Perceived effectiveness of text vs. multimedia Location-Based Advertising messaging

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Abstract: The emergence of mobile communication and positioning technologies has presented advertisers and marketers with a radically innovative advertising channel: Location-Based Advertising (LBA). Despite the growing attention given to LBA, little is understood about the differential effects of text and multimedia advertising formats on the mobile consumer perceptions and behaviours. This exploratory study empirically examines the effects of multimedia advertisements vis-à-vis text-based advertisements on consumer perceptions and behaviours in a simulated LBA environment. A structural model was formulated to test their effects on consumer perceptions of entertainment, informativeness and irritation. Results show that multimedia LBA messages lead to more favourable attitude, increase the intention to use the LBA application, and have significant impact on purchase intention. Furthermore, this study indicates the role of multimedia as a double-edged sword: on the one hand, it suggests that multimedia impose a higher level of irritation; on the other hand, it suggests that multimedia enhance the informativeness and entertainment value of LBA. Implications for theory and practice are discussed.

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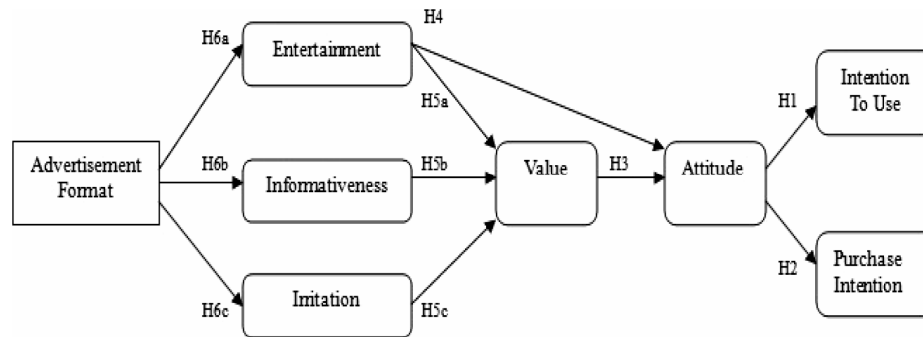
1 Introduction

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 internet, advertisers are further endowed with unprecedented opportunities to leverage on the reach and multiple addressing capabilities of these technologies to perform targeted marketing. Traditional advertisers and the earlier internet advertisers have largely used the media as a channel for mass communication. However, marketers have in recent years found direct marketing to be a profitable approach (Nowak and Phelps, 1997). Consequently, there is a trend towards using more personalised 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.

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-Based Advertising (LBA). LBA involves the provision of advertising messages to cellular subscribers based on their location. Wireless devices as a channel for advertising possess 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 customised to an individual's tastes, geographical location and time of day. With LBA, advertisers could reach consumers when and where they are most likely to make a purchase and deliver advertising messages contextually through the media on a geographically targeted basis. Some industry analysts predict that LBA messages are expected to create five to ten times higher click-through rates compared to the internet advertising messages (Ververidis and Polyzos, 2002).

Despite the vast opportunities offered by LBA, 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 the TV and the internet media, mobile devices lack the capability to transmit or receive rich multimedia content because they are constrained by the bandwidth of wireless communication networks. In addition, the small 'screen-estate' and limited memory and storage capacity of mobile devices have further inhibited the growth of LBA. However, with the rollout of Third-Generation (3G) network, the bandwidth will increase greatly and the mobile networks could support transmission rate of up to 2 Mbps. Furthermore, with the increasing diffusion rate of multimedia-enabled mobile devices with a larger coloured screen and increased memory and storage capacity, the commercial prospects for location-based advertisements to be as rich in content and presentation as traditional and the internet advertisements seem very promising. Indeed, the volume of multimedia messages sent in both the USA and UK has been growing steadily over the recent years (SYBASE, 2007; MDA, 2008)

In general, research into mobile advertising is still in its infancy stage and the specific type of mobile advertising – LBA has received even less scholarly attention. While we are begin to see research attempts that look into privacy issues pertaining to LBA (Xu and Teo, 2005) and attitude toward LBA (Bruner II and Kumar, 2007), we found that limited research has been done to empirically examine the effectiveness of advertisement formats for LBA. Understanding the effects of the advertisement format is particularly important when LBA campaign decisions are further complicated by the choices of advertisement formats and advertisers' weak knowledge base regarding their effects. Therefore, the aim of this research is to examine the differential effects of text and multimedia advertising formats on the mobile consumer perceptions and behaviours in terms of intention to use LBA as well as product purchase intention. Given the promising marketing potential of mobile communication and positioning technologies and the limited attention span of consumers, deeper insight into the effects of multimedia advertising formats on the mobile consumer behaviour can inform the design and development of effective LBA.

