs designed to run on mobile devices to perform various functions, including email, calendar, web browsing, social networking, and online gaming. It is estimated that the app economy will create revenues of more than €10 billion per year within the European Union (VisionMobile 2014).

The mobile game market is the fastest growing app market in the world and total mobile game revenue is predicted to double by 2017 (Newzoo 2013). Compared to personal computers and game consoles, a mobile device may not be the ideal gaming platform because of its small size and limited visual effects. Nevertheless, convenience, portability, and cost have made mobile games a popular leisure activity choice (Bose and Yang 2011). Most mobile games are free and generate some of their revenue from in-app advertising. However, a survey by Swrve.com revealed that only 1.35% of mobile game players spent real money for mobile games in July of 2014 (Swrve.com 2014). The top spenders, on the other hand, contributed 62% of the total revenue. For mobile game service providers, these findings stress the importance of knowing how to attract more players to spend real money on mobile games.

In order to increase usage and induce users to pay, more and more mobile game companies provide "freemium" services, which cost the player nothing for basic usage but require payment in real money for advanced functionality or virtual goods (Liu et al. 2015; Staykova and Damsgaard 2015). For example, Skype provides Skype credits inside the app so that its users can send low cost text messages or use Skype WiFi. According to a survey by Distimo.com, a business intelligence and analysis company, in-app purchase revenue grew more than 50% from 2013 to 2014 (Schoger 2014).

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In-app purchases reportedly accounted for 79% of App Store revenue in January, 2014. Hence, freemium/in-app purchase is becoming a popular monetization strategy to increase revenue from mobile games and applications.

The antecedents for playing mobile games have recently been studied from a variety of perspectives, including personality traits, user motivation, and network externalities (Phillips et al. 2006; Wei and Lu 2014). For example, Wei and Lu (2014) found that both network externalities and individual gratification significantly impact the intention to play social games on mobile devices. Phillips et al. (2006) demonstrated that particular personality traits such as agreeableness and neuroticism may influence the level of interest a person may show in new mobile phone features, or the amount of time per week a person spends playing games. However, few of these studies have specifically investigated the reasons why the players were willing to pay for mobile game services. Consequently, one of our research purposes is to explore the antecedents of the intention to pay for the freemium services.

Although the technology acceptance model and the expectation confirmation model are widely used to explain technology usage/adoption behaviors, the factors of perceived usefulness or performance in these models may not comprehensively reflect the motivation of users' in-app payment behavior (Hsu and Lin 2015). In payment behavior studies, perceived value and loyalty are recognized as the main determinants of payment intention (Choi and Kim 2004; Rauyruen and Miller 2009; Lu and Hsiao 2010; Hsu and Lin 2015). The perceived value of the service and loyalty to the service lead to purchase behaviors. For instance, Rauyruen and Miller (2009) demonstrated that loyalty to business-to-business services leads to future transactions. Hsiao (2013) demonstrated that the perceived value of having the Internet on a mobile device influences smartphone users' intention to pay for mobile services. Lu and Hsiao (2010) found that overall satisfaction with social networking services might not affect users' willingness to pay, but perceived value does. Therefore, our other research purpose is to integrate these two major determinants into the research model to explore the factors affecting users' intentions to pay for mobile game services.

Additionally, the current study will examine differences in these factors between paying and nonpaying mobile game players. Past studies have found that the determining factors of information system adoption differ between potential users and experienced users (Teo et al. 2009; Hsu et al. 2007). Therefore, factors that influence the purchase intentions of paying and nonpaying players may differ as well (Hsu and Lin 2015). In order to determine factors which may influence in-app purchase intention, this study applied structural equation modeling (SEM) to assess the strength of the relationships in the proposed model. SEM approach was adopted because it is a robust and powerful multivariate technique for analyzing causal models.

2. Theoretical background

2.1. Mobile games

A mobile game is a video game played on a mobile device such as a smartphone or tablet computer. Games played on dedicated handheld video game systems such as the PlayStation Vita or Nintendo 3DS are not considered mobile games. The development of smartphones and the availability of mobile Internet are changing the circumstances of mobile gaming. Touch screens, higher-quality graphics displays, and ubiquitous connections to networks provide users a better play experience. Today, players of mobile games can download a greater variety of games from online application stores (Feijoo et al. 2012). Mobile games allow playing for short periods of time and are much more accessible and convenient than are games on other platforms. In addition, more and more mobile games are developing new features which facilitate interactions between players. The mobile social game is a type of mobile game that is played through online social networks. These games allow individuals to play games with one another or with many players in their social networks. Social interactions during gameplay help drive game adoption and player retention (Fields and Cotton 2012).

Mobile games usually employ the following features: asynchronous gameplay, community, and virtual currency (Radoff 2011). Asynchronous gameplay allows users to play games without needing other players to play simultaneously. Game communities attract players to discuss and share their game experiences, achievements, or photos with other friends. With the in-game currency, players can purchase upgrades, achievements, and special virtual goods for themselves or for friends. Virtual currency must usually be purchased with real-world money, and is an important source of revenue for the company.

2.2. Perceived value

Recent studies of purchasing behavior have paid increasing attention to the importance of perceived value (Sweeney and Soutar 2001; Turel et al. 2007). Perceived value is defined as the consumer's overall assessment of the utility of a product or service, determined by a consumer's perception of what is received and given. This value can be increased either by enhancing the benefits provided or reducing the expense of purchasing and using it (Lovelock and Wirtz 2011). The ratio of quality to price is a common way of assessing value, which increases as quality increases or price decreases. However, the evaluation of total value is not based on price and quality alone. Past studies have suggested several types of value: functional, social, emotional, epistemic, and conditional. Any or all of these may influence a consumer's decision to purchase. Sweeney and Soutar (2001) proposed a modified model, PERVAL, that assumed functional value could be decomposed into quality and price value, and that the epistemic and conditional elements of perceived value were less critical, while specific cases of other types of value could be excluded. Their general value measure included four dimensions of perceived value: emotional, social, price, and performance/quality.

These perceived values will have different effects on users' payment behaviors in different contexts. Past research has found that all four values have significant influence on the intention to pay for social networking sites, but only emotional value and social value significantly influence the intention to pay for mobile Internet services (Lu and Hsiao 2010; Hsiao 2013). This is because mobile Internet users give greater consideration to emotional value and social value as the service's price gradually decreases and performance remains stable. Hsu and Lin (2015) found that, in the mobile app context, only emotional value and price have direct, significant effects on the intention to pay for a non-free app. Hence, the effects of the values on in-app purchase intention for mobile games may differ, thus meriting further exploration.

