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EFFECTS OF MULTIMEDIA ON MOBILE CONSUMER BEHAVIOR: AN EMPIRICAL STUDY OF LOCATION-AWARE ADVERTISING

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Abstract

Location-aware advertising is widely touted as the “killer-app” for mobile commerce to flourish. With the imminent rollout of third-generation mobile networks, advances in multimedia-enabled mobile devices and positioning technologies, its commercial viability is enormous. Location-aware advertising is primarily text-based at the present, but it is envisioned to allow the delivery of multimedia advertisements to geographically targeted consumers. This exploratory study empirically examines the effects of multimedia on consumer behavior in a simulated mobile commerce environment. A structural model was formulated to test the effects of multimedia on entertainment, informativeness, and irritation in the context of location-aware advertising. The results show that multimedia location-aware advertising messages lead to more favorable attitudes and increase the intention to reuse the mobile advertising service. Evidence also suggests that multimedia has a significant impact on purchase behavior.

Keywords: Mobile commerce, location-aware advertising, multimedia, consumer behavior

Introduction

Advertising plays a pivotal role in commercial activities and has undergone tremendous evolution from printed media and telephone to broadcasting media such as radio and television. With the widespread diffusion of personal computers and the ubiquity of the Internet, advertisers are further endowed with unprecedented opportunities to leverage on the reach and multiple addressing capabilities of these technologies. Traditional advertisers and early Internet advertisers have largely used the media as a channel for mass communication. However, in recent years, marketers have begun to regard direct marketing as being a more profitable approach (Nowak and Phelps 1997). Consequently, there is a trend toward using more personalized one-to-one relationship marketing with the aid of database technologies and Web-based “cookies” to gather more information about the consumers in order to deliver more relevant and higher impact advertising messages (Macavinta 2000).

Over the past few years, the development of mobile communication and positioning technologies has presented advertisers with a radically new form of advertising channel: location-aware advertising (LAA). Location-aware advertising involves the provision of advertising messages to cellular subscribers based on their location. Wireless as a channel for advertising possesses unique characteristics unavailable in traditional and electronic media. It opens up an innovative conduit to deliver advertisements, promotions, coupons, and other offers that are uniquely customized to an individual’s tastes, geographical location, and time of day (Xu et al. 2003). With LAA, advertisers could reach consumers when they are most likely to make a purchase and deliver advertising messages contextually through the media on a geographically targeted basis. Analysts predict that location-aware advertising messages are expected to create 5 to 10 times higher click-through rates compared to Internet advertising messages (Ververidis and Polyzos 2002).

Despite the vast opportunities offered by location-aware advertising, many merchants and consumers are still skeptical about the idea. Besides the overarching concerns of location information privacy, another important impeding factor is the effectiveness of the mobile media. Compared to TV and Internet media, mobile devices lack ability to transmit or receive rich multimedia content because they are constrained by the bandwidth of communication networks. In addition, the limited “screen-estate” and the fact that the current generation of mobile devices are mostly monochrome have inhibited the growth of LAA. In the foreseeable future, network bandwidth will increase greatly with the imminent rollout of third-generation mobile networks that support transmission rate of up to 2Mbps. Furthermore, with the increasing rate diffusion of multimedia-enabled mobile phones with a larger colored screen and increased memory and storage capacity, the commercial prospects for location-aware advertisements to be as rich in content and presentation as traditional and Internet advertisements seem very promising.

Research into mobile commerce is still in its infancy stage and the state of empirical research into the use of mobile technologies has generally lagged behind the technological development. While we are increasingly seeing research attempts to look into mobile device adoption and information privacy, we found that, to the best of our knowledge, no research has been done to empirically examine the effectiveness of different content types that could be delivered to mobile devices in the context of advertising. The aim of this research is to examine the differential effects of text and multimedia advertising content types on mobile consumer behavior in terms of intention to reuse the service as well as product purchase intention. The findings of this research will significantly advance our understanding of the potential of location-aware advertising as a type of mobile commerce application.