Figure 1   Research model

2   Theoretical foundations and hypotheses

Figure 1 presents our research model. Drawing on the advertising literature, we posit that the antecedents that constitute the mobile consumer's value toward LBA are entertainment, informativeness and irritation (Ducoffe, 1996). According to the limited capacity information processing theory, we further hypothesise that the advertisement format type (Short Messaging Service (SMS) vs. Multimedia Messaging Service (MMS)) may affect consumers' usage intention of LBA application and product purchase intention through their perceived values and overall attitude toward LBA. The following sections develop and elaborate the key constructs and the theoretical rationale for the causal relationships among the constructs in the research model.

2.1   Location-Based Advertising

LBA is marketer-controlled information customised for recipients' geographic positions and received on mobile communication devices (Bruner II and Kumar, 2007). It can be viewed as a part of a larger form of Location-Based Services (LBS) that utilise geographical positioning information to provide users with pervasive flexibility to be uniquely reachable and to access networks and services while on the move. The mechanisms of LBA content delivery can be either pull or push (Bruner II and Kumar, 2007). In pull-based LBA, consumers request for some information or use some service on a one-time basis and in the process are exposed to commercial messages (MMA, 2005). This type of LBA may be seen in some 'on demand' services where the consumer dials or signals a service provider for specific information/service such as the nearest Auto-Teller Machine (ATM) or Starbucks store. In these services, the location information is ephemeral and useful only to complete the transaction requested (e.g. informing the user of the nearest ATM or Starbucks store). The other approach to LBA is called push-based LBA and it amounts to the marketer working with the carriers and delivery networks to send advertisements to the users based on the tracking of the device's location (Bruner II and Kumar, 2007). This type of LBA may include sending users advertisements based on their known proximity to a store or service centre via a wireless device. In the push-based approach, location information is used to target users and they are sent the related advertisements when they get within the vicinity of the merchants.

In this study, we are particularly interested in examining push-based LBA for at least two reasons. Firstly, given the popularity and prevalence of push technologies such as Blackberry and Really Simple Syndication (RSS), we believe that studying push-based LBA is especially relevant and timely. Secondly, compared to pull-based LBA, push-based LBA is more complicated in terms of maintaining a long-term relationship between consumers and marketers. In addition, the push-based approach is further complicated by consumers' concerns about privacy and authentication. Invasion of consumers' privacy is a prime concern especially for push-based LBA since consumers are wary of being tracked whenever and wherever they are, or being spammed with mobile advertisements (Unni and Harmon, 2007). However, there are ways to get around this barrier. Permission-based solution recommends that push-based LBA be offered on a subscription basis that allows users to signal their readiness for receiving LBA messages and disallows unauthorised 'spamming' or unsolicited push messages (Barwise and Strong, 2002).

In fact, the permission-based approach to push-based LBA is a legal requirement in the USA and Europe. In the USA, sending advertising messages to mobile devices is prohibited both under the Telephone Consumer Protection Act (TCPA) and the Controlling the Assault of Non-Solicited Pornography and Marketing Act (CAN-SPAM), unless the recipients have opted-in (Kimball, 2004). A similar path was taken by the European Commission in a directive (2002/58/EC) on privacy and electronic communications, which explicitly requires that mobile advertising messages be sent only with the consent of the recipient (EC, 2002). Therefore, permission-based LBA is the focus of this research. The push-based LBA[1] is used in the experiment scenario because push-based applications can exploit location-based information largely.

2.2   *Impacts on mobile consumer perceptions and behaviours*

The Theory of Reasoned Action (TRA) links individual beliefs, attitudes, intentions and behaviour to describe the psychological process that mediates the observed relationships between attitudes and behaviour (Ajzen and Fishbein, 1980). Fishbein and Ajzen (1975) define an attitude as a learned predisposition of human beings. Based on such predisposition, an individual would respond in a particular way toward a specified class of objects (Rosenberg, 1960). In the context of advertising, consumer attitudes toward advertising in general have long been found to be negative (Mittal, 1994). However, we also know that the results can vary depending upon the advertising channel (Elliott and Speck, 1998). Consequently, consumer attitudes toward LBA – a new type of advertising channel and also a new type of technology, remain unknown and call for more scholarly attention (Bruner II and Kumar, 2007). Furthermore, scholarly studies on investigating the impacts of attitude toward LBA on mobile consumer behaviour are still extremely rare (Bruner II and Kumar, 2007).