3. Research framework and hypotheses

We administered an open-ended questionnaire to identify the key factors affecting mobile game players' payment intention. We asked fifteen heavy users of mobile games to answer questions regarding the factors affecting their intention to play and pay for mobile game services. Statistical analysis of their responses

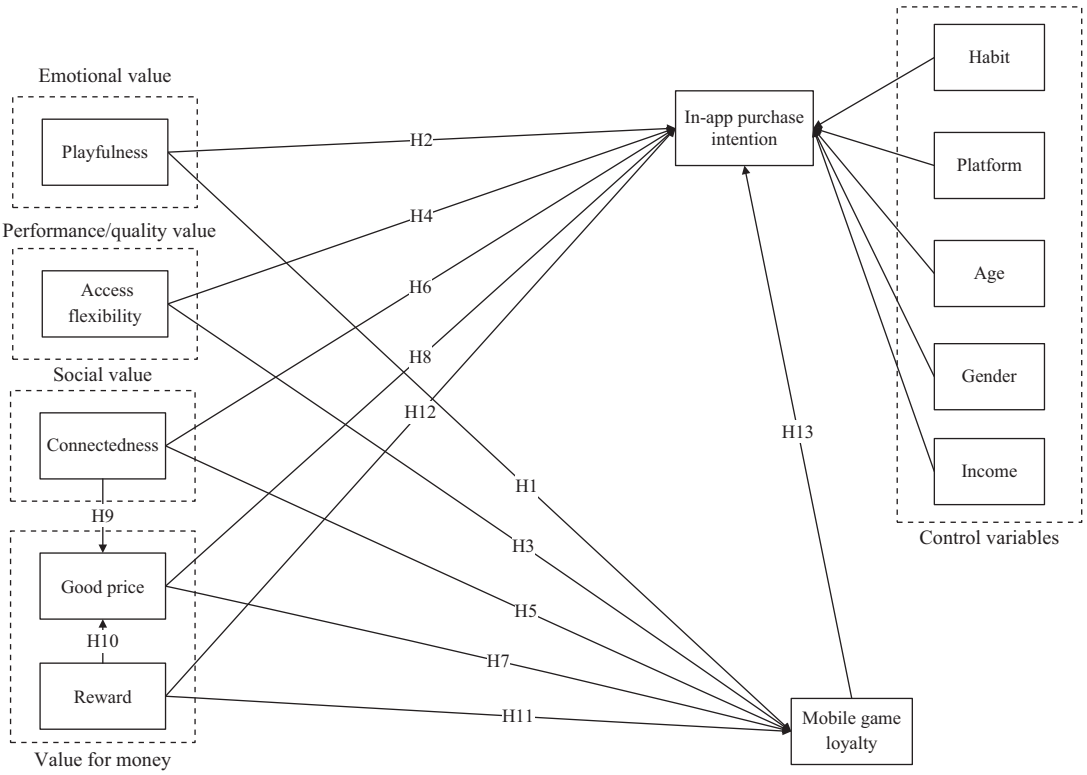


Fig. 1. Research model.

revealed five major determinants of payment intention: playfulness, connectedness, access flexibility, reward, and price (Yi and Jeon 2003; Zhao and Lu 2012; Hsiao 2013; Wei and Lu 2014). Based on the results, we categorized these determinants into the four dimensions of perceived value (Sweeney and Soutar 2001; Hsu and Lin 2015). Loyalty is also an important determinant of purchase intention (Flavián et al. 2006; Cyr et al. 2006). Therefore, we designed a research model (Fig. 1), based on the results and on the theory of perceived value, in order to examine the interrelationships between the constructs. The definitions of the constructs and the rationales for the proposed hypotheses are described below.

3.1. Emotional value

Emotional value refers to the utility derived from the feelings or affective states generated by the mobile game (Lu and Hsiao 2010). In this study, the affective state is perceived playfulness, which refers to the enjoyment an individual perceives in playing the game or in interacting with other people through the mobile game service. More and more people use online services in pursuit of self-filling values such as excitement and happiness. If users derive more enjoyment from an online game, they will continue to play the game with a positive attitude or with even stronger motivations such as loyalty and payment intention (Colwell 2007; Wei and Lu 2014). Past research has also found that enjoyment or playfulness is positively related to the intention to use mobile services (Kim et al. 2009; Wei and Lu 2014). A few scholars have also indicated that a playful user experience is the most influential factor that positively affects consumers' intention to pay for mobile value-added services (Wang and Li 2012). When users perceive more playfulness in a mobile game, they might be expected to expend more effort on playing the game, and increase their intention to pay for the game. Thus, we propose the following hypotheses.

H1. Perceived playfulness positively influences loyalty to the mobile game.

H2. Perceived playfulness positively influences in-app purchase intention.

3.2. Performance/quality value

Performance/quality value is defined as the utility derived from the perceived quality and expected performance of the service of the mobile game. In this study, access flexibility is one of the important performance/quality values in a mobile game service. It refers to the degree to which a user can play a mobile game at any time and can control the period of time to play (Wei and Lu 2014). In order to allow users to enjoy the game at any time, the service provider must enhance the accessibility and quality of its platform. Past research has indicated that availability and flexibility are important service quality factors for application service providers (Ma et al. 2005). Lin (2007) demonstrated that the quality and value of a website increases users' intention to stay and transact on the website. Therefore, a player's loyalty and payment intention can be enhanced by increasing the performance/quality value of the website. Thus, we propose the following hypotheses.

H3. Access flexibility positively influences loyalty to the mobile game.

H4. Access flexibility positively influences in-app purchase intention.

3.3. Social value

Social value is defined as the utility derived from a mobile game service in enhancing one's social self-concept (Lu and Hsiao 2010). In a mobile game context, the social value comes from connectedness (Zhao and Lu 2012). Perceived connectedness refers to an individual's sense of being connected to others through playing a mobile game (Zhao and Lu 2012). It reflects social interactions and a feeling of closeness. Scholars have noted the importance of social connectedness in online social services (Grieve et al. 2013). In order to experience a sense of belongingness, individuals intend to develop and continue positive social relationships. When users feel that they are connected with other friends via a social game, they may be willing to remain on the game, and even pay for it. Thus, we propose the following hypotheses.

H5. Perceived connectedness positively influences loyalty to the mobile game.

H6. Perceived connectedness positively influences in-app purchase intention.

