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UNDERSTANDING USER INTENTIONS TO DOWNLOAD GAMES ON MOBILE PHONES: TECHNOLOGY ADOPTION AND USER DEMOGRAPHIC PERSPECTIVE

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ABSTRACT

In recent years, various forms of mobile technology based hedonic services are emerging. As this is a relatively new and unexplored practice which seems to be more popular among young generation, there is a need to examine its acceptance among student community who use mobile phones for many purposes including entertainment. We thus report a study which examines a segment of the Australian students' acceptance of downloading games on their mobile phones using Technology Adoption Model as a theoretical lens. We further highlight the role of student demographic characteristics on their perceptions. The implications of our findings are discussed.

Keywords: mobile technology, hedonic context, games downloading, acceptance, demographics

MOTIVATIONS FOR THE RESEARCH

During the past few years, there has been a sharp rise in the use of mobile technology based applications in support of hedonic activities. According to industry sources, the revenue potential of wireless hedonic technologies is enormous. Gartner, Inc. [8] estimates that the worldwide mobile game end-user revenue will surpass US\$5.6 billion in 2010. Jung et al. [12] thus rightly point out that the mobile service providers continue to fight for market share by offering new services supporting various hedonic activities (e.g. mobile tv). Mobile devices are ubiquitous and are used for several purposes such as personal management, work, and leisure activities. At the same time, several scholars highlight that some unique barriers associated with mobile devices (e.g. small screen size) may hinder individuals from using mobile technologies to seek entertainment. These contradicting viewpoints about the use of mobile technologies for hedonic activities make these technologies an interesting topic for examining their acceptance by individuals. Hence, further research attention is needed to focus on consumer acceptance of the use of mobile technologies supporting their hedonic games downloading activities. Another

motivation emerges from the fact that existing literature about the influence of demographic characteristics on individuals' intentions to use mobile technology for hedonic applications is still at infancy due to the emerging nature of mobile technology. Therefore, it is essential to examine the role of demographic characteristics from consumer marketing perspective. Motivated by these two concerns, we have therefore initiated this exploratory study among a segment of student population at a large Australian university to understand students' intentions to use mobile technologies to engage in hedonic activities using Technology Adoption Model (TAM) developed by Davis [5] as an appropriate theoretical lens. We further seek to examine the association of two key demographic characteristics (age and gender) with the students' perceptions about engaging in hedonic behaviours using mobile technologies. In particular, we have chosen downloading games on students' mobile phones as the appropriate context to address our research concerns. Downloading games represents an instance of hedonic activity and is a relatively new phenomenon for which limited studies are reported in scholarly literature. Hence, the use of TAM to games downloading context will help in clarifying its applicability by highlighting TAM's ability to explain mobile hedonic technology acceptance by individuals which has not been adequately explored in the past.

THEORETICAL BACKGROUND

Hedonic activities: The word „hedone“ is traced to its roots, meaning pleasure – akin to sweet [26]. Seligman [25] describes hedonic activities as those for which individuals engaging in such activities (e.g. leisure) experience pleasant feelings. Many technologies qualify for hedonic purposes. In recent years, mobile service operators are introducing various mobile services (e.g. ringtones) for satisfying the hedonic needs of their subscribers as mobile technologies and associated services are also used to meet hedonic [16]. According to Liu and Li [18], playing games on mobile phones represents one of the most promising and profitable services.

Technology acceptance: Acceptance of

technologies by individuals has long been regarded as a topic of immense significance to the IT and e-commerce adoption scholars. Many frameworks are reported; however among them TAM is known to be quite robust and influential in explaining technology acceptance by individuals [10] [23]. Even though TAM has been primarily applied to a wide range of productivity enhancement technologies, in recent years some scholars have also applied it for hedonic context [33] [21]. TAM provides an explanation of factors determining general computer use for organisational context. It encompasses the impact of external factors (e.g. demographic characteristics) on internal beliefs, attitudes and intention [6]. The two constructs fundamental to the original model are perceived usefulness and perceived ease of use [12]. Perceived usefulness is generally defined as “the prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organisational context” [6]. However, for hedonic context, the definition of perceived usefulness changes from utilitarian perspective to satisfying emotional desires perspective [14]. This view is also supported by Jung et al. [12]. Perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort” [5]. TAM also posits that computer usage (behaviour) is determined by behaviour intention, which is represented as the weighted sum of the person’s attitude towards using the system and perceived usefulness. The relationship between attitude and intention implies that people form intentions to perform certain behaviour when they have positive feelings towards it. Although subjective norm was not included as a predictor of intention in the original model, it was later included in TAM to account for mandatory system use [32]. It also suggests the influence of external variables (e.g. demographic characteristics) on both ease of use and usefulness. Although intended for productivity-oriented technologies, TAM has been applied to explain the acceptance of mobile technologies intended for hedonic situations. However, most of these studies were conducted in either Asian countries (e.g. China, Taiwan and South Korea) or some European nations context (e.g. Spain and Norway), and no studies are reported for Australia. Moreover, the dependent variable seems to be either attitudes or intentions [1][11][12] [18] [22]. Furthermore, conflicting evidence is found about the role of perceived usefulness and perceived ease of use.

