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WILL MOBILE VIDEO BECOME THE KILLER APPLICATION FOR 3G? - AN EMPIRICAL MODEL FOR MEDIA CONVERGENCE

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Abstract

Mobile carriers have continually rolled out 3G mobile video applications to increase their revenue and profits. The presumption is that video is superior to the already successful SMS, ringtones, and pictures, and can create greater value to users. However, recent market surveys revealed contradicting results. Motivated by this discrepancy, we propose in this paper a parsimonious model for user acceptance of mobile entertainment as digital convergence. Integrating research on Information Systems, Flow, and Media Psychology, we take a unique approach to user acceptance of digital convergence – platform migration. Our key proposition is that the interaction between media types and the platform-specific constraints is the key determinant of user evaluation. Particularly, users' involvement in the media is determined by both the entertaining time span on the original platform and the attentional constraint of the new platform. The mismatch between the two spans can result in lower level involvement, which in turn cause no or even negative user emotional responses. The model was tested with empirical data. We discuss the theoretical contributions, strategic and design implications, and future research directions derived from this theoretical framework.

Key Words: Media Psychology, Platform Migration, Digital Convergence, Mobile Entertainment

Introduction

The advent of 3G mobile network provides more opportunities for mobile operators to increase their ARPU[1] and profits. Encouraged by the success of ringtones, pictures taken by camera phones, some analysts and operators believe that mobile videos for entertainment will be one promising candidate for 3G killer applications - "Watching video on cell phones could eventually easily surpass [demand for games, ringtones and wallpapers], to reach 100% of the population." (Olga 2005). Operators have spent billions to upgrade their infrastructure and launch a variety of mobile video contents, such as full-length movies, mobile-TV programs, and music videos (Reardon 2005). However, recent studies do question the mobile video hype. According to a survey conducted by RBC Capital Markets, about 75 percent of roughly 1,000 people polled said they had no interest in watching TV on their cell phones (Reardon 2006). Another study by In-Stat revealed that only one in eight respondents indicated they were interested in purchasing mobile video services from their wireless carrier, and two thirds of mobile phone subscribers are not yet ready for video services on their handsets (In-Stat 2005). This contradictory customer survey expectations challenge the huge investment of 3G suppliers.

User adoption of mobile applications has been examined by a number of Information Systems (IS) studies (e.g., Sharma and Deng 2002; Kim and Kim 2003). However, as will be discussed in next section, few of them have addressed the unique characteristics of mobile platform in digital convergence and the experiential aspect of mobile entertainment. Furthermore, most research in digital convergence is at the firm level and focusing on competing strategies and standardization (e.g., Yoffie 1997). This stream of research is short on the insights into end users' psychological process when evaluating the converged media. There is a niche to provide a theoretical framework to explain the contingency fit in putting video into mobile platform.

Therefore, the current research attempts to address the above theoretical gap so as to derive strategic insights into the business problem of mobile video. Using mobile entertainment[2] as the focal case, we take a platform-migration approach to the issue of media convergence and propose a theoretical framework from end users' perspective. Two major research questions are:

(1) What are the key factors that influence user preferences with media convergence, especially mobile entertainment?

(2) What is the role of platform migration in user evaluation of the converged entertainment media?

The rest of the paper is arranged as follows. Section II does a brief literature review and identifies the theoretical gap. Section III defines key constructs and proposes a theoretical model for user evaluation of mobile entertainment as media convergence. Empirical study is presented in Section IV. Our contributions to IS research and managerial implications are discussed in Section V. Finally, future research directions are suggested in Section VI.

Literature Review & Theoretical Foundations

Research on Mobile Application Adoption

IS research on Mobile Application Adoption is mainly based on theoretical frameworks such as Technology Acceptance Model (TAM) (e.g., Sharma and Deng 2002), Consumer Behavior Models such as risk perceptions and perceived value (e.g., Kim and Kim 2003), and Media Richness (e.g., Chen et al. 2002). For instance, Sharma and Deng (2002) replicated TAM in the case of PDA acceptance. Lu et al. (2004) extended TAM by considering the effects of social influence and personal innovativeness in wireless internet adoption. Kim and Kim (2003) studied post-adoption behavior of mobile internet users and find consumer perceived value and consumer type are two important factors besides other technology characteristics. Finally media richness was incorporated into existing

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[1] ARPU – Average Revenue Per User.

[2] In the current study we focus on linear media contents for mobile entertainment. By linearity we refer to the fact that end users cannot change or actively control the sequence of delivery of the content. Thus mobile gaming is not included in our study though our framework can be extended to accommodate it.

adoption models. Chen et al. (2002) found that media richness could increase user perceived playfulness, usefulness, and ease of use of Multimedia Messaging Services.

Although existing literature identified several important factors for mobile application adoption, such as consumer value, media richness, and playfulness, we find several limitations. First, research based on TAM or Consumer Behavior usually falls short of media richness in mobile contents and users' experiential / emotional response. On the other hand, media richness and playfulness alone cannot fully explain why video contents receive user resistance in the real world, considering the fact that video is richer and more enjoyable than SMS or MMS.

