Computers in Human Behavior 25 (2009) 123–129

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Consumer adoption of mobile TV: Examining psychological flow and media content

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ARTICLE INFO

Article history:
Available online 25 September 2008

Keywords:
Flow experience
Cognitive concentration
Media content
Technology acceptance model (TAM)
Mobile TV
The digital multimedia broadcasting (DMB)

ABSTRACT

Mobile TV service, which provides television-like content through a mobile device, holds a limelight as the next killer application of wireless technologies and also as a prospective hedonic information technology. However, in a world where other potential wireless technologies and services speedily emerge, vendors and service providers interested in mobile TV hope that it will be diffused over the gulf between early users to general ones prior to competing sprouts. At this point, an investigation of early consumers' adoption of mobile TV may offer precious information for its survival. Based on the theoretical assumptions of the technology acceptance model (TAM), this study examines influences of cognitive concentration (or flow experience) and media content on consumers' acceptance of mobile TV. The results are threefold. First, results suggest that cognitive concentration (or flow experience) and content have a significant role in consumers' intention to use hedonic information technology. Second, results show that content has a critical impact on cognitive concentration. Finally, results support the use of the extended TAM as an explainer in the context of hedonic information technology.

1. Introduction

As the wireless market continues to mature, we observe two different efforts championed by two very distinct groups. First, wireless service subscribers continue to request performance improvements and more extensive applications. This seems to be an effort to get comparable applications and services to those found in the wireline arena. Second, at the same time, wireless providers continue to fight for market share by offering new services with the hope that bring higher revenues. Mobile TV service is one such service that is regarded as the next big thing for the wireless industry (Cullen, 2005; Hyers, 2006; Shim, Ahn, & Shim, 2006). Mobile TV service involves providing TV services to the mobile phone via wireless networks. Mobile TV has also been described as "takeout TV" or "cellevision", and it uses a multicast process to deliver digital multimedia contents such as dramas, news, music, sports and documentaries, to mobile devices (Shim et al., 2006). Considering the possible offerings of the current content, mobile TV can be regarded as entertainment-centric information technology (IT) or hedonic IT.

Despite the optimistic expectation of the success of mobile TV, some pessimists doubt the prosperity of mobile TV (Knoche & McCarthy, 2004). Pessimists believe that the small screen size on wireless phones and the flawed quality of service (e.g., asynchronous mismatch between video and audio) will hinder subscribers from immersing themselves into the mobile TV. They also point out that the current content of mobile TV is not too fascinating so as to attract consumers. These opposing views of the viability and success of mobile TV raise an interesting dichotomy worthy to be studied. These pessimistic opinions arouse ones' attention concerning the possibility of consumers' adoption of mobile TV. In this paper, we investigate subscribers' acceptance of mobile TV using the technology acceptance model (TAM) which is extended with cognitive concentration (i.e., flow experience), and media content.

The TAM has been proven to be a valid and reliable model, and also influential, in explaining the individual's acceptance of technologies (Hu, Chau, Sheng, & Tam, 1999). Despite its successful reputation, some researchers point out that the task-related nature of the TAM makes researchers lean to overlook an effect of intrinsic factors (Van der Heijden, 2004; Wakefield & Whitten, 2006). Recent TAM studies have employed intrinsic motivations (e.g., cognitive absorption, perceived enjoyment), in the TAM, and have empirically demonstrated their influential role in user behavior of IT (Agarwal & Karahanna, 2000; Koufaris, 2002; Wakefield & Whitten, 2006).

Due to the hedonic aspect of mobile TV service, this study adds a cognitive flow and a content aspect to the TAM. First, cognitive flow indicates "the holistic sensations that people feel when they act with total involvement" (Csikszentmihalyi, 1977, p. 36). This concept is assumed to have a key role particularly in users'

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doi:10.1016/j.chb.2008.07.011

perception of entertainment-centric information systems such as the current mobile TV service that is being studied. Specifically, we employ cognitive concentration which has been commonly used as flow experience in prior research. Second, we also examine the applicability of the construct content in the TAM. In studies on consumer adoption of IT, quality of content has an influential role in consumers' appraisal of IT (Jarvenpaa & Todd, 1997; Palmer, 2002). Content is also expected to significantly affect cognitive flow (Skadberg & Kimmel, 2004). Thus, considering its importance in consumer adoption of IT and a potential antecedent to cognitive concentration, we assume that content is a highly relevant construct in this study. Ultimately, by adding cognitive concentration and content to the TAM, this study aims at a better understanding of consumers' acceptance of hedonic IT.