Demographic Characteristics and Use of Hedonic Technologies: There exists scant

literature on how demographic characteristics of consumers may influence their use of mobile technologies. We therefore review the broader IT and e-commerce literatures and find inconclusive evidence about the role of gender and age on an individual’s use of online and innovative technologies. For example, from the theoretical perspective, the potential influence of demographic characteristics on a person’s attitudes towards performing a given behaviour has been acknowledged by TAM [6] and Theory of Reasoned Action [7]. In TAM [5], several external variables were incorporated which may influence user belief structure towards perceived ease of use and usefulness. Some of these variables include users’ demographic characteristics and situational context. The TRA [7] model claims that attitude (towards a behavior), subjective norm, and intention are the prime determinants of behavior. It further does not deny the possibility that demographic factors will also have a relationship with behavior. However, empirical e-commerce literature provides mixed support about the role of demographic factors mentioned in TAM and TRA. For example, scholars like Schofield and Davidson [24], Nachmias et al [20], Stone et al. [27], Teo et al. [28], and Zhang [35] reported that individual characteristics of users are related to the use of various types of IT systems (including the Internet) for both personal and organisational contexts. In contrast, such scholars as Anandarajan et al. [2] and Konradt et al. [17] did not find significant relationship between users’ demographic characteristics and their use of Internet-enabled IT systems. Thus, for the mobile technology based applications intended for hedonic context, the role of demographic characteristics needs further research attention.

Gaps in the Literature: We acknowledge that works of various scholars [1][11][12][18][22] make an important contribution towards establishing the applicability of TAM for using mobile technologies for hedonic context. Despite such contribution, little work has yet been reported in the literature to demonstrate how TAM applies to downloading games on mobile phones context. Moreover, past studies of the applicability of TAM has focused on some Asian and European student population, and to the best of our knowledge, no empirical work involving TAM for mobile technologies supporting hedonic activities has yet been reported for the Australian student context. Hence, further studies are needed.

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

By including the key constructs of TAM, we

now propose a research model (Figure 2) and derive several hypotheses. Each hypothesis is briefly described below.

Gender: There is evidence in the broader IT literature that is indicative of the existence of a difference in individuals' dispositions towards various types of information technologies. For example, Venkatesh and Morris [31] observed that attitudes of males are more dominated by their perceptions of portal's usefulness. In contrast, attitudes of females are often guided by their attitudinal perceptions towards portal's ease of use. Furthermore, some scholars [9] indicated that females are more likely to be anxious about using IT systems than their male counterparts depending on the degree of complexity involved in it. According to Vallerand [30], males tend to be more confident with the execution of complex tasks using IT systems than their female counterparts. For a hedonic application such as downloading

Age: The broader IT literature provides some evidence and arguments in support of age playing a role in forming an individual's belief and attitudes towards his/her perceived usefulness, ease of use and attitudes for IT systems use. For example, older people may be more likely to form an attitude for using an IT application based on their perceptions of the degree of effortlessness in using that particular application [31]. In other words, older people tend to form positive attitudes towards an IT system when usage of those applications does not demand considerable effort on their part. Another argument is that perceived usefulness of an IT application may differ between young and more matured people because older people may take longer time to learn new ways of doing things as they have formed habits over a period of time [30]. For a hedonic application such as downloading games on mobile phones, we argue that when mobile technologies are perceived hard to use and involve greater learning requirements and the degree of hedonic satisfaction to be derived from the use of such technologies is influenced by how smartly and comfortably such applications can be used, then a significant difference in the perceived usefulness, ease of use and attitudes of students towards downloading games on their mobile phones can be expected. As a result, the following hypotheses are proposed:

H2a: There is a significant difference in perceived usefulness of downloading games between young and more matured students

H2b: There is a significant difference in perceived ease of use associated with downloading games between young and

games on mobile phones, we argue that when mobile technologies are perceived complex and the degree of hedonic utility to be derived from the use of such technologies is not obvious, then a significant difference in the perceived usefulness, ease of use and attitudes of students towards downloading games on their mobile phones can be expected. As a result, the following hypotheses are proposed:

H1a: There is a significant difference in perceived usefulness of downloading games between male and female students

H1b: There is a significant difference in perceived ease of use associated with downloading games between male and female students

H1c: There is a significant difference in attitudes towards downloading games between male and female students

more matured students

H2a: There is a significant difference in attitudes towards downloading games between young and more matured students

Perceived usefulness of downloading games: Perceived usefulness is defined as the extent to which individuals feel that a certain technology would enhance their performance, and would help them in achieving certain goals [5]. For the mobile games downloading context, perceived usefulness describes how easily and efficiently does downloading games on mobile phone enables the users to satisfy their urge of playing games. Usefulness represents extrinsic motivation, that is motivation based on goal achievement [32]. Given that downloading games is a hedonic activity, usefulness is concerned with providing a better channel for entertaining individuals who play games. Hence, the following hypothesis is proposed:

H3: Perceived usefulness of downloading games is positively related to students' attitude towards downloading games on mobile phone.

Perceived ease of use associated with downloading games: According to Davis [5], the term "perceived ease of use" refers to the extent to which an individual believes that a particular technology would be easy to understand and use [5]. For the downloading games on mobile phones context, it can be argued that perceived ease of use relates to the easiness of learning how to play games on mobile phone, downloading them and becoming skillful at playing games. Easiness of mobile games is a subjective decision, as it is directly affected by users' experience in downloading games. It can be easy for some

and difficult for beginners. It also depends on self-efficacy and mobile aptitude of the users, hence it can be said that when the downloading task is easy, it positively impacts attitude. Therefore, the following hypothesis is proposed:

H4: Perceived ease of use associated with downloading is positively related to students' attitude toward downloading games.

Attitude towards downloading games: Davis [5] defines attitudes as “the affect that one feels for or against some object or behavior”. Ajzen and Fishbein [7] distinguish between two types of attitude: a) attitude towards object (e.g. mobile phone, computers, PSP etc), and b) attitude towards behavior (e.g. downloading games online gaming, chatting etc). For our research context, attitude measures the behavioral dispositions of the users’ intention in downloading games on mobile phone. This is affected by a person’s belief of usefulness and ease of use of mobile games download services, and the game itself. Hence, the following hypothesis is proposed:

H5: Students' attitude towards downloading games is positively related to their

intentions to download games.

RESEARCH APPROACH

Justification of survey approach: Our research is exploratory in nature because the applicability of TAM to hedonic contexts involving mobile technologies in Australia has not been examined before. Hence, based on the suggestions of Yin [34], an exploratory survey approach was considered appropriate.

Survey population and sample: Participants of the survey are students from a large Australian university. They were chosen at random basis at public meeting places around university where large number of students gather (e.g. cafes, library). A total of 300 questionnaires were distributed and 209 completed responses were obtained resulting in 69.5% which is quite satisfactory. Data obtained from the completed responses were analysed using SPSS version 19.

Operationalisation of research variables: The variables used in the research model were operationalised using a number of items adapted from the established literature sources. A high level summary is shown in Table 1.

Table 1: Items used to measure research variables

Construct	No of items	Literature Sources
Perceived ease of use (PEOU)	4	Nyseven et al (2005), Hsu et al (2004), Klopping, et al (2004).
Perceived usefulness (PU)	3	Nyseven et al (2005), Hsu et al (2004).
Attitude towards downloading games on mobile phones (AT)	4	Nyseven et al (2005)
Behavioural intentions (Dependent variable)	1	Turel et al, (2007)

Survey instrument design: Drawing on Table 1, an initial theory driven survey instrument was developed which included 12 items. According to research gurus, a research instrument should be refined before administering it among the target population in order to enhance instrument reliability and validity [34]. In keeping with this view, the initial survey instrument was evaluated through a three stage qualitative process: a) evaluation by domain experts [15], b) item factor association, and c) pilot test. At the first stage, the initial survey instrument was circulated to four domain experts who were requested to comment on the comprehensiveness, accuracy, and readability of the items included in the instrument. Based on their suggestions, several items were rephrased. At the second stage, the revised

instrument was given to five participants including two PhD students and three undergraduate students. Based on their evaluations, several amendments were incorporated. Finally, a pilot test was conducted among randomly selected ten students to identify any ambiguities still present in the survey instrument which in turn enhances the face validity of the instrument. The analysis of the feedback from these students enabled us to further refine the instrument. Following that, the revised survey instrument was distributed among a randomly selected sample of 300 students at a large Australian university.