Overview of Location-Aware Advertising

Technologies Enabling Location-Aware Advertising

Mobile applications can be delivered over different underlying technologies such as wireless application protocol, general packet radio service, or short messaging service (SMS). Currently, location-aware advertising is carried out mainly using SMS (Kölmel and Alexakis 2002), which is limited to 160 text characters. The increasing mobile phone penetration and high SMS usage in many countries are great market drivers for mobile commerce. In a survey of 200 European direct marketers, 21 percent of respondents had used SMS marketing (Poropudas 2002). Seeing the growth of SMS-based marketing, marketers seem to be convinced that there is a business case for multimedia messaging service (MMS), which can be multimedia enhancements of existing SMS offerings. In fact, many telecommunication operators are already offering MMS over so called 2.5G networks such as general packet radio service.

Permission-Based Advertising

Location-based advertising could take the form of *pull-based* (users request information and services based on their locations) or *push-based* (location-sensitive content is automatically sent to users based on their location) (Wallace et al. 2002). Invasion of consumers’ privacy is a prime concern, especially for push-based location advertising since consumers are wary of being tracked whenever and wherever they are, or being spammed with mobile ads (Barwise and Strong 2002). Permission-based possibilities increase the consumers’ confidence with LAA because they are allowed to signal their readiness for receiving advertising messages and disallowed unauthorized spamming or unsolicited push messages. One LAA application with huge commercial potential is the mobile coupon (m-coupon) service. M-coupon service involves recruiting customers by service registration and interest subscription: customers are asked to register their mobile phone numbers by subscribing from a list of merchants who provide m-coupon services, based on their interests and preferred period of time for receiving m-coupons. The profiling information is then used to target the subscribers and they are sent related advertisements when they are within the vicinity of the merchants. The consumers can then bring their phone to the stores and redeem the coupons.

Conceptual Foundations and Hypotheses

Impact on Mobile Consumer Behavior

The study of online consumer behavior in the context of the Internet has mainly focused on the two key aspects of intention to return to a Web site and purchase intention (Koufaris 2002; Li and Zhang 2002). These behaviors, which comprise one’s action

tendencies, can be considered as conative effects of advertising. The hierarchy of advertising effects model suggests that a consumer will go through a sequence of mental stages sequentially from cognitive, to affective, to conative, closely following the typical attitude structure components (Ray 1973).

Attitude toward advertising can be defined as the predisposition to respond in a favorable or unfavorable manner to a particular advertising stimulus during a particular exposure situation (Mackenzie et al. 1986). Extant literature on information technology adoption and usage along the line of the theory of reasoned action (Fishbein and Ajzen 1975) provides ample empirical support that users' positive attitude toward a technology will increase their intention to use or reuse the technology. Recent research has further affirmed that these findings are also applicable to mobile technologies and services (Perdersen 2003). Therefore, consumers' attitude toward location-aware advertising is likely to be positively related to intention to reuse the service. Hence, we hypothesize:

H1: Attitude toward location-aware advertising is positively related to intention to reuse.

Previous advertising research has shown that attitude toward advertising is a good indicator of advertising effectiveness. Shimp (1981) and Mackenzie et al. (1986) reported that attitude toward advertising is a useful construct that contributes to explaining the effects of advertising exposure upon consumer brand beliefs, brand attitude, and purchase intentions. Brown and Stayman (1992) also suggested a substantial and significant relationship between attitude toward ad and purchase intention. Li and Zhang (2002) have likewise highlighted the existence of this positive interrelationship in much of the online shopping empirical research. Hence, we hypothesize:

H2: Attitude toward location-aware advertising is positively related to purchase intention.

Attitude and Contributing Factors

Rosenberg (1960) suggested that changes in the affective component of attitude can create continuing parallel changes in the cognitive component. He pointed out that the cognitive component can be measured with perceived value. Furthermore, strong positive affect toward a given object should be associated with beliefs that it leads to the attainment of a number of important values. Value is defined as conceptions of the desirable means and ends of action (Oskamp 1991). It is believed to be a key determinant of attitude because once a value has been internalized, it becomes a criterion for developing and maintaining attitude toward relevant objects and situations (Rokeach 1972). Hence, we hypothesize:

H3: Higher assessment of value should result in more favorable attitude toward location-aware advertising.