In this paper we propose that previous research neglected one important dimension of IT artifact – the platform and its constraint on user experience with the converged entertainment media. Based on this rationale and using mobile entertainment as the focal case, we build a theoretical framework that integrates research on media convergence, psychology of media entertainment, Human-Computer Interaction, and the platform-application dichotomy. Next we will briefly review relevant literature from these research streams.

Research on Digital Media Convergence

Digital convergence is generally described as a unification of the functions, and a coming together of the previously distinct digital technologies. Particularly, the last couple of decades have witnessed widespread digitization of information and content, increasing incorporation of digital technologies into the products of diverse industries, and often, an accompanying shift to using von-Neumann-like platform-based product architectures (Mentana and Sundrarajan 2003). One important development is the so-called Media Convergence, where content and services previously offered through various media will in the future be conveyed to a single artifact (Boczkowski and Ferris 2005). Research on digital convergence separates contents from their platforms like the von-Neumann-like platform-based product architectures or the single artifact. However, this stream of research focuses more on competing strategies for firms rather than further considering the characteristics of the platform and its role in user evaluation of media convergence (e.g., Yoffie 1997). Furthermore, no explicit definition of platform is available in this research.

The Platform-Application Dichotomy

A platform is a set of subsystems and interfaces that form a common structure from which a stream of derivative applications can be effectively developed and distributed (McGrath 1995). This reflects the widely-accepted metaphor of technology layering in which an IT artifact is a layered system in which technologies in the lower layer serve as the "platform" upon which technologies in the upper layer (i.e., "applications") function. For instance, the Wintel combination is the platform while Microsoft Word is the application with Word documents as the benefits. In the case of mobile entertainment, Video Call, TV Clips, Movie Trailers, are the applications while the network and mobile device with the embedded OS form the platform[3].

In digital convergence, applications are transferred (and maybe transformed) from the original (old) platform to a new one. For instance, a common 'platform' for a full-length movie can be a TV set at home together with the underlying TV broadcasting network, while a 3G movie service is based on the platform consisting of the mobile network, the mobile device and the associated usage context, etc. Thus from end users' perspective, digital convergence is essentially a 'platform-migration' to them.

Research on Experience of Flow and Psychology of Media Entertainment

The concept of IT experience has been widely examined in IS research. It is mainly defined and measured as either skill level or length and width of feature usage (e.g., Thompson et al. 1994). Recently the concept of user experience in HCI literature has been studied in the IS discipline, including the discussion of emotion, affect, and flow. The focus is still on how a user experiences a particular interface or technology. In the case of mobile entertainment, end users are consumers of contents with an emphasis of having a good time. Thus, users' attentional involvement and emotional response during the content delivery gain more weight than factors such as user skills or interface.

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[3] Platforms can be identified at different layers of the technology, we target at the physical device & network level.

The phenomenon of optimal experience has been accounted for by psychology research on flow (Csikszentmihalyi 1975). It refers to an experience of dynamic and wholistic involvement that occurs when an activity is optimally challenging, as reported by some rock climbers, chess players, and surgeons. Flow theory describes how enjoyment and involvement become salient qualities of experience when task demands match individual's current skills. Flow theory has been applied in the context of IT applications. For instance, Koufaris (2002) integrated flow theory and technology acceptance model to study online consumer behaviour. Ghani and Deshpande (1994) examined task characteristics and flow experience in human-computer interaction. Though the concept of flow can be applied to the experiential nature of entertainment media, its underlying mechanism is not – usually watching videos, learning to music, or reading novels do not put forth any significant challenge to one's skills.

Research on media psychology has a direct focus on the explanation of entertainment experiences. Particularly, two key concepts are related to our research. One is attentional involvement (Calvert 1994) that refers to perceptual focus on mediated information and the avoidance of stimuli that do not belong to the media offering, such as unrelated own cognitions or external cues that undermine the nonmediation experience, i.e., the phenomenon of audiences being "captured" by a medium. Particularly, Vorderer (1992) differentiates two levels of involvement: a distant, analytical way of witnessing the events presented by the medium (low involvement); and, in contrast, a fascinated, emotionally and cognitively engaged way of enjoying the presentation (high involvement).

Involvement acts as the antecedent to users' emotional response to the entertainment media, that is, enjoyment (Vorderer et al. 2004) - a "pleasant" experiential state that includes physiological, cognitive, and affective components. This state is also termed "pleasure" and considered as the "heart of media entertainment" (Vorderer et al., 2004). Bosshart and Macconi (1998) continued their dimensional analysis and subdivide pleasure into four sub-categories:

(1) pleasure of the senses, as in the use of physical abilities, or in the experience of motor and sensory activity;

(2) pleasure of the (ego-) emotions, as in evoking and experiencing emotions, or in mood-management;

(3) pleasure of personal wit and knowledge, as in the use of cognitive or intellectual powers or competence in being able to use one's wit; and

(4) pleasures of the (socio-) emotions, such as the ability to feel an emotion with and for others, to identify with others.