3.4. Price

Price refers to the utility derived from a mobile game service because of a reduction in its perceived short-term and long-term costs (Lu and Hsiao 2010). Price is usually used as the key measure representing the sacrifice consumers make to obtain a product/service. This study defines good price as the degree to which a consumer believes that the mobile game service received was worth the monetary cost (Chu and Lu 2007). Each person holds a different perception of the price he or she is willing to pay. The price of a product/service is a monetary sacrifice. If customers feel that the mobile game service they received was worth the price they paid, their perception of the value received for that price will be high. In mobile social games, interaction with others and connectedness are important sources of gratification and may enhance the perception of a good price and the intention to pay (Wei and Lu 2014). Past studies have also shown that a good price increases users' positive attitude and their payment intention (Lu and Hsiao 2010; Hsiao 2013). Thus, the following hypotheses are proposed.

H7. Good price positively influences loyalty to the mobile game.

H8. Good price positively influences in-app purchase intention.

H9. Connectedness positively influences the consumer's perception of good price.

The other value for the price is the reward obtained within the mobile game. In this study, reward refers to benefits that are acquired or experienced while playing the mobile game. In many mobile games, as players improve, they get higher virtual rewards, such as game points or virtual money/products. These rewards can help the player play the game even better, and can enhance both the perceived value and customer loyalty (Yi and Jeon 2003). Free/additional rewards received in games may influence users to feel that the game is worth the price. Furthermore, prior empirical research has identified perceived value as a major determinant of customer loyalty in retailing services and online services (Yang and Peterson 2004). Hence, the following hypotheses are proposed.

H10. Reward positively influences the consumer's perception of a good price.

H11. Reward positively influences loyalty to the mobile game.

H12. Reward positively influences in-app purchase intention.

3.5. User loyalty to the mobile game

Online loyalty has been defined as a consumer's intention to buy from a website or to visit it again (Flavián et al. 2006; Cyr et al. 2006). In this study, loyalty to the mobile game refers to a gamer's willingness to replay or recommend that mobile game. Lin and Wang (2006) examined the factors of customer loyalty in a mobile context and found loyalty to a mobile service to be influenced by perceived value. Loyalty can be of substantial value to both customers and companies. When consumers are loyal to a product/service, they may reduce the amount of time they spend searching and evaluating purchase alternatives. Customer loyalty is one factor contributing to the success of e-commerce (Chang and Chen 2009). Loyal customers often bring in substantial revenue. Therefore, loyal mobile game players are expected to be more willing to pay for the service. Thus, we propose the following hypothesis.

H13. Loyalty to the mobile game positively influences in-app purchase intention.

3.6. Control variables

Age, gender, habit, income, and software platforms were added to the model as control variables in order to evaluate their effect on the purchase intention. Past research has indicated that age, gender and income may affect users' online behavior or purchase intentions (Lu and Hsiao 2010). The influence of habit on loyalty and usage continuance has also been verified (Lin and Wang 2006; Venkatesh et al. 2012). Moreover, the Wall Street Journal reported that Mac users spend more on their travel trips than do PC users (Mattioli 2012). Thus, iPhone users are expected to have a greater intention to pay for mobile games.

4. Research methodology

4.1. Data collection and sampling

The data for this study were collected via an online field survey. This research targeted the users of Tower of Saviors (ToS) in Taiwan. ToS was the most popular mobile game in the App Store and Google Play in the Taiwan and Hong Kong markets in 2014. It is a "match 3" game which has been downloaded over 15 million times worldwide (Wikipedia 2015). The game provides various rewards to its players, including rewards for daily login, level up, and tower clearance. The rewards are virtual diamonds, which are the premium currency and can be used to draw seal cards, extend inventory, and extend the friend limit in the game. The seal cards can help players defeat monsters in the towers. Diamonds also can be purchased from the store in the game by using real money.

Web-based questionnaires were distributed online from April 7 to April 14, 2014. Participants were recruited via popular virtual communities of ToS, and participation was encouraged by offering a raffle. After incomplete responses and duplicates were eliminated, 3309 usable responses remained. Analysis of the sample shows that 89% of the respondents were male, most respondents were between 17 and 22 years of age, and 62% had at least one year of experience playing mobile games. About 2500 of the

respondents had purchased game diamonds. Table 1 summarizes the demographics of the respondents.

4.2. Measurement development

The questionnaire contained two sections: demographic profile and construct items. The items used to operationalize the constructs included in the model were adapted from relevant prior studies and were slightly modified to fit the target context. Appendix A lists the final questionnaire items used to measure each construct. Items for measuring in-app purchase intention were adapted from Hsiao (2013). Items for measuring user loyalty to the mobile game were adapted from Yang and Peterson (2004). Items for measuring perceived playfulness and connectedness were taken from Zhao and Lu (2012). Items for access flexibility were adapted from Wei and Lu (2014). Items for measuring good price were from Hsiao (2013), and items for measuring reward were from Yi and Jeon (2003). All items were measured using a 5-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5). In order to modify ambiguous expressions, the wording of the scales, and the length of the instrument, a pretest was performed with 3 experts and 10 respondents familiar with mobile games. Practical problems with implementation were identified via a pilot test administered to 56 respondents selected from a population of mobile game players. The results of the pilot tests showed acceptable reliability and validity of the measurements.

Table 1
Profile of respondents.

Measure	Items	Frequency	%
Gender	Male	2959	89.00
	Female	350	11.00
Age (years)	<17	505	15.26
	17–22	1696	51.25
	23–27	724	21.88
	28–33	225	6.80
	>33	159	4.81
Income (NT)	<5000	1810	54.7
	5000–14,999	676	20.4
	15,000–24,999	220	6.6
	25,000–34,999	290	8.8
	>35,000	313	9.5
Mobile game experience (years)	<0.5	377	10.02
	0.5–1	967	27.42
	1–3	1252	38.66
	3–5	491	16.23
	5–7	134	4.53
	>7	88	3.12
Mobile game platform	iOS	696	19.57
	Android	2613	80.43
Payment	Never	813	24.6
	At least once	2496	75.4
Friends recommend payment	Never	2760	83.4
	At least once	549	16.6
Habit (play time per day)	>1 h	211	6.97
	1–3 h	1522	44.86
	3–5 h	1237	36.27
	5–7 h	199	7.02
	>7 h	140	4.88
Frequency of discussion on ToS communities	Never	376	11.4
	Seldom	406	12.3
	Sometimes	601	18.2
	Often	916	27.7
	Usually	1010	30.5
Familiarity with ToS	Very unfamiliar	56	1.7
	Unfamiliar	165	5.0
	General	678	20.5
	Familiar	1962	59.3
	Very familiar	448	13.5

4.3. Analysis results

4.3.1. Descriptive statistics and normality

The means and standard deviations of the constructs in the model are shown in Table 2. For both the paying user and potential user groups, the construct of playfulness has the highest mean and lowest standard deviation, while good price has the lowest mean and relatively high standard deviation. This means that the users in each group had similar, relatively high perceptions of the game's playfulness, but the consensus was that the price of the game was not as good. According to the independent-sample *t*-test, paying users had significantly higher perceptions of playfulness, connectedness, access flexibility, good price, loyalty to the mobile game, and in-app purchase intention. The univariate normality of our sample can be tested by using skewness and kurtosis. The results shown in Tables 3 and 4 show that absolute skew and kurtosis values for all variables are less than 3, which indicate that the data in our study are close to the univariate normal distribution (Kline 2005). Moreover, variance inflation factors (VIF) were used for detecting the degree of multicollinearity. We used SPSS 20.0 software to conduct a regression analysis by modeling in-app purchase intention as the dependent variable and the other six variables as the independent variables. The results show that the VIF values range from 1.083 to 2.720, which are below the threshold value of 3.3 (Lee and Xia, 2010). The results indicated that no significant multicollinearity problem exists with regard to the data.