The value of location-aware advertising measures the cognitive components of our research model. We adapted Ducoffe's (1996) advertising value model to measure the value of location-aware advertising. We posited that the antecedents that constitute consumers' value of LAA are entertainment, informativeness, and irritation. Entertainment refers to the ability to arouse aesthetic enjoyment. Informativeness refers to the ability to effectively provide relevant information. Irritation refers to any offending effects that may go against what a user values.

For location-aware advertising, the use of multimedia in addition to text can provide a certain level of entertainment and enjoyment. LAA advertising messages could include a picture annotated with text, audio clip, or even video clip. Affective components such as entertainment and satisfaction have been found to contribute to attitude formation both directly and indirectly via influencing cognitive value (Ducoffe 1996; Rosenberg 1960; Teo et al. 2003). Hence, we hypothesize:

H4: Higher level of entertainment should result in more favorable attitude toward location-aware advertising.

H5a: Higher level of entertainment should result in higher assessment of the value of location-aware advertising.

By matching the information on personal preferences provided by the consumers with their location information, LAA is able to provide consumers with personalized and location-sensitive advertising messages. The increased relevance and timeliness of

the advertising message will assist the consumer in making a better purchase decision and consequently perceiving LAA to be valuable. Hence, we hypothesize:

H5b: Higher level of informativeness should result in higher assessment of the value of location-aware advertising.

Irritations in location-aware advertising could arise when the consumer receives spam messages or finds the message annoying. Another source of irritation could come from the difficulties experienced in accessing the advertising message through the channel of delivery. Thus, such perceived irritations will likely reduce the value assessment of location-aware advertising. Hence, we hypothesize:

H5c: Higher level of irritation should result in lower assessment of the value of location-aware advertising.

Advertising Content Type

Multimedia content tends to be more engaging as it can impact on a number of senses concurrently. The positive effects of multimedia in making learning more entertaining have gained empirical support in the field of education (Bagui 1998). In the context of LAA, multimedia-enhanced MMS with its ability to include both text and graphical content will certainly be able to provide more vivid information about the product compared to text-based SMS. As previously attested in multimedia learning research, multimedia mobile advertisements will also likely increase the enjoyment and excitement factor compared to plain-text mobile advertisements. This is especially the case for a novel mobile service such as MMS. Hence, we hypothesize:

H6a: MMS advertising should result in greater entertainment compared to SMS advertising.

Multimedia elements such as color and graphics are found to significantly affect the outcomes of organizational information processing and advertising. Graphical and colored representation of information improve decision making (Benbasat and Dexter 1986). Furthermore, Lim et al. (2000) reported that multimedia is a more powerful means than text for affecting attitudes and judgments since multimedia has two unique characteristics, namely rich language and complementary cues. Simultaneous presentation of congruent information in different modalities such as picture with text has also been illustrated to lead to better retention and retrieval (Levie and Lentz 1982; Wetzel et al. 1994). It is thought that multiple representations of an object or event will increase the number of possible links between existing knowledge and information to be stored, thus leading to better retention in long-term memory. In advertising context, Fernandez and Rosen (2000) showed that advertisements with color were more likely to attract attention and improve product appeal. Similarly, Lohse and Rosen (2001) also found significant effects of color and graphics in enhancing informativeness and leading to favorable evaluation of the advertising medium. Hence, we hypothesize:

H6b: MMS advertising should result in greater informativeness compared to SMS advertising.

Advertising researchers have devoted much attention to the study of irritation arising from advertisements such as TV commercials and Web pop-up advertisements. For the case of permission-based location-aware advertisements, the level of irritation should be rather low since messages are delivered with the receiver's prior consent. However, the penetration of MMS-enabled phones at the present is still very low compared to SMS-enabled phones. Hence, consumers without an MMS-enabled phone will need to access their MMS messages through a service provider's Web site. This might contribute to low perceived usability and inconvenience for MMS. Given the context of our study, we hypothesize:

H6c: MMS advertising should result in greater irritation compared to SMS advertising.