In responses to this call for deeper insights into mobile consumer behaviours, we consider the mobile consumer to be both a technology user and a shopper and hence focus on two key aspects of behavioural intentions in this study: intention to use LBA and product purchase intention (Koufaris, 2002). These behavioural intentions that comprise one's action tendencies can be considered as conative effects of LBA. The hierarchy of advertising effects model suggests that a consumer will go through a sequence of mental stages sequentially from cognitive, affective to conative, closely following the typical attitude structure components (Ray, 1973).

Drawing on the advertising literature (Mackenzie, Lutz and Belch, 1986), attitude toward LBA is defined as the predisposition to respond in a favourable or unfavourable manner to particular advertising messages that are received on a personal mobile device based on one's geographic location. Extant literature on technology adoption along the line of the TRA (Fishbein and Ajzen, 1975) provides ample empirical support that users' positive attitudes toward a technology will increase their intentions to use the technology (Davis, 1989; Pedersen, 2005). Therefore, a consumer's attitude toward LBA is likely to be positively related to her intention to use the LBA application. Hence, we hypothesise:

H1: Attitude toward LBA is positively related to intention to use.

Previous advertising research has shown that attitude toward advertising in general is a good indicator of advertising effectiveness. For example, Haley and Baldinger (1991) found that the degree to which consumers like an advertisement is the best single predictor of sales effects. It has also been reported that attitude toward advertising is a useful construct that contributes to the effects of advertising exposure on consumer brand beliefs, brand attitude and purchase intentions (Shimp, 1981; Mackenzie, Lutz and Belch, 1986; Lee and Miller, 2006). Recent empirical studies have likewise highlighted the existence of this positive relationship between attitude toward advertising and purchase intention in many of the online shopping empirical research (Li and Zhang, 2002; Ko, Cho and Roberts, 2005). Hence, we expect a similar relationship between attitude and purchase intention in the LBA context.

H2: Attitude toward LBA is positively related to purchase intention.

2.3 Attitude and contributing factors

Attitude is an important concept in research on advertising and technology acceptance. Attitude is shaped by the internalisation of value formed through affective and cognitive evaluations (Perloff, 1993). Value is defined as the consumers' overall assessment of the utility of a service based on perceptions of cost incurred and benefits received (Zeithaml, 1988). Once a value has been internalised, it becomes a criterion for developing and maintaining attitude toward relevant objects and situations (Oskamp, 1991). Other research affirms that the cognitive aspect of a person's attitudes may largely consist of expectations about how her values are served through the agency of the attitude object (Tolman, 1951). Value is shown to be a key determinant of attitude and its importance in attitude formation has already been attested in web advertising studies (e.g. Ducoffe, 1996). Hence, we expect a similar relationship between value and attitude in the LBA context.

H3: Higher assessment of value results in more favourable attitude toward LBA.

According to previous online advertising research, the assessment of value is influenced by benefits that typically include entertainment and informational value (Ducoffe, 1996; Eighmey and McCord, 1998; Chen and Wells, 1999). Entertainment refers to the extent to which the advertising media is fun and entertaining to media users (Eighmey and McCord, 1998; Raney et al. 2003) and informativeness is defined as the extent to which the advertising media provides users with resourceful and helpful information (Ducoffe, 1996; Chen and Wells, 1999; Ko, Cho and Roberts, 2005). The value of media entertainment lies in its ability to fulfil users' needs for escapism, hedonistic pleasure,

aesthetic enjoyment or emotional release (McQuail, 1983). It has been shown that entertainment contributes to attitude formation both directly and indirectly via influencing value (Ducoffe, 1996). Hence, we predict that enjoyment, fun seeking, and entertainment are significant antecedents of attitude toward LBA as well as motivations for using LBA.

H4: Higher level of entertainment results in more favourable attitude toward LBA.

H5a: Higher level of entertainment results in higher assessment of the value of LBA.