In the following section, we will introduce mobile TV service, and then build a consumer' acceptance model depending on literature on the TAM, flow and media content. Afterward, methodology and analysis follow. Finally, we discuss our findings and conclude the study.

2. Theoretical background and the research model

2.1. The outline of mobile TV

In this paper, mobile TV service refers to the digital video broadcasting-Handheld (DVB-H), and the digital multimedia broadcasting (DMB). DVB-H has been tested mainly in European countries and the biggest mobile phone manufacturer Nokia supports this standard; on the other hand, DMB has been mainly adopted by Asian countries, Japan and South Korea (Cullen, 2005). DMB is an advanced version of digital audio broadcasting (DAB), which was initiated in the Unite States and European countries in 1990s (Shim, 2005). DMB service for in-automobile terminals was started in Japan in 2004, and DMB service in mobile phones as well as in-automobile terminals was launched in South Korea in 2006 (Shim, 2005). In Europe, major wireless service providers such as O2, Orange France, and The Italian arm of three, have prepared for DVB-H (Cullen, 2005). Moreover, US wireless service providers will make or have already made an alliance with specific network operators to launch mobile TV before 2010 (Hyers, 2006).

Although several threats may hinder the launch and further success of mobile TV (i.e., small screens, short battery life, content rights), according to consumer surveys, consumers are likely to be ready for it. Innovative consumers (early adopters) seem to be willing to adopt mobile TV soon, and main stream consumers also have an intention to use mobile TV in the future (Cullen, 2005; Hyers, 2006). In fact, as of 2006, over a million Korean people subscribe to mobile TV services, and it is projected that the number of subscribers will reach over 10 millions by 2009 (TU Media Report., 2005). Moreover, according to Cullen (2005), 56 percent of UK cellular phone subscribers are interested in mobile TV. In North America, it is estimated that by the year 2011 more than 27 million subscribers will spend an estimated $2.3 billion to access mobile TV. Even more, it is expected that $841 million will be spent in advertising agency costs in support of mobile TV (Hyers, 2006). These numbers give a positive outlook for network operators, service providers, and advertisement managers, because adoption and diffusion of mobile TV means a new source of revenue for those players (Shim et al., 2006).

2.2. The technology acceptance model

User acceptance of technologies has received much attention from previous research, and there are varied theoretical frameworks that analyze the individual's acceptance of technologies. Among them, the technology acceptance model (TAM) is estimated greatly robust and influential in explaining user technology acceptance (Hu et al., 1999). The TAM has been popularly used as an interpreter in user acceptance of technologies and it is supported by abundant empirical studies. The TAM has been successfully applied in the acceptance of the diverse technologies such as personal computer (Davis, 1989), telemedicine (Hu et al., 1999), websites (Agarwal & Karahanna, 2000), and mobile devices (Wakefield & Whitten, 2006).

The TAM theorizes that an individual's behavioral intention to accept a technology depends on two beliefs: perceived usefulness (PU), defined as the extent to which a person believes that using the technology will enhance his or her job performance, and perceived ease of use (PEOU), defined as the extent which a person believes that using the technology will be free of effort (Davis, 1989). This definition of PU is based on work situational contexts. This definition needs to be operationalized to be able to be applied in entertainment uses of IT.

In fact, mobile TV can be used to offer information on weather or transportation, but the current use of mobile TV is mainly entertainment-focused. This situation is much different from a situation where the purpose of using IT is external and clear; for example, when using online store, the purpose may be a purchase of a product. In research of hedonic IT, such as mobile TV, if one regards PU as a work-related notion (e.g., a performance of searching information) as in prior TAM research, one cannot exactly grasp users' utility for hedonic IT usage. Therefore, we widely define PU as an individual's perception of the degree to which a technology helps the user attain the purpose for the technology usage. PU has a direct impact on acceptance intention, because users will be more willing to use a technology if it can provide benefits. On the other hand, following prior TAM studies, we assume that PEOU influences both acceptance intention and perceived usefulness. The easier it is for an individual to interact with a technology, the more likely the individual will find it useful and intend to use it. Consistent with prior TAM studies, we hypothesize that (see Fig. 1).