In the context of this paper, the second and fourth dimensions are the most relevant. Therefore, whether users can experience pleasant emotions – "having a good time" is the key determinant of their evaluation of the converged media – mobile entertainment.

Human-Computer Interaction Literature on Mobile Technology

HCI research recognized the attentional constraint of the mobile platform. For instance, Oulasvirta et al. (2005) discussed the fragmented nature of attentional resources in mobile HCI and pointed out that user interactions "on the move" usually happen in "bursts" like four to eight seconds. Also, users tend to shift their attention to environment several times during the delivery of content.

However, most of mobile entertainment applications, especially video and music, require a non-stop (i.e., linear) session to get users involved for the joyful experience – enjoyment. Thus, attentional constraints of the mobile platform can moderate user involvement and emotional response to the entertainment media. This is the key interaction we propose in our theoretical framework.

Hypotheses Development - A model for User Evaluation of Media Convergence

Building upon the theoretical foundations reviewed above, we propose a theoretical framework for user evaluation of media convergence – as mobile entertainment in the current research (See Figure 1). We already defined most of the key constructs in last section. So here we will focus on explaining the paths in the model.

Hypothesis 1 Emotional enjoyment determines user satisfaction with 3G Mobile Entertainment Services;

Emotional enjoyment is one dimension of hedonic value that users derive from their consumption experience (Hirschman and Holbrook 1982). Both utilitarian and hedonic values are found as important dimensions of

consumer attitude, which leads to purchase and usage behaviour (Voss et al. 2003). Furthermore, in some situations consumers may choose hedonic options over utilitarian alternatives of the same product category (Dhar and Wertenbroch 2000). Also, Hedonic outcomes are also found as a determinant of Home PC adoption (Venkatesh and Brown 2001). Given that enjoyment is the central component of entertainment experience (Vorderer et al. 2004), we propose that emotional enjoyment is the most important factor that influences user acceptance of mobile entertainment, as compared to other possible determinants, such as utilitarian outcomes, social influence, etc. In this paper we measure user acceptance by satisfaction. Satisfaction has been shown to be the key variable for IT continuance (e.g., Bhattacherjee, 2001). We use satisfaction as a measure of user acceptance after trial of mobile video services.

Hypothesis 2 User attentional involvement determines the level of enjoyment a user derives from the entertainment;

Again, this is an established relationship in media psychology. Involvement is a key prerequisite to the occurrence of entertainment experience (enjoyment). It captures the user's sense of being there, that is, of being transported to the site of the action, actually being there along with those who participate in the action while actually facing a screen. Enjoyment can thus be derived from this sensation of nonmediation (Biocca, 2001; Lee, 2004).

Hypothesis 3 Different media content types create different levels of attentional involvement to users when viewed on their original platforms;

We take a broad approach to media content types. E-books, e-mail, online news, music, and videos are all different types of media. While learning to music may only require relatively lower attentional involvement, watching a movie demand more cognitive resources. In this paper, we categorize entertainment media based on the time span of attentional involvement they create for end users, i.e., the duration of a video clip. For instance, a full-length movie watched in theater has an involvement span of 100 minutes on average; a movie trailer of 90 seconds, a video music of 5 minutes, a TV program of 30 minutes, and a novel of the time for reading one chapter (and maybe more). According to research on psychology of entertainment (e.g., Vorderer et al., 2004), when movies are viewed in theatres, TV viewed at home, or novels read in a quiet place, attentional involvement can be achieved for an optimal time span. Because of the phenomenon of attentional inertia, longer videos tend to get users more involved and reduce distractibility among viewers (Calvert 1994). Thus longer videos will create greater attentional involvement.

We focus on the duration of content in this paper because it is most relevant to 3G video services and the attentional constraint of the mobile platform.

Hypothesis 4 In digital convergence, the attributes of the new platform constraint the level and span of user attentional involvement;

This path is the key component of our theoretical model. The platform-specific constraint on attention may be caused by:

(1) Usage Context, e.g., the mobile context with many interruptions and / or distractions;

(2) Prior Usage Pattern with other applications, e.g., always making short voice calls with a mobile phone, or reading entertainment news with photos, and

(3) User Interface, e.g., the small form of mobile platforms, media player interface.

As found in Mobile HCI literature, end users usually cannot concentrate on the content for long due to the above reasons. However, time is needed to create the optimal level of involvement so that enjoyment can be felt by end users. Consider the following user comments on Music Video[4]:

"*I downloaded a music video yesterday to a Vodafone 3G mobile phone. The quality of the sound was fine. The image, given the small screen size, was adequate. But watching the video in my outstreched hand while a crowd gathered around, I found myself losing interest after about 40 seconds.*