4.3.2. Tests of the measurement model

To test the proposed research model, this study used SEM to examine the hypotheses. SEM is a multivariate statistics technique and is widely used in the marketing, education, psychology, and many other fields. The estimation of the proposed casual models in SEM involves two components: the measurement and the structural models. The two components were assessed by AMOS 21.0 software package.

A confirmatory factor analysis, using AMOS, was conducted to test the proposed measurement model. Several fit indicators in Table 7 were evaluated to assess how well the model fitted the data. The results show that the model fit was good: ratio of chi-square statistics to the degree of freedom (*df*), the standardized root mean squared residual (SRMR), and root mean square error of approximation (RMSEA) are less than the recommended values while goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), normed fit index (NFI), incremental fit index (IFI), Tucker–Lewis index (TLI) are greater than the suggested threshold. According to the above test outcomes, it can be summarized that the hypothesized measurement model fits the data well.

Table 2
Descriptive statistics (means and S.D.).

Construct	Paying users		Potential users		*T*-test
	Means	S.D.	Means	S.D.	Significant
Playfulness	4.216	0.856	4.099	0.882	**
Connectedness	3.811	0.915	3.712	0.940	**
Access flexibility	3.957	0.888	3.814	0.908	***
Good Price	2.724	1.046	2.341	1.082	***
Reward	3.892	0.915	3.854	0.945	n.s.
Mobile game loyalty	4.148	0.880	4.010	0.912	***
In-app purchase intention	3.727	1.005	2.516	1.217	***

** $p < 0.01$.
*** $p < 0.001$ (two-tailed).

Table 3
Individual item reliability of paying user group.

Construct	Item	Loading	Skewness	Kurtosis	Composite reliability	AVE	Cronbach's α
Playfulness (PLA)	1	0.915	−1.600	2.686	0.934	0.834	0.953
	2	0.917	−1.222	1.373			
	3	0.900	−1.075	0.886			
	4	0.921	−1.597	2.648			
Mobile game loyalty (LOY)	1	0.853	−0.897	0.328	0.936	0.798	0.952
	2	0.897	−1.739	3.206			
	3	0.924	−1.047	0.622			
	4	0.932	−1.430	1.705			
	5	0.857	−0.851	−0.024			
Good price (PRI)	1	0.754	0.703	−0.457	0.748	0.724	0.838
	2	0.938	−0.182	−0.838			
Reward (REW)	1	0.865	−0.532	−0.288	0.854	0.774	0.911
	2	0.893	−0.906	0.373			
	3	0.881	−0.862	0.195			
Access flexibility (ACC)	1	0.825	−0.507	−0.295	0.860	0.782	0.915
	2	0.919	−1.121	1.040			
	3	0.907	−1.030	0.724			
Connectedness (CON)	1	0.874	−1.105	0.717	0.823	0.738	0.894
	2	0.818	−0.414	−0.500			
	3	0.884	−0.658	−0.166			
In-app purchase intention (INT)	1	0.937	−0.579	−0.175	0.933	0.811	0.957
	2	0.945	−0.675	0.008			
	3	0.934	−0.536	−0.397			

Table 4
Individual item reliability of potential user group.

Construct	Item	Loading	Skewness	Kurtosis	Composite reliability	AVE	Cronbach's α
Playfulness (PLA)	1	0.913	−1.144	0.909	0.947	0.818	0.947
	2	0.911	−0.935	0.363			
	3	0.884	−0.717	−0.155			
	4	0.909	−1.189	1.067			
Mobile game loyalty (LOY)	1	0.857	−0.684	−0.173	0.943	0.769	0.943
	2	0.880	−1.428	1.899			
	3	0.901	−0.853	0.359			
	4	0.922	−1.128	0.745			
	5	0.820	−0.686	−0.204			
Good price (PRI)	1	0.776	0.902	−0.162	0.842	0.728	0.842
	2	0.924	0.316	−1.000			
Reward (REW)	1	0.873	−0.607	−0.382	0.906	0.763	0.906
	2	0.880	−0.929	0.305			
	3	0.868	−0.881	0.126			
Access flexibility (ACC)	1	0.831	−0.352	−0.498	0.914	0.780	0.914
	2	0.918	−0.709	−0.104			
	3	0.899	−0.812	0.190			
Connectedness (CON)	1	0.838	−0.848	−0.052	0.872	0.694	0.872
	2	0.789	−0.397	−0.631			
	3	0.871	−0.517	−0.436			
In-app purchase intention (INT)	1	0.954	0.325	−0.937	0.967	0.907	0.967
	2	0.959	0.299	−0.977			
	3	0.944	0.432	−0.836			

The reliability of a research instrument is concerned with the extent to which the instrument yields the same results in repeated trials. Reliability was examined using Cronbach's α, a commonly used measure. As shown in Tables 3 and 4, the alpha coefficients of the constructs ranged from 0.838 to 0.967. Accepted standards require all item reliability (factor loading) values to be greater than 0.5. As shown in Tables 3 and 4, the values were all above the accepted threshold of 0.5.

Convergent validity uses three recommended standards to assess the measuring model: (1) all indicator factor loading values should exceed 0.5 (Hair et al. 2006); (2) composite reliability (CR) should exceed 0.6 (Bagozzi and Yi 1988); and (3) the average variance extracted (AVE) of each construct should exceed 0.5 (Fornell and Larcker 1981).

Tables 3 and 4 show that the indicator factor loading of each item in the measuring model exceeded 0.7. Composite reliability of constructs ranged from 0.748 to 0.967. AVE ranged from 0.694 to 0.907. Therefore, all figures meet the conditions for convergent validity. Tables 5 and 6 show that the square roots of AVE were all greater than the off-diagonal elements in the corresponding rows and columns. Therefore, we conclude that the discriminant validity of each of the construct measures is satisfactory.