- H1: Perceived usefulness will positively affect a consumer's intention to use mobile TV.
- H2: Perceived ease of use will positively affect a consumers' intention to use mobile TV.
- H3: Perceived ease of use will positively affect perceived usefulness.

2.3. Consumers' flow experience and cognitive concentration

Flow, developed by Csikszentmihalyi (1990), represents "the state in which people are so involved in an activity the noting else seems to matter" (p. 4). Flow was initially used to describe dancers' or rock climbers' sensation in the middle of an optimal experience. The state of flow is characterized by "a narrowing of the focus of awareness, so that irrelevant perceptions and thoughts are filtered out, by loss of self-consciousness, by responsiveness to clear goals and unambiguous feedback, and by a sense of control over the environment" (Csikszentmihalyi, 1977, p. 72). Novak, Hoffman, and Yung (2000) classify Csikszentimihalyi' flow components into three stages (i.e., flow antecedents, flow experience and flow consequences), and state that flow experience includes concentration and control. However, there is no dogmatic application of flow, and prior studies have applied Csikszentmihalyi's work in many diversified ways. For instance, in Ghani (1995), control was used as a flow antecedent; in Chen (2000), loss of self-consciousness was used as flow experience; and Hoffman and Novak (1996) added the new relevant construct of telepresence.

The diverse modes of flow experience have been popularly applied in IT and Web environments. Ghani and Deshpande (1994)

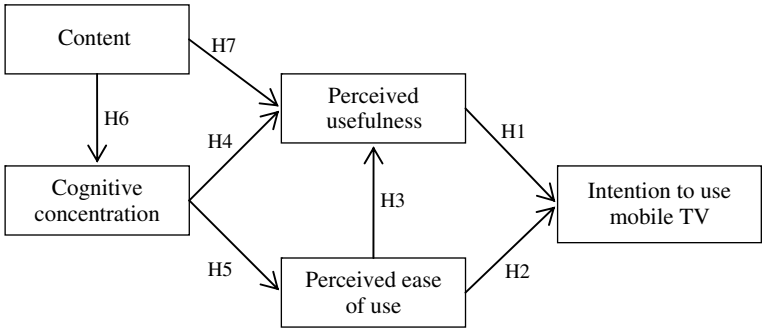

Fig. 1. The research model.

examine flow with computers in the workplace. In their model, flow is measured by enjoyment and concentration which encourages users to use computers. Chung and Tan (2004) examine perceived playfulness which is considered one dimension of flow experience in the Web context. In the study of online shoppers' behavior, Koufaris (2002) examines the influence of flow experience (perceived control, shopping enjoyment and concentration) on online shoppers' intention to return.

Selecting among diverse flow experience concepts, we employ cognitive concentration, which is defined as the extent to which an individual attention is absorbed by the activity (Hoffman & Novak, 1996). Cognitive concentration is not only conceptually identical to flow concept, but it has also been commonly used as flow experience (Csikszentmihalyi, 1997; Novak et al., 2000; Skadberg & Kimmel, 2004). Although enjoyment is frequently used as flow experience, we excluded it in this study. Hedonic IT users primarily aim at 'enjoyment' itself rather than other external purposes, and our definition of PU already encompasses the utility from enjoyment.

In our study, we expect that cognitive concentration is considerably relevant in the mobile TV context. Mobile TV users generally use the service in an 'unstable' situation. Users typically use mobile TV during their commute or in short spare moments on the road. Imagine an individual using mobile TV in a crowded space like in subway or in a bus. In these situations the surrounding people may "peep" at the individual's mobile TV or the individual may have to constantly check for his/her arrival at the destination. In particular, when such distracted situations are combined with technological drawback (e.g., flawed scenes, difficulty to use a device) and boring content, users' concentration on mobile TV may be significantly hindered. Therefore, cognitive concentration should be considered in understanding users' perception of mobile TV.