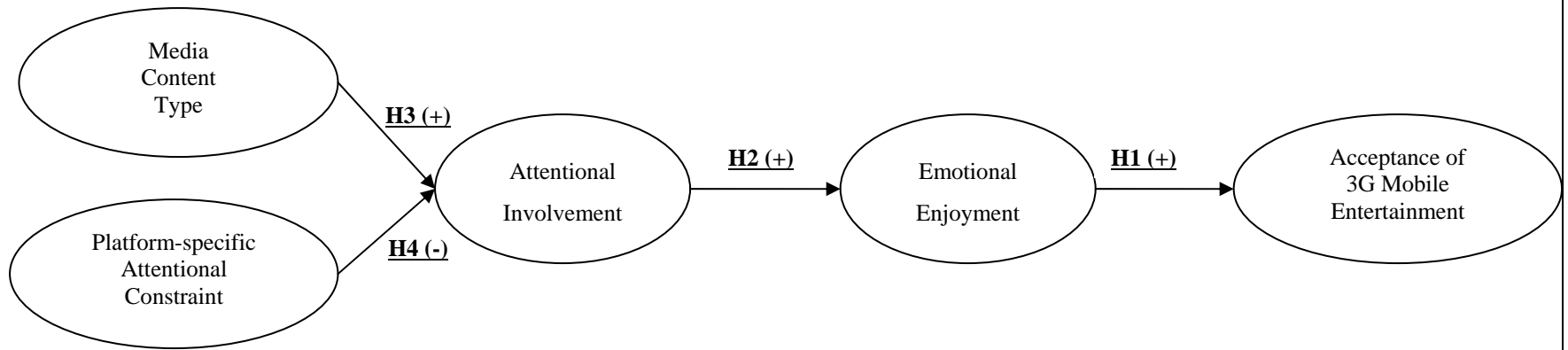---

[4] Hhttp://blogs.smh.com.au/entertainment/archives//003536.htmlH

Figure 1 A Theoretical Model for User Acceptance of Mobile Entertainment as Digital Convergence

In the end I couldn't bring myself to watch all three minutes of the video - besides sending me cross-eyed, it was annoying to stand there staring at the tiny screen. Does anyone actually enjoy watching music and television clips on small portable screens?"

This description illustrates that, though the quality of the converged content is acceptable as compared to the one on its original platform, the attentional constraint of the mobile platform (the usage context - a crowd gathered around; and the small form factor of user interface – the tiny screen) decreases the involvement level (the outstreched hand & being cross-eyed), which leads to less or even no enjoyment (losing interests in 40 seconds). This comment, though anecdotal, illustrates that sometimes a content that is entertaining on its original platform may sometimes lead to negative feelings or experiences among users (being annoyed).

In the case of 3G mobile video services, while longer movie or TV clips are introduced recently to offer greater entertainment, the attributes of mobile platform, through attentional involvement, may decrease the enjoyment users derive from the contents, even to a negative level. This in turn lowers user satisfaction with the mobile video services. Therefore, we derive the following hypotheses in the case of mobile video services:

Hypothesis 4a Attentional involvement, enjoyment, and satisfaction on the mobile platform will be lower than that on the PC platform;

Method and results

Experiment with within-subject design was employed for a preliminary test of the model. We performed manipulations of Platform (Mobile Phone vs. Desktop) and Duration (2 mins vs. 5 mins). The context of mobile platform was simulated by users' holding a mobile phone in a moving vehicle with views and noises from outside. The desktop platform is simulated by a media player on Windows Desktop. For either platform, we also simulated three Interruption Levels– No Interruption, Silent Interruption (SMS vs. MSN message alerts), and Active Interruption (incoming phone call). All manipulations are depicted in Figure 2 below.

	Mobile Context			Desktop Context		
Time Dur.	Interruption		No Interruption	Interruption		No Interruption
	Active	Silent		Active	Silent	
Long						
Short						
Figure 2 Experiment Design with Manipulations						

A total of 32 college students were recruited for the experiment. The average age is 21. 7 subjects are male and 25 are female students. Subjects were randomly assigned to two groups. Group 1 viewed movie clips in a simulated context of mobile phone first, and then moved on to the desktop context. The order was reversed for Group 2. Three complete movies are offered for subjects' choice. Each movie was cut continuously into clips of either 5 minutes or 2 minutes. Interruptions were inserted in the middle of each clip. After viewing each clip, attentional involvement and enjoyment were measured by semantic scales. Behavioural intention was measured for each platform. Each subject viewed 3 long clips (5 mins) and 3 short clips (2 mins) on either platform. Thus totally 12 clips were viewed. The arrangement of the experiment is outlined in Table 1.

All measurement scales are adapted from existing literature (Appendix A). The psychometric properties of the scales, descriptive statistics, and correlations for the initial test and cross-validation are shown in Tables 3 and 4. Since we have multiple rounds of measurement, we pooled all items scores together and obtained the statistics. All standardized factor loadings are significant and above 0.70 (Comrey 1973; Fornell and Bookstein 1982), indicating excellent convergent validity. Composite reliabilities were exceeding the 0.70 cutoff which is considered as the minimum acceptable level (Gefen et al. 2000). The average variances extracted (AVEs) are all above the recommended 0.50 level (Hair et al. 1998), which means that more than one-half of the variance observed in the items was accounted for by their hypothesized constructs. Discriminant validity was assessed by comparing AVEs with correlations among latent variables (Fornell and Larcker 1981). All correlations were lower than the corresponding AVEs, thus supporting discriminant validity.