Research Method

Figure 1 depicts the research model. This study utilizes the controlled laboratory experiment method to address the research questions. In contrast to most m-commerce research, which is conducted through survey, an experimental approach provides us the opportunity to operationalize the research constructs more realistically to examine consumer behavior in a mobile context.

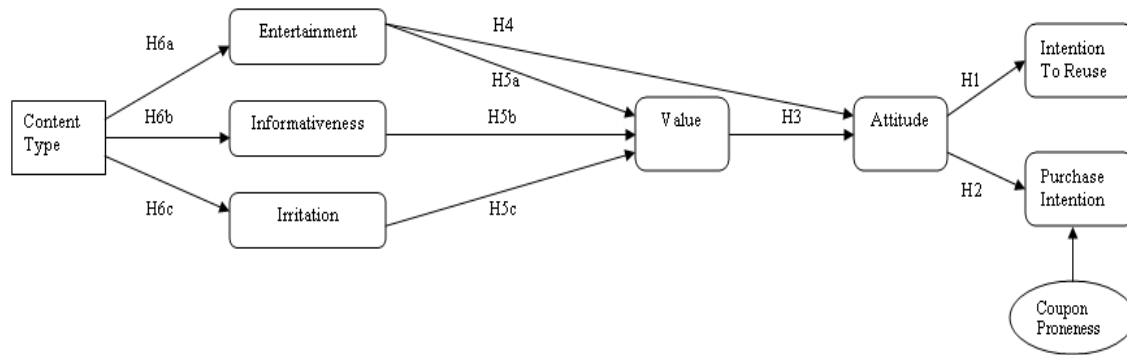


Figure 1. Research Model

Instrument Development

Scale development for the constructs was based on an extensive survey of literature on consumer behavior, advertising, and information systems. Validated standard scales were adapted for use as far as possible and new questions were generated to cover the specific domain of LAA context. *Purchase intention* is a common effectiveness measure and often is used to anticipate a response behavior. Respondents often are asked to evaluate an advertisement or product and then indicate their intention to purchase (Beerli and Santana 1999). We used a two-item, seven point semantic differential scale (not-at-all interested/very interested, not-at-all likely/extremely likely) to measure the likelihood that subjects would purchase a product (Putrevu and Lord 1994). *Intention to reuse* was assessed based on three questions taken from Baker et al. (1992) and from Okechuku and Wang (1988). *Attitude* was measured using five questions taken from Okechuku and Wang and from Zhang (1996). *Value* and its contributing factors (*entertainment*, *informativeness*, and *irritation*) were measured by the scales taken from Chen and Wells (1999) and from Ducoffe (1996). A control variable, *coupon proneness* (Lichtenstein et al. 1990), was included because it could potentially affect *purchase intention*. All items were anchored on a seven-point scale. Table 1 summarizes the questions measuring each construct in this study.

A process of conceptual validation was next carried out for the theoretical constructs with multiple indicators. Discussions with two information systems faculty members and eight postgraduate student volunteers were conducted to ascertain the adequacy of content validity. The revised questionnaire was subjected to pilot testing, involving 16 information systems postgraduate students. Cronbach's alpha computations and factor analyses (Kerlinger 1986) confirmed the stability and validity of these constructs.

The Experiment

Subjects

A total of 82 (41 females, 41 males) computing undergraduates were recruited in a large university. The recruitment advertisement specified that participants must own a mobile phone and be familiar with using SMS. They were required to complete an online registration by providing their background information. As an incentive for their participation, each subject received S\$15¹ upon completion. As mobile services have become part of young people's daily routines (Pedersen 2003), we believed that the use of undergraduate students as m-coupon subscribers was appropriate.