Recent studies have empirically supported Csikszentmihalyi (1990) statement that a greater flow experience may make people more productive and effective. Yi and Hwang (2004) report the significant connection of flow experience and PU in e-learning context; Agarwal and Karahanna (2000) demonstrated that cognitive absorption has a significant influence on PU in Web environment. Zhang, Li, and Sun (2006) also show that cognitive absorption significantly affects students' perception of usefulness of a university website. In the current study, when users are deeply absorbed in watching mobile TV, they may feel they get the most utility for IT usage (greater PU). Thus, we hypothesize:

- H4: Cognitive concentration will positively affect perceived usefulness.PEOU is empirically demonstrated to enhance flow experience (Lee, Cheung, & Chen, 2005); reversely, Agarwal and Karahanna (2000) maintain that cognitive absorption positively affects PEOU, funding their assertion on Venkatesh, 1999 argument that an intrinsic-motivated individual feels it is easier to work. Argawal and Karahanna argue that an immersed individual feels a lower cognitive burden and demonstrate that cognitive absorption has a significant influence on PEOU. Several studies also confirm the significant influence of flow experience on PEOU (Yi & Hwang, 2004; Zhang et al., 2006). Thus, we hypothesize that a greater concentration on watching mobile TV will make the consumer perceive lower cognitive burden.
- H5: Cognitive concentration will positively affect perceived ease of use.

2.4. Media content

This study examines content as a new potential antecedent of cognitive concentration and PU. Content is usually defined as a construct which has dimensions of exactness, relevance, and sufficiency (Doll & Torkzadeh, 1988). More specifically, Palmer (2002) defines content of websites as a construct that includes "the amount and variety of content as well as the use of text, graphics, and multimedia" (p. 156). De Wulf, Schillewaert, Muylle, and Rangarajan (2006) synthesize previous concepts of content and define content as an individual's assessment of credibility, timeliness, sufficiency and relevance of information provided by a content provider. In this study, we accept the latter definition but with the exception of credibility. We believe that the credibility dimension of the content construct is rooted in informative content. In the case of entertainment-oriented situation like mobile TV, credibility is not easily applied in an individual's cognitive understanding of content. Hence, this manuscript defines content as a consumer's assessment that programs are applicable (relevance), up-to-date (timeliness), and sufficient (sufficiency). It has been reported that content is a significant predictor of positive responses in end-user computing satisfaction (Doll & Torkzadeh, 1988); website satisfaction (De Wulf et al., 2006); and perceived success of websites (Palmer, 2002).

Finneran and Zhang (2005) posit that any current or actual activity (e.g., buying a digital camera on the web) is the combination of using artifacts (e.g., internet store websites) and the specific tasks related to the activity (e.g., searching for information of a specific digital camera). Tasks are bound up with the content aspect. For example, in an online shopping experience, despite a well-designed internet store and a high-speed connection, if the online shopper cannot find the wanted information, the shopper is not likely to concentrate on or enjoy using the website. Therefore, researchers need to consider both artifacts and task-related content in examining flow experience within the activity. Consequently, this argument holds in the context of mobile TV service. Technological weaknesses apart, it seems that the consumer's level of concentration for a specific content (e.g., a drama) is closely related to his/her interest. If the drama is boring and uninteresting, the consumer will lose his/her concentration. Thus, when using mobile TV service, consumers' concentration is assumed to be

affected by content (task) as well as the technological side (artifact). In their empirical study examining antecedents of flow experience, Chung and Tan (2004) found that the most influential antecedent of flow experience is content. Also, given mobile TV is basically an entertainment service, content is expected to have a direct influence on consumers' perception of utility for mobile TV usage. While a boring and repeated content may make consumers perceive a low level of utility for the service, an exciting and unique content may provide greater satisfaction and induce higher-level perception of utility.

- H6: Content will positively affect consumer's cognitive concentration.
- H7: Content will positively affect consumer's perceived usefulness.