Table 1 Experiment Schedule				
	Group 1		Group 2	
Step #	Step	Time Dur.	Step	Time Dur.
1	Briefing	5:00	Briefing	5:00
2	Mobile: 3 Long Clips + Measurement	3 * (5+1) = 18:00	Desktop: 3 Short Clips + Measurement	3 * (5+1) = 18:00
3	Mobile: 3 Short Clips + Measurement	3* (2+1)= 9:00	Desktop: 3 Long Clips + Measurement	3* (2+1)= 9:00
4	Refreshment	1:00	Refreshment	1:00
5	Desktop: 3 Long Clips + Measurement	3 * (5+1) = 18:00	Mobile: 3 Short Clips + Measurement	3 * (5+1) = 18:00
6	Desktop: 3 Short Clips + Measurement	3* (2+1)= 9:00	Mobile: 3 Long Clips + Measurement	3* (2+1)= 9:00
7	DeBriefing	5:00	DeBriefing	5:00
Total	7 Steps	65:00	7 Steps	65:00

Table 2 Measurement Properties - Items					
Construct	Items	Mean	Standard Deviation	Composite reliability	Standardized factor loading
Satisfaction	SAT1	4.10	1.57	.91	.92
	SAT2	4.09	1.79		.91
	SAT3	4.03	1.56		.87
	SAT4	4.12	1.63		.88
Perceived Enjoyment	PE1	4.08	1.38	.91	.92
	PE2	4.03	1.34		.84
	PE3	4.06	1.48		.99
	PE4	4.09	1.29		.84
Attentional Involvement	AI1	4.03	1.39	.93	.90
	AI2	4.06	1.38		.91
	AI3	4.17	1.53		.94
	AI4	4.07	1.46		.87

Table 3 Measurement Properties - Constructs					
	Mean	S.D.	SAT	PE	AI
Satisfaction	4.05	1.51	(0.81)		
Perceived Enjoyment	4.04	1.36	0.68	(0.82)	
Attentional Involvement	4.10	1.41	0.79	0.80	(0.88)

Note: Off-diagonal values are correlations while on-diagonal values are AVEs.

To test our hypotheses, we first established the relationships in H1 and H2 for either platform (Mobile vs. PC). PLS was employed to generate the path coefficients. For H3, H4, and H4a, one-sided paired t-tests were preformed considering the within-subject design of our experiment. The path diagrams for both platforms are show in Figure 3. Results for one-sided paired t-tests of all manipulation effects - are shown in Table 4 and Table 5.

H1 and H2 were supported by the significant path coefficients in Figure 3. Attentional involvement explained about 60% of the variance of enjoyment from viewing movies on the mobile platform, which in turn determined the level of user satisfaction. Similar results were discovered in the case of the desktop platform.

We now turn to results for our two key hypotheses – although longer video clips such as movie may increase user enjoyment, the attentional constraint of the new platform (mobile) may decrease it even to a negative level. As show in Table 4 and Table 5, H3, H4, and H4a were partly supported.

Overall H3 was not supported. The effect of duration on attentional involvement was not significant on either platform. Its effect on enjoyment is only marginal significant on the mobile platform, indicating that under distraction, longer video clips tend to produce slightly greater pleasure than the quiet environment. This marginal significance may be artificially caused by our manipulation – the longer clips lasted about 5 minutes, which may not be discernable from the clips of 2 minutes on the either platform. Thus further empirical evidence is needed to confirm our findings.

H4 and H4a were supported. All overall differences between platforms – attention, enjoyment, and satisfaction – were significant at the 0.05 level. Particularly, average scores of all three constructs on the mobile platform changed from greater than four on the desktop platform to less than four on the mobile platform, showing a significant change from positive feelings to negative ones when the same media is transferred from original platform to a new one with strong attentional constraint.

When interruption levels were considered, our results also show some interesting findings. When there were only distractions from the background (No Interruption), subjects can still have positive experiences from long clips on the mobile platform, but not from the short clips. This may also indicate that by the mechanism of attention inertia, short-clip viewers may lose concentration more easily than long-clip viewers, which needs further theoretical and empirical support.