Design and Manipulations

The study was designed as a one-factorial experiment manipulating content type with participants randomly assigned to one of the two groups. The gender ratio of each group was maintained at 1:1; other individual characteristics and personality factors were controlled by randomization. The push-based m-coupon service was operationalized in the experiment. Instead of using the

¹The reward was framed in Singapore dollars. As of April 2003, one Singapore dollar = 56 U.S. cents.

commercially available type of pull-based LAA, we took the opportunity of this experimental study to design a push-based LAA which can exploit location-based information to a greater extent. A popular brand of casual fashion wear and a well-known cinema were selected based on the subjects' interest subscription.² The descriptions of the two advertisements are (1) "Special promotion for today from the *apparel shop A*: 40% Storewide Discount (including new collection) by using this M-coupon. Buy now!" and (2) "Top recommendations from *cinema B*: Tears of the Sun! Special discount for today: \$2 off movie ticket by using this M-coupon! Book now!"

The content type (SMS/MMS) was manipulated as follows. (1) For the SMS treatment group, the relevant text advertising messages were sent to the subjects' mobile phones via SMS. (2) For the MMS treatment group, a mobile phone with MMS function (shown in the appendix) was simulated by using Macromedia Flash to display the advertising message with pictures because of the current low penetration of MMS-enabled mobile phones. The SMS and MMS treatment received the same text content except that the MMS message received an additional color image of the product.

Task

After completing the questions about their personal information that serve as control checks, the subjects were asked to assume the role of an m-coupon service subscriber. They were next presented with a scenario that they were shopping in a mall and were now within the vicinity of merchant A. Meanwhile, another experimenter sent a "live" advertising message to the subjects' mobile phones via SMS. After receiving the first message, subjects were told to imagine that they continued to walk around the shopping mall. When they were within the vicinity of merchant B, a second advertising message was sent to the subjects. The task and sequence of the scenario were the same for the MMS treatment except that the subjects were shown the animated simulation of the MMS phone. Upon receiving both advertising messages, the subjects were asked to complete the questionnaire.

This experimental setting ensured that we have simulated the scenario of location-aware advertising to be as realistic as possible. The assumed role as a LAA subscriber receiving advertising messages of interest via SMS or MMS in a shopping mall helped make the experimental task meaningful. Subjects' responses to the realism of task were significantly different from the neutral value of 4 ($t = 16.81, p < 0.001$).

Analyses and Results

Manipulation Check

One question about content type was asked for the purpose of manipulation check. All of the subjects correctly answered the question, "The m-coupon advertising message is delivered to me via: SMS/MMS," which suggested that the subjects had perceived the manipulation in the way we intended.

PLS Analysis

Given that our research topic is relatively new and the sample size is relatively small, partial least squares (PLS) is an appropriate choice for data analysis (Fornell and Bookstein 1982). PLS is able to assess the measurement model (relationships between questions and constructs) within the context of the structural model (relationships among constructs). It maximizes the explanation of variance and prediction in the theoretical model and does not demand multivariate normal distributions.

Testing the Measurement Model

The measurement model of PLS is evaluated by examining the convergent (Cook and Campbell 1979) and discriminant validity (Campbell and Fiske 1959) of the research instruments. In PLS, three tests are used to determine the convergent validity of measured constructs: reliability of questions, the composite reliability of constructs, and the average variance extracted by con-

²The subjects were required to choose three shops or merchants in which they were interested from a large "brick-and-mortar" shopping mall when they were registering. In all 97 percent indicated interest in apparel shop A and 99 percent indicated interest in cinema B.