3. Methodology

3.1. Sample and measurement

We chose mobile TV users in South Korea as subjects based on the pervasiveness of mobile TV in South Korea. Two types of DMB services (i.e., satellite-DMB and terrestrial-DMB), a sort of mobile TV service, were inaugurated in South Korea in 2005 (Shim, 2005). TU Media, one of Korean DMB service providers, predicts that the number of subscribers will be over 10 millions by 2010 (TU Media Report, 2005). Considering the rapid growth of DMB market, South Korea is considered to be good fit in examining early users' adoption of mobile TV service. In order to solicit DMB users, we posted a short notice which introduced this study with a Web address for the survey on the boards of online communities where users exchange information related to DMB service. The authors adopted a Web-based survey method due to the geographically distance between the researchers and the site selected. The survey software allowed only one response for each IP address to prohibit a subject's multiple responses. A total of 216 questionnaires were collected over three-week survey period. Among them, eight respondents had no answer on three-items or more out of the 16-items presented. Following Hair et al.'s recommendation (90% of all items answered), these respondents were dropped from the analysis (Hair, Black, Babin, Anderson, & Tatham, 2006). After correcting for missing data, a total number of 208 questionnaires were included in the analysis. The demographic information of respondent is described in Table 1. Our respondents consisted of 33 females (15.9%) and 172 males (82.7%). Over one-third participants were under 29 ages (161 respondents, 77.4%) and had educational background of university or below (183 respondents, 87.9%).

A 20-item Web-based survey (four related to demographic/general information) was developed. The survey was initially developed in English and then subsequently translated into Korean by one of the manuscript's authors. A back translation was conducted by two other bilingual graduate students to make sure of the accuracy of the translation. A seven-point Likert-scale was used to measure each item. Perceived usefulness scales were based on Chau (1996) and Lu, Yao, and Yu (2005). Those items are much suitable to measure our comprehensive concept of PU (e.g., productive in my life/work). The items for intention to use and PEOU were based on Davis (1989) instrument which has been widely validated in prior TAM research. The items for concentration came from flow literature, especially those based on Ghani and Deshpande (1994) and Koufaris (2002). Finally, the items for content focused on critical dimensions of content (timeliness, sufficiency, and relevance of content) which were proposed by Doll and Torkzadeh (1988) and De Wulf et al. (2006). The specific items are described in Table 2.

Table 1
Demographic information of respondents

Demographic profile		Frequency	Percent (%)
Gender	Female	33	15.9
	Male	172	82.7
	No answer	3	1.4
	Total	208	100.0
Age	Under 20	76	36.5
	20–29	85	40.9
	30–39	33	15.9
	40–50	5	2.4
	Over 50	6	2.9
	No answer	3	1.4
	Total	208	100.0
Education	Under or high school	71	34.1
	College/university	112	53.8
	Graduate school or over	14	6.7
	No answer	11	5.3
	Total	208	100.0

3.2. Pilot study

A card sorting method was adopted to examine the convergent and discriminant validity of the measurement items (Moore & Benbasat, 1991). Five DMB users were asked individually to sort each index card, which included a single measurement item, into five constructs (perceived usefulness, perceived ease of use, concentration, content and intention to use). In Table 3, an examination of the diagonal shows that a total of 78 hits were correctly placed among 80 target placements, indicating an overall hit ratio of 97.5%. Further examining each row shows that the items for the particular constructs are actually being classified. All constructs were properly matched with their own items, except for the content construct which had only one improper placement. The results from a card sorting test illustrates that users could properly classify the items into the constructs with an accuracy rate of over 93 percent. The measurement items did not violate convergent and discriminant validity. Subsequently, we tested the construct reliability with a pilot test. Thirty-one DMB users, who are excluded from the formal survey, voluntarily participated in the pilot test. The result provided acceptable Cronbach's alpha values for all construct (on or over 0.7) (Nunnally & Bernstein, 1994). The results of the card sorting test and the reliability test tentatively suggested that the measurement items had acceptable convergent and discriminant validity and construct reliability.