Table 4 Mean Levels of Satisfaction & Enjoyment						
Plat.	Mobile Platform		Desktop Platform		Plat. Effect	
Satisfaction	3.48		4.13		**	
Enjoyment	3.76		4.20		**	
Plat.*Dur.	Mobile Platform		Desktop Platform		Plat. Effect	
Long	3.89		4.26		*	
Short	3.64		4.14		*	
Dur. Effect	*		n.s.			
Plat.*Dur.*Int.	Mobile Platform			Desktop Platform		
	Interruption		No Int.	Interruption		No Int.
	Active	Silent		Active	Silent	
Long	3.46	3.86	4.34	3.95	4.29	4.55
Short	3.70	3.71	3.50	3.91	4.10	4.41
Dur. Effect	n.s.	n.s.	***	n.s.	n.s.	n.s.
Plat. Effect - S				**	*	n.s.
Plat. Effect - L				n.s.	n.s.	***

Notes:

Plat. ~ Platform:	Mobile vs. Desktop;
Dur. ~ Duration:	2 minutes vs. 5 minutes;
Int. ~ Interruption:	Active vs. Silent vs. No Interruption;

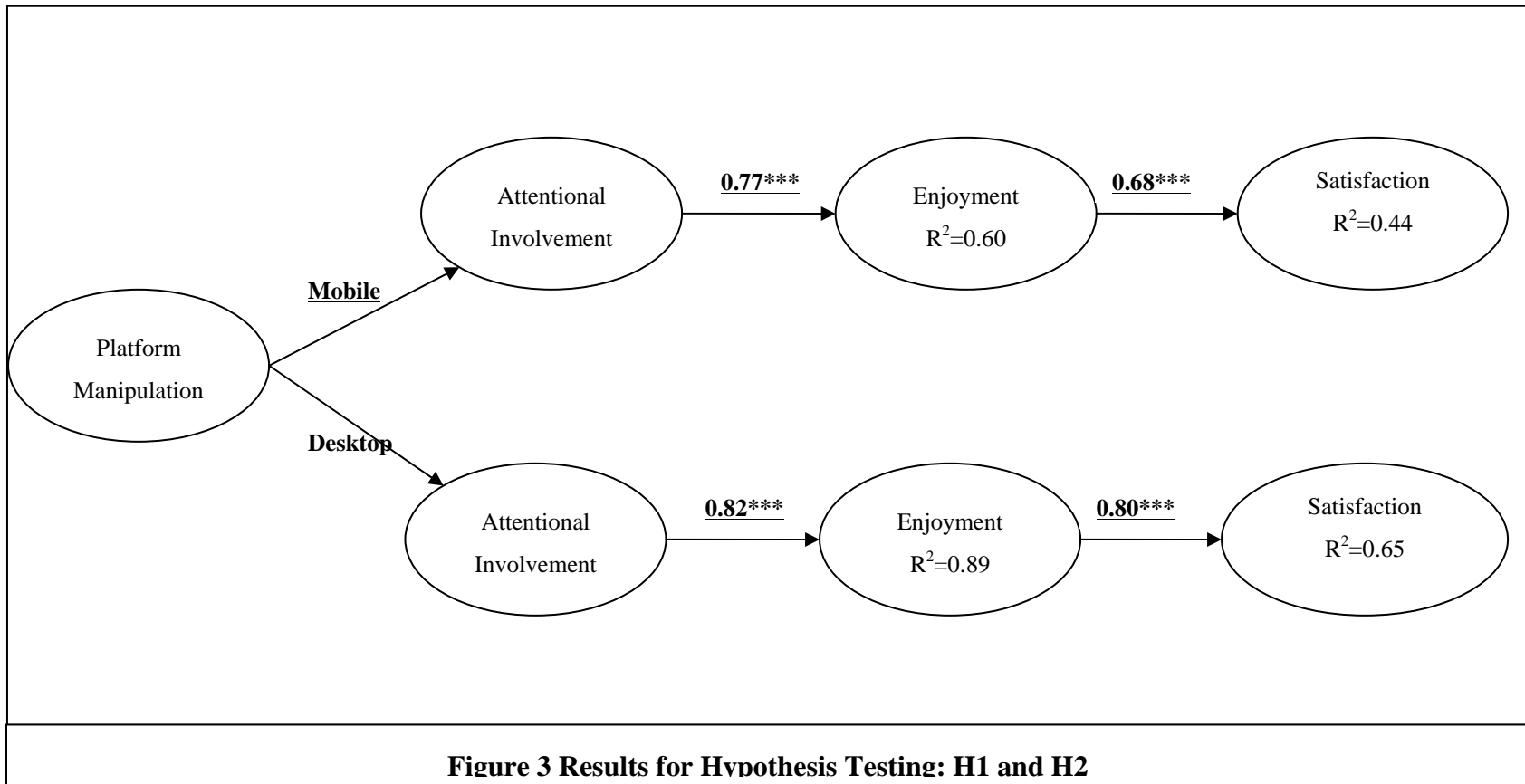* ~ P-Value< 0.10; ** ~ P-Value< 0.05; *** ~ P-Value< 0.01.

Figure 3 Results for Hypothesis Testing: H1 and H2

Table 5 Mean Levels of Attentional Involvement					
Plat.	Mobile Platform		Desktop Platform		Plat. Effect
Attention	3.89		4.49		***
Plat.*Dur.	**Mobile Platform**		**Desktop Platform**		**Plat. Effect**
Long	3.90		4.53		***
Short	3.87		4.44		**
Dur. Effect	n.s.		n.s.		Interaction: n.s.