Table 1. Psychometric Properties of the Measurement Model

Measures of Constructs (measured on seven-point, Likert-type scale unless otherwise stated)	Item Loading	Composite Reliability	Cronbach's Alpha	Variance Extracted
Content Type: 1-SMS; 2-MMS The M-coupon is delivered to me via: SMS/MMS	TYPE 1.000	1.000	1.000	1.000
Entertainment: The location sensitive advertising is... entertaining enjoyable fun to use cool exciting	ENT 0.790 0.908 0.919 0.895 0.930	0.950	0.937	0.792
Informativeness: The location sensitive advertising... is a good source of product information supplies relevant product information is a good source of up-to-date product information makes product information immediately accessible is a convenient source of product information.	INF 0.766 0.769 0.754 0.733 0.803	0.876	0.804	0.586
Irritation: The location sensitive advertising is... cumbersome annoying irritating	IRR 0.707 0.937 0.914	0.893	0.831	0.738
Value: The location sensitive advertising is... useful valuable important	VAL 0.811 0.884 0.708	0.845	0.707	0.647
Attitude: Please indicate on the scale your attitude toward the location sensitive advertising: 1-boring; 7-interesting 1-unimpressive; 7-impressive 1-not-attractive; 7-attractive 1-unappealing; 7-appealing 1-unlikable; 7-likable	ATT 0.853 0.864 0.869 0.876 0.897	0.941	0.929	0.760
Intention to Reuse: How likely would you reuse such services? How likely would you recommend your friends to use? Would you actively seek out more information about such services from the service provider's Website?	INTR 0.895 0.909 0.812	0.906	0.845	0.762
Purchase Intention: How interested would you buy movie tickets within today? How likely would you buy movie tickets within today? How interested would you buy Bossini™ products within today? How likely would you buy Bossini™ products within today?	INTP 0.743 0.707 0.885 0.880	0.881	0.821	0.652
Coupon Proneness: When I use coupons, I feel that I am getting a good deal. I have favorite brands, but most of the time I buy the brand I have a coupon for. I am more likely to buy products for which I have a coupon.	COU 0.670 0.885 0.876	0.855	0.752	0.667

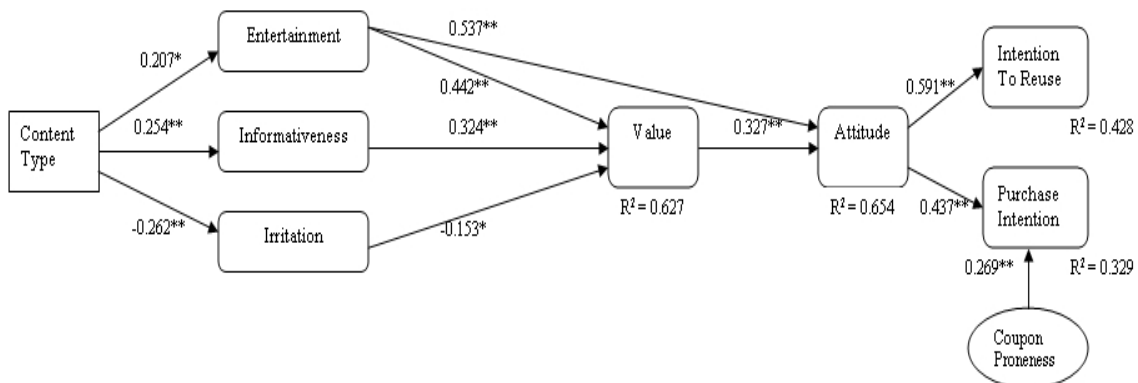
structs. Table 1 presents an assessment of the measurement model. Given that all questions had reliability scores above 0.5, and most questions had reliability scores above 0.707 (Chin 1998), the questions measuring each construct had adequate reliability. Composite reliabilities of constructs with multiple indicators exceeded Nunnally’s (1978) criterion of 0.7 while the average variances extracted for these constructs were all above 50 percent. Cronbach’s alphas were also higher than 0.7. These results of the convergent validity tests provided evidence for convergent validity of the measurement model. To ensure discriminant validity, the squared correlations between constructs (their shared variance) should be less than the average variance extracted for a construct. Table 2 reports the results of discriminant validity, which is checked by comparing the diagonal to the non-diagonal elements. All items fulfilled the requirement of discriminant validity.

Table 2. Discriminant Validity of Constructs

Construct	TYPE	ENT	INF	IRR	VAL	ATT	INTR	INTP	COU
TYPE	1.000								
ENT	0.207	0.890							
INF	0.254	0.691	0.765						
IRR	-0.262	-0.479	-0.421	0.859					
VAL	0.084	0.739	0.693	-0.500	0.804				
ATT	0.228	0.778	0.674	-0.500	0.723	0.872			
INTR	0.097	0.603	0.465	-0.467	0.583	0.628	0.873		
INTP	0.080	0.594	0.456	-0.380	0.432	0.512	0.603	0.808	
COU	0.117	0.274	0.243	-0.048	0.258	0.282	0.349	0.392	0.816