Instrument validation: In order to improve the reliability of the survey instrument, we have first applied the suggestions of Churchill [4] to purify the items included in the instrument by drawing on the responses received from the

survey. Out of 11 items used for measuring the perceived usefulness, perceived ease of use and attitude (Table 1), we have removed 2 items for which “corrected-item-total” correlation was

less than 0.30. The results of reliability analysis are displayed in Table 2.

Table 2: Item total statistics

Item	Item Description	Corrected item-total correlation	Chronbach's alpha value (overall)
PEOU2	Learning to play games on my mobile phone is not difficult for me	.391	
PEOU3	Games on my mobile phone are easy to play	.430	
PEOU4	My interaction with mobile games downloading is clear	.427	
PU1	Downloading games on my mobile phone enables me to accomplish the task of playing games more efficiently	.346	.857
PU3	Overall, I find downloading games on my mobile phone is useful	.618	
AT1	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: good .	.638	
AT2	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: valuable	.504	
AT3	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: desirable	.629	
AT4	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: enjoyable	.661	

We have then computed the reliability (Chronbach's alpha value) of the survey instrument involving the remaining 9 items which was found to be 0.857 and is quite satisfactory. Next, we have applied an exploratory factor analysis to determine whether the remaining 9 items truly represent the constructs of TAM. The results of the factor analysis are shown in Table 3 and Table 4 which confirm that these 9 items indeed correspond to three constructs (e.g. PEOU, PU and attitude).

Table 3: Factor loadings of retained items

Items	Factors		
	Factor 1 (Attitude)	Factor 2 (PEOU)	Factor 3 (PU)
PEOU2		.810	
PEOU3		.844	
PEOU4		.509	
PU1			.886
PU3			.458
AT1	.799		
AT2	.809		
AT3	.808		
AT4	.682		

Table 4: results of factor analysis

Statistics	Factor 1 (AT)	Factor 2 (PEOU)	Factor 3 (PU)
Eigen values	3.68	1.44	1.03
Variance by individual dimension	40.9	16.07	11.14
Cumulative variance	40.9	56.98	68.12
Kaiser-Meyer-Olkin Measures of Sampling Adequacy = .816			
Bartlett's Test of Sphericity (Approx.)			
Chi-Square = 591.88; df = 36; Sig.(p) = .000			

EMPIRICAL FINDINGS AND DISCUSSION

Demographic Characteristics: A total of 209 completed questionnaires were received. Out of that, 102 students reported to have downloaded games on their mobile phones. This indicates that 48.08% of students have experience with mobile games downloading service. Out of 209 participants, 138 are male (66%) and the remaining 71 are female (34%). Hence, a dominance of the male participants is observed. A vast majority of the participants

were young (93.8%) as they belong to age group of 18-25 years. About three-fourths (76.6%) of the respondents are currently enrolled in various undergraduate degree programs, and nearly 24% are enrolled in post graduate degree.

Hypotheses Evaluation: A regression analysis was performed to examine the relationship between perceived usefulness and perceived ease of use with students' attitude towards downloading games on their mobile phones. The results are presented in Table 5. Both

Table 5: Regression analysis results for hypotheses H1 and H2

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	p-value
	B	Std. Error			
PEOU	.233	.078	.187	2.98	.003*
PU	.520	.071	.458	7.31	.000*
R ² (Adjusted) = 30.4%, F = 46.4, p = .000					

Another round of regression analysis (Table 6) was performed to find the explanatory power of students' attitude towards downloading games on their intentions to download games. The

Table 6: Regression analysis results for hypothesis H3

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	p-value
	B	Std. Error			
Attitude	.698	.077	.534	9.081	.000*
R ² (Adjusted) = 28.1%, F = 82.47, p = .000					

Several rounds of student t-tests were performed to evaluate the existence of significant differences in students' perceived usefulness, ease of use and attitudes towards downloading games between male and female students as well as between young and matured students. The results are displayed in Table 7 and confirm the lack of any major association between the students' demographic characteristics and their perceptions towards downloading games. On the matter of age, although age was measured into 3 distinct categories (Table 5), we have collapsed age into two categories (i.e. less than 21 years and above 21 years) because out of 209 responses only 13 were above 26 years of age category.