In order to detect common method bias, this study adopted post hoc Harman's one factor analysis to check whether variance in the

Table 5
Discriminant validity of paying user group.

	Construct						
	PLA	LOY	PRI	REW	ACC	CON	INT
PLA	0.913						
LOY	0.746	0.893					
PRI	0.243	0.238	0.851				
REW	0.571	0.649	0.322	0.880			
ACC	0.732	0.693	0.308	0.581	0.884		
CON	0.653	0.602	0.250	0.505	0.688	0.859	
INT	0.437	0.470	0.488	0.447	0.437	0.373	0.939

Notes: The diagonal elements show the square root of the average variance extracted. The off diagonal elements show the correlations between the constructs.

Table 6
Discriminant validity of potential user group.

	Construct						
	PLA	LOY	PRI	REW	ACC	CON	INT
PLA	0.904						
LOY	0.748	0.877					
PRI	0.119	0.166	0.853				
REW	0.516	0.596	0.229	0.874			
ACC	0.716	0.695	0.189	0.546	0.883		
CON	0.629	0.587	0.156	0.450	0.640	0.833	
INT	0.241	0.303	0.518	0.242	0.286	0.241	0.952

Notes: The diagonal elements show the square root of the average variance extracted. The off diagonal elements show the correlations between the constructs.

data can be largely attributed to a single factor (Podsakoff et al. 2003). An unrotated principle component factor analysis was conducted for all constructs. The results revealed seven factors with eigenvalues greater than 1. The first factor accounted for 39.5% of covariance among the measures at maximum. The other four factors contributed 28.6% of the remaining variance, each accounting for 3–9%. Thus, no obvious common method bias was detected.

4.3.3. Structural model and hypothesis testing

AMOS 21.0 was used to access the structure model and hypotheses by examining the path coefficients and R^2 values. The fitness measures of the structure model also indicated a good level of fit (see Table 7). The path coefficients are standardized regression coefficients and are used to explain the direction of relationships among variables. R^2 values represent the proportion of variance in the endogenous variables and are shown as a representation of the explanatory power of the structure model. In order to investigate the behavioral differences between the paying players and nonpaying players, respondents were classified into two groups.

For the paying player group (Fig. 2), all of the constructs of perceived value were shown to significantly influence loyalty to the mobile game, with the exception of good price, supporting H1, H3, H5, and H11 ($\beta = 0.508$, $p < 0.001$; $\beta = 0.061$, $p < 0.001$; $\beta = 0.105$, $p < 0.001$; $\beta = 0.300$, $p < 0.001$), but not H7. These constructs of perceived value account for 71.3% of the variance in loyalty to the mobile game. The results also showed that playfulness, good price, and reward affect in-app purchase intention ($\beta = 0.080$, $p < 0.05$; $\beta = 0.441$, $p < 0.001$; $\beta = 0.087$, $p < 0.01$), thereby supporting H2, H8, and H12. Unexpectedly, access flexibility and connectedness where shown to have no direct influence on purchase intention; therefore, H4 and H6 were not supported. In addition, connectedness and reward were found to significantly influence good price. Thus, H9 and H10 were supported. The paths account for 13.7% of the variance in good price. Moreover, loyalty to the mobile game has a strong impact on in-app purchase intention, as shown by the path coefficient of 0.233 ($p < 0.001$), supporting H13. Among the control variables, habit, age, gender (1 = male, 0 = female), and income also affect in-app purchase intention, whereas the influence of age and platform (1 = iOS, 0 = Android) were not significant. Together, these paths account for 44.0% of the variance in in-app purchase intention.

Among nonpaying players, as shown in Fig. 3, all of the perceived values also significantly affect loyalty to the mobile game, with the exception of good price, supporting H1, H3, H5, and H11 ($\beta = 0.523$, $p < 0.001$; $\beta = 0.061$, $p < 0.05$; $\beta = 0.105$, $p < 0.01$; $\beta = 0.294$, $p < 0.001$), but not H7. These constructs of perceived value account for 71.6% of the variance in loyalty to the mobile game. Surprisingly, among the constructs of perceived value, the results show that only good price affects in-app purchase intention ($\beta = 0.628$, $p < 0.001$), thereby supporting H8, but not H2, H4, H6, and H12. Moreover, reward was also shown to significantly influence good price, supporting H10. However, the paths account for only 6.1% of the variance in good price. Loyalty to the mobile game also has a significant impact on in-app purchase intention, as shown by the path coefficient of 0.159 ($p < 0.05$), supporting H13. Among the control variables, both habit and platform affect in-app purchase intention, whereas the influences of age, gender, and income are not significant. Together, these paths account for 43.5% of the variance in in-app purchase intention. Table 8 summarizes the testing results.

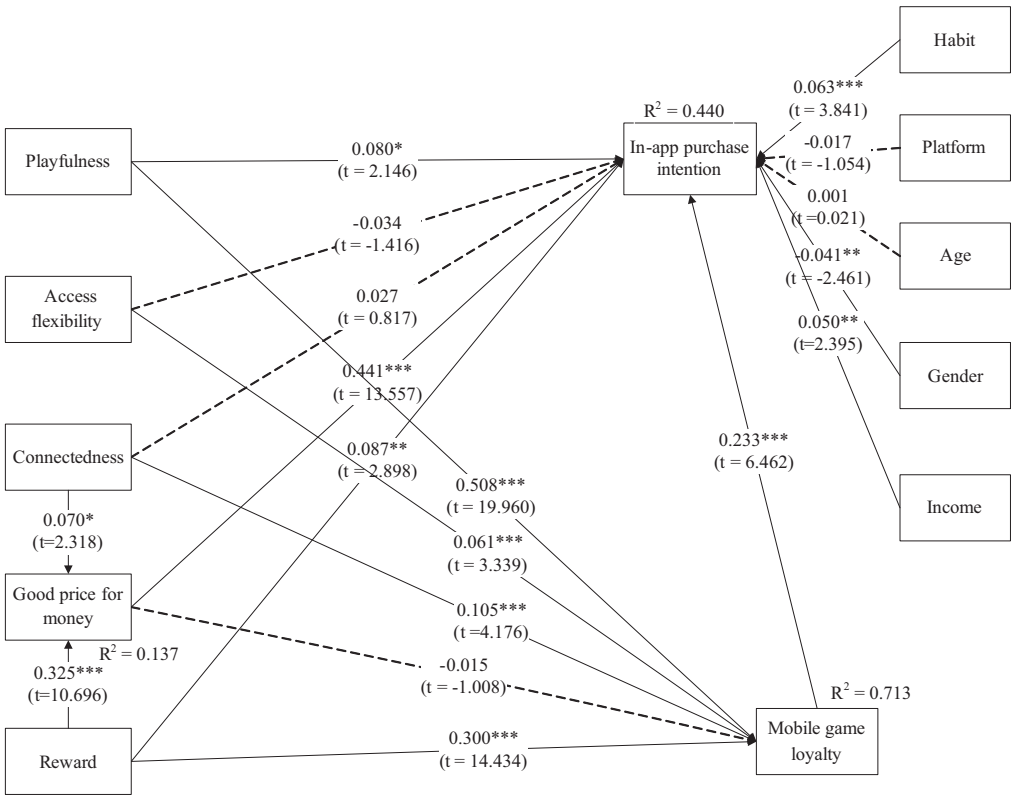
In order to examine the moderating effect of payment behavior, multiple group analysis (MGA) was performed using the procedure recommended by Jöreskog and Sörbom (1993). In the first SEM analysis, the paths in the structural model are fixed with equal regression weight across two groups. In the second analysis, all path coefficients in the structural model are freely estimated. Then, a chi-square difference test is conducted to determine the significance of moderating effects. The p-values of the testing results are showed in Table 8. Payment behavior moderated the paths PLA → INT (H2), PRI → INT (H8), REW → PRI (H10), and REW → INT (H12). The results demonstrated that playfulness and reward had stronger effect on paying players' purchase intention and reward had stronger effect on their perceived price. In addition, perceived good price had stronger effect on nonpaying players' purchase intention.