Testing the Structural Model

With assurance of good psychometric properties in the measurement model, the PLS structural model was next assessed to determine its explanatory power and the significance of the hypothesized paths. The explanatory power of the structural model was determined based on the amount of variance in the endogenous constructs (*intention to reuse and purchase intention*) for which the model could account. Our model could explain 43 percent of intention to reuse and 33 percent of purchase intention. Figure 2 shows the structural model. Hypotheses were tested at the 1 percent significance level. Each hypothesis corresponded to a path in the structural model. Jackknifing techniques were used to obtain the corresponding t-values in order to assess the significance of the path coefficients.



*Significant at 5% level of significance.

** Significant at 1% level of significance.

Figure 2. Structural Model

Attitude was a significant predictor for both intention to reuse (H1) and purchase intention (H2). The path coefficient from attitude to intention to reuse was significantly stronger ($t = 7.207$, $p < 0.01$) than that of attitude to purchase intention ($t = 5.660$, $p < 0.01$). Both value (H3) and entertainment (H4) were significant predictors of attitude. The two hypothesized positive relationships of entertainment (H5a) and informativeness (H5b) as predictors for value were both significant. Results showed that the effect of entertainment on value had a stronger path coefficient ($t = 4.460$, $p < 0.01$) than informativeness ($t = 3.046$, $p < 0.01$). Irritation (H5c) as a negative predictor of value was not significant at the $\alpha = 0.01$ level, but was significant at the $\alpha = 0.05$ level. Likewise, content type was not a significant predictor of entertainment (H6a) at the $\alpha = 0.01$ level, but was significant at $\alpha = 0.05$. However, as hypothesized, content type was a significant positive predictor of informativeness (H6b) and negative predictor for irritation (H6c). Table 3 summarizes the results of hypotheses testing. The control variable of coupon proneness was significant for purchase intention.

Table 3. Results of Hypothesis Testing

Hypothesis (path)	Path Coefficient (b)	t-Value	Supported ^a
H1: Attitude → Intention_Reuse	0.591	7.207**	Yes
H2: Attitude → Purchase_Intention	0.437	5.660**	Yes
H3: Value → Attitude	0.327	3.010**	Yes
H4: Entertainment → Attitude	0.537	5.119**	Yes
H5a: Entertainment → Value	0.442	4.460**	Yes
H5b: Informativeness → Value	0.324	3.046**	Yes
H5c: Irritation → Value	-0.153	-2.284*	No
H6a: Content_Type → Entertainment	0.207	1.922*	No
H6b: Content_Type → Informativeness	0.254	2.610**	Yes
H6c: Content_Type → Irritation	-0.262	-2.757**	Yes

^aAt 1% level of significance

Analyses on Purchase Intention

Drawing on Baumgartner's (2002) three-dimensional typology of purchase behaviors, we further analyzed consumers' purchase intention on those subjects who intended to buy the apparel product and movie ticket. We used a multiple-answer question "you decide to buy the apparel product/movie ticket within today because..." to gain more insights based on the types of behavior classified by Baumgartner. Altogether, there were 12 measurement items adapted from Baumgartner and from Tam et al. (2002) to assess the eight types of purchase behaviors. Among those who intended to buy the apparel product, 43 percent were spontaneous purchases and 57 percent were deliberate purchases. Among those who intended to buy the movie ticket, 41 percent of them made the purchases spontaneously and 59 percent were considered deliberate purchases. Table 4 summarizes the responses of the eight types of purchase behaviors.

Discussions and Conclusions

In line with prior research reporting positive outcomes of multimedia in various fields, our findings revealed affirmative results that are applicable to mobile advertising. The findings showed that up to 43 percent of the consumers' intention to reuse the location-aware advertising service could be accounted for by content type. It also had a significant impact on purchase intention and could potentially increase consumers' spontaneous buying. As shown in Table 4, up to a quarter of the consumers would buy the product because of the m-coupon promotion and the percentage could be even higher in a real-life situations.