In summary, out of five proposed hypotheses, three (H3, H4 and H5) were empirically supported by our survey findings. Furthermore, perceived usefulness and perceived ease of use jointly explain only 30.4% variations in students' attitudes towards downloading games. Moreover, attitudes explain only 28.1% of variations in their intentions to download games. Hence, overall the constructs used in TAM are significant for explaining students' intentions to download games but the explanatory of TAM is

perceived useful and perceived ease of use were found to significantly explain the variations in students' attitudes towards downloading games. As a result, hypotheses H3 (p = .000) and H4 (p = .003) were supported. However, R² (Adjusted) indicates that these two variables are responsible for explaining about one-third variations in attitudes. The beta values indicate that perceived usefulness is more related to attitude as compared to perceived ease of use.

results confirm that attitude is significantly related to students intentions for downloading games (p = .000) and thus support hypothesis H5.

not very high. These findings are indicative of the possibility that TAM alone cannot fully explain the variation in intentions (for this type of mobile technology used for hedonic context) which in turn calls for more research into integrating other alternative theoretical perspectives with TAM. One possibility is to develop a more comprehensive acceptance model for hedonic context by integrating ideas borrowed from Consumption Value Model (CVM) which was used by Turel [29]. Another important finding is that neither gender nor age of the students was related their perceptions about usefulness, ease of use and attitudes towards downloading games. This observation suggests that at least for this hedonic context demographic characteristics do not have much significance. This is quite different from those reported in the broader IT and e-commerce literature sources which provide mixed findings about the role of demographic characteristics on individuals' attitudes and intentions towards IT acceptance. The lack of significance of demographic characteristics for downloading games has implications for the mobile service providers' marketing programs. Such programs should be designed based on the assumption that the appeal for downloading games has

appeal to consumers regardless of their gender and age orientation.

Table 7: Results of student t-tests

Demographics	Perceived usefulness	Perceived ease of use	attitude
Gender	Male mean: 2.93	Male mean: 3.57	Male mean: 2.86
	Female mean: 3.08	Female mean: 3.55	Female mean: 2.92
	t- value: - 1.41, df= 140.4	t- value: .166, df= 152.1	t- value: - .486, df= 166.8
	p-value: .161	p-value: .868	p-value: .628
	H1a is not supported	H1b is not supported	H1c is not supported
Age	Mean (young): 2.97	Mean (young): 3.51	Mean (young): 2.82
	Mean (mature): 3.0	Mean (mature): 3.64	Mean (mature): 3.01
	t- value: - .254, df= 174.8	t- value: -1.38,df:169.2	t- value: -1.57, df:147.8
	p-value: .80	p-value: .168	p-value: .117
	H2a is not supported	H2b is not supported	H2c is not supported

CONCLUSION

Mobile technologies are now growingly used for hedonic purposes. As such, we have reported the findings of an initial exploratory survey among a segment of the Australian university students about their attitudes and intentions for downloading games on mobile phones. We have analysed students' views using TAM. It however seems that although the underlying principles of TAM apply to the games downloading hedonic context, the explanatory ability of TAM to explain the variations in students' intentions to download games is limited. This in turn suggests that future research is still needed to consider the inclusion of factors from other competing theories (e.g. CVM). Furthermore, for downloading games context, students' demographic characteristics were not found to be relevant at all which contradicts the current belief for the productivity oriented technology use by individuals. Further studies should also seek information on a, b and c to better understand how students use and download games on their mobile phones. However, we caution against generalizing our findings because they were drawn from student sample only. Despite this, our findings make contributions to theory by highlighting limited ability of TAM for hedonic context. To practice, knowledge of our findings would mean that mobile services providers can design their marketing campaigns without differentiating the influence of gender and age. Our research although useful is not free from weaknesses. One limitation of our research is that the survey participants are predominantly students currently pursuing their degree. As a result, views from other types of participants were not captured, thereby restricting generalisability of the research findings. Further research studies are thus needed to include different types of respondents (e.g. business people, professionals, trade people) in a survey.

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