Plat.*Dur.*Int.	Mobile Platform			Desktop Platform		
	Interruption		No Int.	Interruption		No Int.
	Active	Silent		Active	Silent	
Long	3.59	3.85	4.27	4.36	4.55	4.70
Short	3.78	3.84	3.98	4.29	4.31	4.71
Dur. Effect	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Plat. Effect - S				***	***	*
Plat. Effect - L				*	*	**

Notes:

Plat. ~ Platform: Mobile vs. Desktop;
Dur. ~ Duration: 2 minutes vs. 5 minutes;
Int. ~ Interruption: Active vs. Silent vs. No Interruption;

* ~ P-Value< 0.10; ** ~ P-Value< 0.05; *** ~ P-Value< 0.01.

Discussion

In this paper we propose and empirically test a parsimonious model for user acceptance of mobile entertainment as digital convergence. Integrating research on Information Systems and theories of Media Psychology, we take a unique approach to user acceptance of digital convergence – platform migration. Our key proposition is that the interaction between media types and the platform-specific constraints as the key determinant of user evaluation. Particularly, we hypothesize that users' attentional involvement in the media is determined by both the entertaining time span on the original platform and the attentional constraint of the new platform. The mismatch between the two can result in even negative user experience.

The empirical results support most of our hypotheses. Some key findings are:

1) attentional involvement is a key determinant of enjoyment in either platform, which in turn determines user acceptance;

2) in the case of media convergence, the attentional constraint of the target platform (mobile) can significantly influence user experience (attention and enjoyment) during content delivery, which may leads to rejection of the services (satisfaction less than 4 in the semantic scale);

3) the duration of the content, such as video clips, may interacts with both platform constraint and interruptions in determining usage experience, which is open to further research.

Theoretical Contributions

We contribute to the literature on digital convergence by emphasizing the demand side. Taking end users' perspective, we show that the success of any digital convergence ultimately depends on if the converged media can create value to end users. Thus end user evaluation can be the key factor for devising competing strategies for digital convergence.

We enrich IS research on technology adoption with two contributions. First, examine user acceptance of a particular type of IT artifact – the converged media and unfold it into two layers, i.e., applications and platforms. We also theorize their interaction in the case of media entertainment. This approach sheds new insights into the psychological process of end user evaluation of digital convergence. Secondly, we study the experiential aspect of IT. Previous IS research defined and measured IT experience mainly as a skill, length of usage, or width of feature usage. We go deep into the course of usage process and propose that user involvement as a key determinant of their emotional response.

Technology acceptance model was found to be one of the dominant models in IS research. It is no wonder why in the study of new applications in the mobile context, technology acceptance model was also widely adopted. However, as we pointed out in the literature review section, the two core determinants in the technology acceptance model fall short of explaining power for user evaluation of mobile entertainment. In our study, we empirically tested our model framework using enjoyment and satisfaction to predict 3G mobile entertainment acceptance. Enjoyment has been one of the constructs in prior information technology acceptance frameworks; however, this core construct has been less studied as a mediator except for research on flow experience. Our model integrates research on IS and HCI, Media Psychology, and Platform that may leads to a new stream of work and possibilities of more future studies in the area.

Practical Contributions - Strategic and Design Implications

Digital Convergence is a pervasive phenomenon in the ICT industry (Yoffie 1997). In the mobile computing and communication sector, this issue is of paramount importance because it involves huge amount of investment on infrastructure and the survival and growth of business facing declining ARPU. Our research provides both strategic and design implications for players in the mobile value chain, especially for content integrators (e.g., mobile carriers) and content developers.

Mobile carriers currently transmit video over the same network that transmits calls. These include bits and pieces of news, movie trailers, programs from popular TV channels, and full-length movies. Our findings suggest that they seem to fall into another trap of "providing more is better." It is therefore more important to wisely allocate the R&D investment onto the most appropriate area, instead of adopting a media convergence strategy that "provides everything elsewhere to the mobile subscribers".

Our model also suggests that system designers should pay more attention to user experience during content / information delivery. It is not enough to design an elegant user interface and to provide as much functionalities as possible. How to facilitate users' processing of information and contents should be another important factor. Users are also concerned about the process of information delivery, how they like the process, and how deeply involved they can be in the process, especially when they face media transferred from another platform.

We summarize below three key action points for practitioners to achieve optimal media convergence:

 (1) Careful Selection of Existing Media for Convergence

To answer the question of "what are the right media that business players should choose for their convergence strategy", practitioners should follow the basic principle of selecting entertainment contents that fit the attentional constraints of the new platform. Recently some mobile carriers have announced the introduction of full-length movies and long TV programs as new services. Our model cast doubts on the success of these initiatives because most mobile users cannot concentrate as long as the movie or TV program goes. The only possible outcome for users who try these services will be frustrated as described in the case of Video Music. In contrast, contents that can create arousal in a short burst may be more acceptable to mobile users, for instance, movie trailers, and short clips for exiting moment of sport events like goals in football or a fantastic round of tennis (as users can see clearly the scenes with 3G technology).