3.3. Exploratory factor analysis

The exploratory factor analysis provided the expected five factors with item loadings higher than the cutoff (.50) (Hair et al., 2006). As seen in Table 4, Cronbachs' alpha values and the average variance extracted (AVE) confirmed convergent validity of our constructs: Cronbach's alpha values ranged from .78 to .91 and all AVE values were over the .5 level (Hair et al., 2006). We also assessed discriminant validity of the construct through item loadings and the AVE. The items loaded mainly on their corresponding construct with no cross loadings. Our results also supported Fornell and Larcker (1981) requirement of having the AVE of a construct being greater than the square of the correlation estimates with the other constructs. Our result assured this rule (see Table 5).

4. Results

We used structural equation model (SEM) as a data analysis method. We analyzed the structural model by using AMOS 7.0 which is the latest and easily operated software for SEM. Our

Table 2
Measurement items

Construct	Item
Perceived usefulness	PU1: Use of mobile TV can increase the quality or output of my life/work. PU2: Use of mobile TV can enhance the productivity of my life/work. PU3: Use of mobile TV can assist my life/work.
Concentration	CON1: During using mobile TV, I am usually absorbed intensely in the activity. CON2: During using mobile TV, I concentrate fully on the activity. CON3: During using mobile TV, I am deeply engrossed in the activity.
Content	CONT1: Mobile TV provides up-to-date contents. CONT2: Mobile TV provides sufficient contents. CONT3: Mobile TV provides content or information pertaining to my concerns. CONT4: Mobile TV provides content or information which I need.
Intention	INT1: Given that I have access to mobile TV, I would continue using it in the future. INT2: I expect my use of mobile TV to continue in the future. INT3: I intend to use it if possible.

Table 3
The result of the card sorting test

Construct (# of items)	PU	PEOU	CON	CONT	INT	N/A	Total	(%) Hits
PU (3)	15	0	0	0	0	0	15	100.0
PEOU (3)	0	15	0	0	0	0	15	100.0
CON (3)	0	0	15	0	0	0	15	100.0
CONT (4)	2	0	0	18	0	0	20	90.0
INT (3)	0	0	0	0	15	0	15	100.0

PU = Perceived usefulness; PEOU = Perceived ease of Use; CON = Concentration; CONT = Content; INT = Intention to Use.

Table 4
Exploratory factor analysis of items

Construct (Cronbach's alpha)	Item	Factor loadings
Perceived usefulness (.91)	PU1: Use of mobile TV can increase the quality or output of my life/work.	.81
	PU2: Use of mobile TV can enhance the productivity of my life/work.	.85
	PU3: Use of mobile TV can assist my life/work.	.83
Perceived ease of use (.78)	PEOU1: Learning to use mobile TV would be easy for me.	.82
	PEOU2: It would be easy for me to become skillful at using mobile TV.	.83
	PEOU3: I find mobile TV easy to use.	.81
Concentration (.85)	CON1: During using mobile TV, I am usually absorbed intensely in the activity.	.80
	CON2: During using mobile TV, I concentrate fully on the activity.	.81
	CON3: During using mobile TV, I am deeply engrossed in the activity.	.87
Content (.85)	CONT1: Mobile TV provides up-to-date contents.	.76
	CONT2: Mobile TV provides sufficient contents.	.82
	CONT3: Mobile TV provides content or information pertaining to my concerns.	.77
	CONT4: Mobile TV provides content or information which I need.	.75
Intention (.90)	INT1: Given that I have access to mobile TV, I would continue using it in the future.	.89
	INT2: I expect my use of mobile TV to continue in the future.	.80
	INT3: I intend to use it if possible.	.78

Table 5
The AVE and the correlation estimates

	PU	PEOU	CON	CONT	INT
PU	.88				
PEOU	.27	.74			
CON	.57	.23	.82		
CONT	.58	.14	.54	.78	
INT	.69	.34	.46	.41	.86

Diagonal elements represent the square roots of the AVE.
Off-diagonal elements are the correlation estimates.

model fit indices show that the research model presents a good fit to the data. All index values satisfied the recommended guideline for a good model fit (see Table 6). The χ^2 of 163.35 with 97 degrees of freedom revealed that a χ^2 to degree of freedom ratio was less than the recommended cutoff (<3.0). GFI of .92, AGFI of .88, RMR of 07, CFI of .97, NFI of .92 and RMSEA of .07 were over their benchmarks which come from Chin and Todd (1995) and Hair et al. (2006). The results suggested that the model was acceptable because fit indices satisfied the recommended cutoffs. The model explains 44 percent of the variance in perceived usefulness (PU), seven percent of the variance of perceived ease of use (PEOU), 29 percent of the variance in concentration (CON), and 50 percent of the variance in behavioral intention (INT).