The entertainment value derived from using location-aware advertising contributes predominantly to advertising value and favorable attitude formation. Among the two factors that were hypothesized to enhance consumers' value of advertising, entertainment had a stronger positive effect on value ($b = 0.442$) compared to informativeness ($b = 0.324$). This suggests that consumers placed high importance on both aspects but could more likely regard LAA as valuable if the advertising messages are perceived to be fun and entertaining. Nevertheless, messages sent should also be of value in terms of relevance, personalization,

Table 4. Percentage of Eight Types of Purchase Behaviors

Purchase Behavior Type		Measurement Items	Responses	
			Apparel Product	Movie Ticket
Spontaneous Purchase	Promotional Purchase	<ul style="list-style-type: none"> It is on sale. 	27%	26%
	Exploratory Purchase	<ul style="list-style-type: none"> You like to buy something out of curiosity. You desire for variety. 	7%	8%
	Casual Purchase	<ul style="list-style-type: none"> You just buy it without thinking much about it. 	2%	1%
	Impulsive Purchase	<ul style="list-style-type: none"> You buy it on impulse. 	7%	6%
Deliberate Purchase	Extended Purchase	<ul style="list-style-type: none"> It is your purchase plan. You need it. 	27%	27%
	Symbolic Purchase	<ul style="list-style-type: none"> It makes people appear impressive. It earns people recognition. 	8%	5%
	Repetitive Purchase	<ul style="list-style-type: none"> It is a routine purchase. You are loyal to it. 	7%	6%
	Hedonic Purchase	<ul style="list-style-type: none"> You just like it. 	15%	21%

and timeliness. The level of perceived irritation was found to negatively influence value perception at $p < 0.05$ level. This finding is consistent with previous research in traditional and Web-based advertising. However, the interpretation of this outcome needs to take into consideration the limitation that the laboratory experiment was not able to fully operationalize the irritation factor in using LAA.

Our findings confirm the positive effects of multimedia on entertainment and informativeness in the context of location-aware advertising. Multimedia appears to have a greater impact on informativeness compared to entertainment. This result reinforces prior studies investigating the effects of multimedia in enhancing information quality and richness. The comparatively weaker effects on entertainment (significant at $p < 0.05$ level) could be due to the fact that the simulated MMS advertising messages in our experiment are still not sufficiently strong enough to induce a higher entertainment perception. It is noteworthy that the path coefficient of content type to irritation is significantly high. This finding supports our hypothesis that the current level of perceived irritation toward MMS could be high due to the newness of the technology and unfamiliarity with it. In fact, the proportion of experimental subjects owning an MMS-enabled phone was only 9 percent.

With the availability of multimedia-enabled mobile devices in the market as well as advancements in the precision of positioning technologies, merchants who are eager to jump onto the location-aware advertising bandwagon should be mindful of the findings from this study. This research has uncovered the potential impacts that multimedia location-aware advertising will have on mobile commerce consumer behavior. There seems to be some evidence to indicate that relevant, personalized, and location-sensitive multimedia advertisements delivered to a consumer’s mobile device will entice impulse buying to a certain extent. Limited by the simulated MMS experience, the effects of multimedia on spontaneous purchase in our study could be largely underestimated. Despite this, the results have sufficiently indicated that MMS have vast potential to increase the entertainment value of location-aware advertising. It should also be noted that consumers still place high expectations on the information value of mobile advertisements. This suggests that merchants should personalize advertisements according to the consumers’ preferences.

As an exploratory study, the findings of this research are significant on numerous fronts. The interactive experiment simulating a mobile shopping environment has provided the much needed preliminary empirical evidence about the possible effects of multimedia on consumer behavior in a mobile commerce context. This research focuses on permission-based location-aware advertising via a push mechanism that is widely touted as a promising killer-app for mobile commerce. Much research remains to be done in shaping the development of this emerging arena. It would also be a challenge to continue improving the operationalization of multimedia in a mobile commerce context and observe its effects on entertainment and irritation. More

importantly, field research along the direction of this study is certainly a fruitful pursuit that will contribute toward the validation of our findings.

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Appendix

Screenshots of MMS Advertising Message Simulated in Experiment