In order to explore the relationships between in-app purchase intention and other behavioral variables, a correlation test was conducted. The variables chosen for this study were friends' recommendation, mobile game experience, frequency of discussion on ToS communities, and familiarity with ToS. The testing results are summarized in Table 9. In the nonpaying user group, only virtual community participation and friends' recommendation

Table 7
Measures of the model fit.

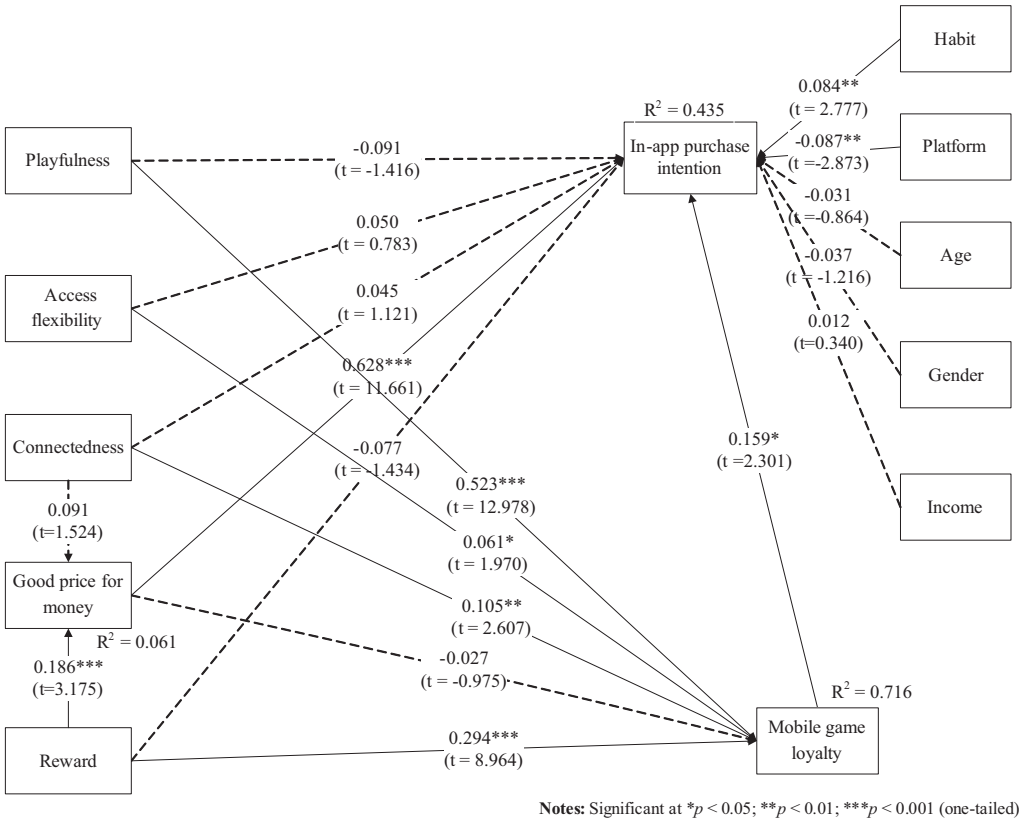
Goodness of fit measures	χ^2/df	GFI	AGFI	CFI	NFI	IFI	TLI	RESEA	SRMR
Recommended value	⩽5.00	⩾0.9[a]	⩾0.9[a]	⩾0.9[a]	⩾0.9[a]	⩾0.9[a]	⩾0.9[a]	⩽0.08[b]	⩽0.1[c]
CFA model	4.96	0.944	0.926	0.964	0.956	0.964	0.957	0.035	0.036
Structural model	4.29	0.950	0.935	0.974	0.967	0.974	0.969	0.032	0.036

Source: [a]Bagozzi and Yi (1988), [b]Browne and Cudeck (1993) and [c]Hoang et al. (2006).



Notes: Significant at $*p < 0.05$; $**p < 0.01$; $***p < 0.001$ (one-tailed)

Fig. 2. Analysis results of paid-player group.



Notes: Significant at $*p < 0.05$; $**p < 0.01$; $***p < 0.001$ (one-tailed)

Fig. 3. Analysis results of unpaid-player group.

Table 8
Results of testing.

Hypothesis	Path	Paying group	Nonpaying group	Conclusion	Chi-square difference[a]
H1	PLA → LOY	0.508***	0.523***	All Supported	0.003
H2	PLA → INT	0.080*	−0.091	Partially supported	5.042***
H3	ACC → LOY	0.061***	0.061*	All Supported	0.004
H4	ACC → INT	−0.034	0.050	Unsupported	2.682
H5	CON → LOY	0.105***	0.105**	All Supported	0.009
H6	CON → INT	0.027	0.045	Unsupported	0.182
H7	PRI → LOY	−0.015	−0.027	Unsupported	0.173
H8	PRI → INT	0.441***	0.628***	All Supported	24.161***
H9	CON → PRI	0.070*	0.091	Partially supported	0.021
H10	REW → PRI	0.325***	0.186**	All Supported	10.038***
H11	REW → LOY	0.300***	0.294***	All Supported	1.36
H12	REW → INT	0.087**	−0.077	Partially supported	7.386**
H13	LOY → INT	0.233***	0.159*	All Supported	0.294

HAB: Habit; PLAT: Platform; GEND: Gender; INC: Income.
[a] Chi-square difference = $\Delta\chi^2_{(\Delta df=1)}$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$ (two-tailed).