The findings provided strong support for all hypotheses, except for H3 (PEOU → PU). PU has a highly significant influence on INT ($\beta = .64$, $p = .01$). PEOU slightly affects INT ($\beta = .17$, $p = .05$) but it has no influence on PU. CON has a significant influence on PU ($\beta = .34$, $p = .01$) and PEOU ($\beta = .26$, $p = .01$). Finally, the results show that content (CONT) has strongly significant explanatory power. CONT has a significant influence on CON ($\beta = .54$, $p = .01$) and PU ($\beta = .38$, $p = .01$) (see Fig. 2).

Table 6
Model fit indices

Fit statistics	Obtained	Recommended
χ^2	163.35	
df	97	
χ^2/df	1.68	<3.00[a]
GFI	.92	>.90[b]
AGFI	.88	>.80[a]
RMR	.07	<.08[b]
CFI	.97	>.90[a]
NFI	.92	>.90[a]
RMSEA	.06	<.08[b]

[a] From Chin and Todd (1995).
[b] From Hair, Black, Babin, Anderson, & Tatham (2006).

5. Discussion

5.1. Key findings

Our results reveal that consumers' intention to use mobile TV service can be explained well by the extended TAM with cognitive concentration and content (R^2 = .50). In addition to this overall result, this study also has several specific findings. First, PU has a strong explanatory power (β = .64) in explaining users' behavioral intention to use hedonic IT. This finding is consistent with prior research which examines the extended TAM with flow experience (β = .48 in Agarwal & Karahanna, 2000; β = .42 in Koufaris, 2002; β = .50 in Zhang et al., 2006). This finding also indicates that users of hedonic IT may feel gratification on leisure activities (i.e., different from a specific task such as searching information) from the utilitarian standpoint. Thus, PU can be still a good explainer for users' behavioral intention in the context of hedonic IT.

Second, PEOU unexpectedly has a slight influence on behavioral intention and no influence on PU, and this result indicates PEOU plays a trivial role in the extended TAM. In prior research examining the extended TAM with flow experience, PEOU significantly affects PU and behavioral intention. A plausible reason why PEOU plays a minor role in our model is that our respondents can be considered early adopters of mobile TV service who may be mobile device-savvy. PEOU had a great mean of 6.11 on a seven-point scale and a small variance of 1.12. Therefore, PEOU is not much influential in users' acceptance of mobile TV.

Lastly, cognitive concentration and content have a crucial influence on users' beliefs driving behavioral intention. Consistent with prior studies (Agarwal & Karahanna, 2000; Zhang et al., 2006), the finding indicates that cognitive concentration has a significant influence on PU and PEOU. Despite little prior empirical evidence, this finding also shows that the content aspect greatly affects cognitive concentration and PU in the context of hedonic IT. This result reveals that cognitive concentration and content are crucial components in understanding users' acceptance of hedonic IT.

5.2. Contributions

In addition to those key findings, this study has several theoretical and practical contributions. The study theoretically contributes to the generalizability of flow theory in investigating users' acceptance of IT, as applying the extended TAM with flow experience in hedonic IT. Although many studies have examined the framework of the TAM extended by flow experience, they focus on its application in the work context. As examining this framework in hedonic IT which has become more important branch of the IT field, our study confirmed applicability of this framework. The study also contributes on theoretical advancement of flow experience as employing the construct content. Prior studies focus on an impact of technological attributes on flow experience and have little interest in the content side. Our study meaningfully revealed a great influence of content on flow experience.