(2) Transformation of Existing Media for Optimal User Experience

Content developers may take into account the attentional constrains of the mobile platform when they design their offerings. Some design tactics have already been suggested by HCI researchers (e.g., Oulasvirta et al. 2005). For example, chopping contents into short clips and providing more controls during the content delivery, such as postponing, delaying, restarting, interrupting. However, the transformation must be done with the goal of user enjoyment. For instance, although movies can be chopped into short clips by 5 minutes to fit the short attention span, this may not lead to optimal user experience. The reason is that movies are edited by natural scenes as represented by changes of camera angle or changes of context / time. Naïve and simple segmenting may break the

flow of these scenes, which results in negative user experience. Instead, movies should be cut into clips of short but also variable length based on film editing principles.

(3) Design for the New Platform

Finally, practitioners can also consider offering new forms of contents that are "made for mobile". These forms of entertainment are designed from the very beginning to fit the new platform. For instance, recently Vodafone launched "24: Conspiracy", a new made-for-mobile drama inspired by the blockbuster Fox TV series "24". These "mobisodes" consist of a series of one-minute video clips that will evolve its own style, its own stars and possibly award categories in acting, writing, directing and editing. As the original '24' fills each 60-minute episode with a precise hour of action, so '24: CONSPIRACY' fills each 60 second mobisode with a parallel slice of cliff-hanging narrative[5].

Limitations and Future Research Directions

There are two major limitations of the current study with within-subject experiment design.

First, we invited undergraduate students to participate in the experiment. This may limit the generalizability of the results to the general consumer group of mobile entertainment. However, considering the fact that most mobile entertainment users are teenagers and younger people, our sample is still representative.

Secondly, we would like to test the effect of the various media content types such as music, video, and multimedia message. However, due to the time pressure, we only focused on movie clips in the current study. Also, the variety of mobile device configurations, such as screen size, may also be an important factor. Future research is needed in this aspect.

This paper focuses on mobile entertainment and use 3G video as an anecdotal case. In future research, our theoretical framework can be readily extended to the general digital convergence, i.e., other types of media and applications such as nonlinear and interactive media - video phone call, gaming, etc. This extension can be simply achieved by include all the dimensions of pleasure to the enjoyment construct. For instance, the social emotional response corresponds to video communications, while the pleasure from using wits can represents enjoyment from playing games.

However, our model still needs to be further tested by more empirical studies. Case studies and focus group discussions are appropriate as the first step for gathering in-depth knowledge about "what constitutes good or ideal media convergence" and for validating our framework by mapping it to the cases. Well designed empirical studies, both surveys and experiments, can be implemented with richer content types (e.g., music vs. video music) to fully test our propositions. Most constructs in the model can be readily operationalized by either psychometric method (e.g., Likert scales) or neurological method (e.g., heart rates). These require future work in the area.

Finally, our framework focuses on the experiential constraint aspect of the platform, but neglects the positive side – benefits provided by the new platform (e.g., mobility). Whether and when users make trade-off between the benefits and the constraints need further theorizing work. Another theoretical expansion is to consider the segmentation of end users. As suggested by Linda Stone, "continuous partial attention" is a common character of post-multitasking users who tend to shift their attention to the environment several times during the delivery of the content. Therefore, users accustomised to a work environment where attention continuously switches between the mobile device and the environment may find it easier to adopt or accept the interruptions associated with mobile entertainment. Users unaccustomised to such environments, on the other hand, may find it extremely frustrating and hence forgo the use of mobile entertainment media altogether[6].

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[5] Hhttp://www.3gnewsroom.com/3g_news/jan_05/news_5414.shtmlH.

[6] Hhttp://radar.oreilly.com/archives/2005/06/supernova_2005_2.htmlH.

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Appendix A – Measurement Scales

1. Perceived Enjoyment (Ghani and Deshpande 1994)

Please describe your feelings about usage experience when watching the previous 6 movie clips:

(1) Interesting	_1_:_2_:_3_:_4_:_5_:_6:_7_	Uninteresting
(2) Fun	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not Fun
(3) Exciting	_1_:_2_:_3_:_4_:_5_:_6:_7_	Dull
(4) Enjoyable	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not Enjoyable

2. Attentional Involvement (Ghani and Deshpande 1994)

(1) I am Deeply Engrossed	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not Deeply Engrossed
(2) I am Absorbed Intensely	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not Absorbed Intensely
(3) My attention is focused	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not focused
(4) I concentrate Fully	_1_:_2_:_3_:_4_:_5_:_6:_7_	Not Fully

3. Satisfaction (Bhattacherjee 2001)

Please describe your overall satisfaction when watching the previous 6 movie clips:

(1) Very Dissatisfied	_1_:_2_:_3_:_4_:_5_:_6:_7_	Very Satisfied
(2) Very Displeased	_1_:_2_:_3_:_4_:_5_:_6:_7_	Very Pleased
(3) Very Frustrated	_1_:_2_:_3_:_4_:_5_:_6:_7_	Very Contented
(4) Terrible	_1_:_2_:_3_:_4_:_5_:_6:_7_	Very Delighted