Table 9
Results of correlation analysis.

		Experience	Community	Familiarity	Recommendation
INT (Nonpaying)	Correlation	.053	.103**	.049	.088*
	Sig. (*p*-value)	.129	.003	.161	.012
	Number	813	813	813	813
INT (Paying)	Correlation	.065**	.128**	.134**	−.015
	Sig. (*p*-value)	.001	.000	.000	.454
	Number	2496	2496	2496	2496

* $p < 0.05$.
** $p < 0.01$.

had significant positive correlations with purchase intention. On the other hand, for the paying group mobile game experience, virtual community participation, and familiarity with ToS were positively correlated with in-app purchase intention, with the notable exception of friends' recommendation.

4.4. Views of respondents

The results of an open-ended questionnaire were summarized to better understand why people play and pay for mobile social games. Fifteen heavy users of mobile games were each asked one open-ended question: Why do you choose to play or pay for Tower of Saviors? The responses were classified and outlined as follows.

4.4.1. Playfulness

"I play the game because I feel the game is interesting."
"The game usually provides new interesting battles and events to play."
"When I play the game, I feel happy and have a lot of fun."
"I like playing the game because it helps pass the time."
"Playing the game makes me relax and helps improve my brain power."
"The game is easy to pick up and play."
"The game's design is challenging and novel so it can attract my attention."

4.4.2. Connectedness

"When I play the game, I can chat and share my experience with my friends."
"The game can connect with Facebook and let me share my game photos."
"If I don't play the games, I can't discuss the games with friends."
"I can chat with other players while I am playing the game."

4.4.3. Access flexibility

"I can play the game anytime."
"I play the game when I am waiting for a bus or for my friends."
"I feel the game service is stable so I can play the game anytime I want."
"I can play the game on my smartphone anytime and anywhere."
"I can play the game in my free time."

4.4.4. Good price

"I want to win the game quickly so I purchase the diamonds. I feel it is worth it."
"Although I bought some diamonds in the game, I still feel they are a little bit expensive."
"I purchased some diamonds to draw new cards to help me win the battles in the game."
"I will buy some diamonds when a sales promotion is held."

4.4.5. Reward

"When I login and play the games, I can get some diamonds."
"I play the game every day because I want to get free diamonds."
"I have a lot of chances to win some diamonds in the game."
"I want to get some free diamonds to draw new cards."

5. Discussion and implications

5.1. Discussion

This study adopted perceived value and loyalty as the base model to provide insight into the factors contributing to paying and nonpaying players' in-app purchase intention. As shown in Table 7, of the thirteen hypotheses, eight were supported in both groups. However, two hypotheses were partially supported and three hypotheses were not supported. Several research and practical implications can be obtained from the analysis results.

User loyalty to the mobile game is found to positively affect the in-app purchase intention of all players. This means that loyalty is an important determinant in the context of in-app purchases. If players are willing to continue to play and recommend a mobile game, they will have a stronger intention to pay. This result is consistent with the findings of past studies (Liu and Shiue 2014). From the perspective of perceived value, with the exception of good price, all factors significantly impacted loyalty to the mobile game in both groups. In particular, perceived playfulness, reward, and access flexibility had strong positive effects on the loyalty of all players. Obviously, perceived playfulness is the main reason why customers play mobile games not surprisingly, its effect on loyalty was the strongest. The rewards provided in mobile games are the second reason why players continue to play the games, according to the results. Reward also had strong positive effect on loyalty. Previous research has emphasized the importance of intrinsic motivation (i.e., emotional value) and extrinsic motivation (i.e., good price). Our study showed that players are motivated to play and recommend mobile games because they perceive such games as offering not only emotional value (playfulness) and value for the cost (reward) but also social value (connectedness) and performance value (access flexibility).

The results also show that the specific values affecting players' in-app purchase intention differ between the paying group and the nonpaying group. As shown in Figs. 2 and 3, the paying players' intention is determined by playfulness, good price, and reward, while the intention of nonpaying players is determined only by good price. Compared with other determinants such as loyalty and playfulness, price obviously had the strongest impact on payment intention for both groups, especially the nonpaying group. We also found that connectedness and reward have significant influence on good price but the percentage of variance explained is relatively low. This means that connectedness and reward alone could not effectively enhance users' sense of the game's value for the cost. To entice nonpaying players to pay, marketing managers should focus on increasing the perceived value of their mobile game's services through bonus offers, package deals, or other possible promotions/factors. Moreover, the habit of playing mobile games also had significant, positive, direct effects on the payment intention for both groups. This implies that players who spend more time on mobile games will have more chances to pay for the services.

The MGA results indicated that the influence of playfulness and reward had stronger positive impact in the paying group. In particular, reward had stronger effect not only on paying users' purchase intention but also on their perceived good price, which is the critical factor of payment intention. It means that the additional reward they can receive in the game can let them feel that the price is worthy. The MGA results also demonstrated that nonpaying players care more about price. Therefore, the results reconfirmed that marketing managers should give paying players additional rewards to enhance their payment behavior and give nonpaying player special prices to attract them to pay.

Gender and income seem to play influential roles in affecting the purchase intention of paying players. This means that male players or players with a higher salary will have a greater intention to pay. Past studies have indicated that gender differences exist in the gaming context. Female players tend to play "pink games," such as cooking and dress-up games, which are successful in attracting girls and use many pink colors in the game design. ToS is a more competitive game and targets male players. Therefore, it successfully attracted more male players to make purchases within the game. Moreover, older players might not be more willing to pay, but higher income players and experienced players will be more willing. According to the correlation analysis results, players who are more familiar with the game or usually have discussions in the game community may have more chances to pay.

For the nonpaying player group, age, gender, and income have no significant effect on in-app purchase intention. Although most of the players were male as well, gender had little effect. We also found that players who use Android smartphones are more willing to pay. Past research (Sullivan 2014) has demonstrated that, in comparison to Android users, iOS users will buy considerably more products and services. However, we found that Android users in the nonpaying group have greater levels of in-app purchase intention. Past research (Sullivan 2014) also reported that Android users have been increasing the amount of products and services purchased via their devices. Hence, marketers should devise strategies to encourage Android owners to pay. Furthermore, our correlation analysis found that nonpaying players have more opportunities to pay through friends' recommendations. This means the impact of peer pressure or word of mouth on their payment intention cannot be ignored. In summary, even though a few nonpaying players in our sample were older and had higher income, they were still unwilling to pay for mobile game services if they did not consider such services worth the cost.