Regarding practical contributions, the research reminds mobile TV service providers of the importance of content. Content may be considered the root source for consumers' acceptance of mobile TV. A positive assessment of content greatly enhances cognitive concentration and perceived usefulness driving behavioral intention. To account for satisfactory content, service providers are required to offer more relevant content to service consumers and unique content only provided by mobile TV. Also, adding other types of content (e.g., educational programming) may increase consumers' perceived usefulness of the system and thus, increase the intention to use. Ultimately, offering satisfactory content is critical factor for the survival of mobile TV service so that mobility, which is its biggest advantage, overwhelms technological drawbacks such as a small screen.

5.3. Limitations and future research

This study includes a few limitations. All our samples were Korean people; thus, the study has a limitation in generalizing our findings in other cultural environments. Future research needs to examine our findings in various cultural settings. Also, our samples had a bias in the way that female samples (15.9%) were much less than male samples (82.7%). This bias was caused mainly by our sampling method. We posted request for volunteers on the bulletin board of virtual communities, and the members voluntarily participated in the survey. Thus, we could not control participants' demographic. In order to check any influence of gender, we conducted ANOVA and the result revealed that gender made no difference in all constructs.

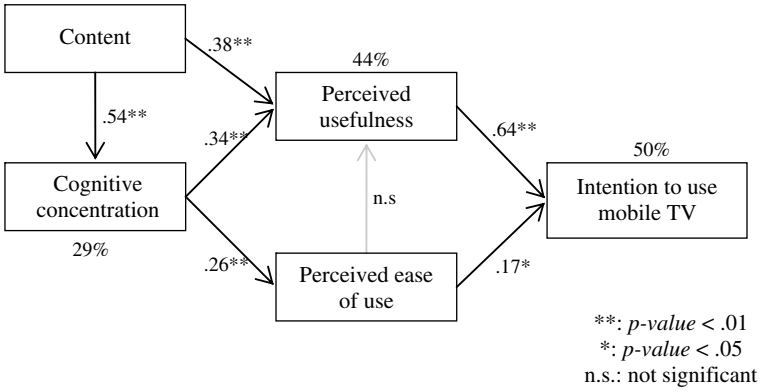

Fig. 2. The structural model.

The study did not include the entire components of flow experience which may encompass enjoyment, time reduction, telepresence, and so on. Taking into account other flow experiences may improve the acceptance model of IT. This study did not examined technological attributes, particularly a small screen which is considered the fatal disadvantage of mobile TV service. Future studies will be required to clarify the influence of a tiny screen on consumers' flow experiences. For this future study, vividness can be regarded as a potential variable. Vividness is defined as the degree of "the representational richness of a mediated environment as defined by its formal features" (Steuer, 1992). Although vividness has been not examined as a direct flow antecedent, it has been found to have an indirect influence on flow experience via telepresence (Hoffman & Novak, 1996). Another limitation of this study is the exclusion of the influence of personal attributes on flow experience. In fact, it is assumed that personal attributes significantly affect flow experience (Agarwal & Karahanna, 2000). We recommend other researchers to consider personal attributes (e.g., utilitarian vs. hedonistic) in examining flow experience. For more rigorous and practical implications, future research may use a multi-dimensional content construct. Although we defined content as an individual's assessment of three dimensions (i.e., timeliness, sufficiency and relevance) of information, we put three dimensions into a single factor or content. Future research may develop multi-items for each dimension, and then have two options: use content as the second-order factor, and separate content into three independent factors such as content-timeliness, content-sufficiency and content-relevance. While the former option provides more rigorous measurement of content, the latter option offers more practical implications (e.g., content-relevance has a greater influence on flow experience than the two other content-related factors; content-sufficiency has a greater influence on PU than the two other factors).

6. Concluding remarks

In this study, we aimed at improving the understanding of users' acceptance of mobile TV service which is considered entertainment-centric information technology. To this end, we incorporated cognitive concentration and the content aspect together with the TAM. The study showed that the TAM is still applicable in the context of hedonic information technology, and flow experience (cognitive concentration) and content can be significant components of an adoption model of this kind of information technology. Although many issues and questions can be addressed, this study has the overarching implication of inquiring consumers' acceptance of hedonic information technology which becomes a big piece of the field of information technology.

Acknowledgement

This work was supported in part by Grant NSF Grant Award No. 0426593.

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