In conclusion, the factors in the model accounted for more than 30% of the variance in in-app purchase intention, and 60% of the variance in loyalty to the mobile game, which were higher than the recommended value of 10% (Falk and Miller 1992). This means that the model fitted the research data. Past research has also found that it is difficult to explain more than 50% of the variance in purchase intention in a research model because customers' purchase behaviors are hard to predict (Lu and Hsiao 2010; Hsu and Lin 2015). Nevertheless, our study showed the explained variance in good price to be lower than 10%, although the effects of connectedness and reward are significant. This may mean that promotion is still the major determinant of good price.

5.2. Implications for academic researchers

The mobile application and mobile game markets are attracting increasing numbers of developers and service providers. Despite this fact, few academic studies have focused on in-app purchase intention. From a theoretical standpoint, the contributions of this study are as follows. First, our study successfully integrated perceived values and mobile game-related factors into a research model in an in-app purchase context. This study provides a better understanding of the relationships among these values, loyalty, and in-app purchase intention. Our model implied that values such as playfulness, good price, and reward have direct impacts on payment intention, and indirect impacts through loyalty. In particular, good price and reward had the strongest total effects on the intention while playfulness had the strongest direct effect on loyalty. To sum up, the values can account for more than 70% of the variance in loyalty to the mobile game and more than 30% of the variance in in-app purchase intention. Second, habit was also found to be an important determinant of user intention to purchase

(Venkatesh et al. 2012). It had significant direct effect on paying and nonpaying players' intention ($p < 0.01$). However, gender and income differences were found to affect the purchase intentions of paying players only. Finally, this study verified and increased our understanding of the differences in the determinants affecting paying vs. nonpaying players. Four significant differences in the paths were found and confirmed in MGA.

5.3. Implications for practice

The results of this study provides app developers and marketers some insights into the best ways to entice players to pay for mobile games. First, good price is the key factor, with its strong direct effect on the in-app purchase intentions of all players ($\beta_{paying} = 0.441$ and $\beta_{nonpaying} = 0.628$). As previously mentioned, freemium is a successful pricing strategy in the mobile app market. Marketers can enhance the service's perceived value by maximizing efficiency, effectiveness or playfulness while minimizing purchase price (Hsu and Lin 2015). Second, loyalty to the mobile game can increase the payment intentions of all players ($\beta_{paying} = 0.233$ and $\beta_{nonpaying} = 0.159$). This finding echoes the observations by Lin and Wang (2006) which emphasized that loyalty can reduce users' intention to purchase alternatives and attract users to pay. According to the findings in this study, enhancing playfulness, access flexibility, connectedness and rewards is an effective way to enhance player loyalty (most of p-values less than 0.001). Third, our results indicate that players' habits influence their payment intention. These results differ from those of a study on paying for mobile apps (Hsu and Lin 2015). In order to encourage user participation, managers could hold daily activities or provide daily rewards, such as login rewards or play bonuses. Forth, Android platform users in the nonpaying group were found to have a stronger intention to make in-app purchases ($\beta_{paying} = 0.087$ vs. $\beta_{nonpaying} = 0.017$). The number of Android users is increasing worldwide. Therefore, marketers should increase advertising and promotions in the Android market. Fifth, in determining strategies appropriate for paying players and nonpaying players, marketers should note the behavioral differences between these two groups. Gender and income influence the payment intentions of paying players. Male players and players with higher incomes are more likely to make in-app purchases. Marketers should develop different marketing strategies for them, accordingly. Playfulness and rewards also had direct effects on paying players' intention. Hence, playfulness and rewards in mobile games are still the key points on which mobile game developers should focus their attention.

Gender, age, income, and the all of the perceived values except for good price were shown to have no direct impact on the purchase intentions of nonpaying players, but these values do have an influence on loyalty to the mobile game. We recommend that managers strive to enhance these values and reflect them in the design of their mobile games in order to increase a sense of loyalty in nonpaying players.

6. Limitations and future research

Our survey was conducted using online questionnaires and employed nonrandom sampling. The online survey method was appropriate for collecting data from a sample which was free of geographical constraints and included only respondents with mobile app experience. Future studies could implement more systematic sampling methods from more diverse samples. Second, our study focused specifically on a mobile game provided by a single company. Other types of mobile games should also be investigated. Third, our research framework integrated loyalty and perceived values to investigate in-app purchase intention. Other variables still need to be investigated, such as flow or achievement, in addition to moderating variables like personality traits. Finally, most of the subjects were active ToS players in Taiwan. A sample taken from countries with a different culture and lifestyle might show different results.

The present study explored possible factors through a survey, and then developed a model based on perceived value theory to predict in-app purchase intention. The importance of the perceived values and loyalty to the game were reconfirmed, conclusions which might be similar to those of social game studies. While this study explored the factors of access flexibility and platform, future studies can further explore other mobile game-related determinants, such as touchscreen interactivity, user interface, and social propensity. Different types of mobile games might also reveal different results. In ToS for example, time cost (one free virtual diamond a day during the period of a campaign) might be a factor driving nonpaying users to consider buying virtual diamonds.

Appendix A

Playfulness (Zhao and Lu 2012)

1. I think playing Tower of Saviors is interesting.
2. I think playing Tower of Saviors is enjoyable.
3. I think playing Tower of Saviors is exciting.
4. I think playing Tower of Saviors is fun.

Connectedness (Zhao and Lu 2012)

1. Players of Tower of Saviors share their experience and feelings with others through this mobile game.
2. Players of Tower of Saviors benefit from the user community using this mobile game.
3. Players of Tower of Saviors share a common bond with other players.

Time-flexibility (Wei and Lu 2014)

1. I can control the time playing Tower of Saviors by myself.
2. I can play Tower of Saviors anytime.
3. I can begin and stop playing Tower of Saviors at any time.

Price for money (Hsiao 2013)

1. Diamonds of Tower of Saviors are reasonably priced.
2. Diamonds of Tower of Saviors are good relative to the price.
3. Diamonds of Tower of Saviors are economical.

Reward (Yi and Jeon 2003)

1. The proposed rewards have high cash value.
2. It is highly likely to get the proposed rewards.
3. The proposed rewards are what I have wanted.

In-app purchase intention (Hsiao 2013)

1. I intend to pay for the diamonds in Tower of Saviors in future.
2. I predict that I would pay for the diamonds in Tower of Saviors in future.

Mobile game loyalty (Yang and Peterson 2004)

1. This mobile game is my first choice.
2. I will continue to play this mobile game.
3. I am willing to say positive things about this mobile game to others.
4. If others want to play a mobile game, I will recommend this mobile game.
5. I will encourage friends and relatives to play this mobile game.

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