Previous studies have suggested that media users consider advertisers' abilities to provide audience information as the fundamental reason for accepting the advertisement itself (Bauer and Greyser, 1968). In addition, it was indicated that advertising's informational role is its major legitimising function (Rotzoll, Haefner and Sandage, 1986; Ko, Cho and Roberts, 2005). By matching the information on personal preferences provided by consumers with their current location information, LBA is able to provide consumers with personalised and localised up-to-date advertising messages. The increased relevance and timeliness of an advertising message will assist consumers in making a better purchase decision and consequently perceiving LBA to be valuable. Hence, we hypothesise:

H5b: Higher level of informativeness results in higher assessment of the value of LBA.

Along with entertainment and informativeness, irritation caused by advertisements also influences people's attitude toward them (Ducoffe, 1996; Chen and Wells, 1999). Irritation refers to any offending effects that may go against what a consumer values (Ducoffe, 1996; Chen and Wells, 1999). Traditional advertising research has devoted much attention to the study of irritation arising from TV commercials, web pop-up advertisements and e-mail spams (Ducoffe, 1996; Chen and Wells, 1999). For the case of permission-based LBA, the level of irritation should be relatively low, since messages are delivered with the receiver's prior consent. However, irritations in LBA could still arise when consumers find the messages annoying or irrelevant under certain circumstances. Even with well-crafted and relevant advertisements, it could be bothersome if consumers receive too many messages from the marketers to which they have subscribed (Bruner II and Kumar, 2007). Thus, such perceived irritations will likely reduce the value assessment of LBA. Hence, we hypothesise:

H5c: Higher level of irritation results in lower assessment of value of LBA.

2.4   Advertisement formats: text vs. multimedia

LBA applications can be delivered over different underlying technologies such as wireless application protocol, General Packet Radio Service (GPRS) or SMS. Early applications of LBA are 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 advertising. In a report from Allied Business Intelligence Inc. (ABI), global spending on SMS-based mobile marketing and advertising will see a 13-fold increase between 2006 and 2011 (ABI, 2006). Seeing the growth of SMS-based marketing, marketers seem to be convinced that there is a business case for MMS (ABI, 2006), which can be multimedia enhancements of existing SMS offerings. MMS allows for including more text in the messages and for

including audio, pictures and small video clips. In fact, many telecommunication operators have already begun offering MMS based on GPRS in GSM mobile networks. With the growing numbers of mobile devices possessing multimedia capabilities as well as advances in mobile communication technologies, LBA in the form of MMS is likely to be adopted widely by marketers in the near future (Yuan and Steinberg, 2006; Unni and Harmon, 2007).

Previous research on mobile advertising have often either studied attitudes toward mobile advertising in general without reference to any specific advertisement format (Okazaki, 2004; Tsang, Ho and Liang, 2004; Bruner II and Kumar, 2007; Karjaluoto and Alatalo, 2007) or focused on SMS format (Merisavo et al., 2006; Drossos et al. 2007; Muk, 2007). These studies obscure some important differences across formats that would be of practical value to the marketers and LBA application designers. To glean further insights into the function of LBA advertisement formats, the current study theorise the impacts of two different LBA advertisement formats (SMS and MMS) on consumer perceptions of entertainment, informativeness and irritation.

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 (e.g. Bagui, 1998). In the context of LBA, 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, multimedia mobile advertisements will also likely increase the level of entertainment and enjoyment compared to plain text advertisement. This is especially the case for a novel mobile service such as MMS. Hence, we hypothesise:

H6a: MMS advertisement format results in greater entertainment compared to SMS advertisement format.

Previous studies suggest that multimedia elements such as graphical and coloured representation of information improves decision-making (Benbasat and Dexter, 1986) and leads to higher levels of user satisfaction (Simon and Peppas, 2004). It has been 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 (Lim, Benbasat and Ward, 2000; Simon and Peppas, 2004). 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 a better retention in long-term memory (Lim, Benbasat and Ward, 2000). In the advertising context, Fernandez and Rosen (2000) showed that the advertisements with colour were more likely to attract attention and improve product appeal. Similarly, Lohse and Rosen (2001) also found significant effects of colour and graphics in enhancing informativeness and leading to favourable evaluation of the ads. Hence, we hypothesise:

H6b: MMS advertisement format results in greater informativeness compared to SMS advertisement format.

The limited capacity information processing theory (Kahneman, 1973; Lang, 2000) argues that media messages, delivered simultaneously in a number of modalities, are cognitively complex and serve to overload the processing system. This theoretical perspective posits that, if users need to spend attentional resources on (extra modalities; e.g. pictures) to text, they will be left with fewer resources for the central task of

information processing (DeFleur et al., 1992; Lang et al., 2002). Hence, the limited capacity information processing theory suggests that when multimedia elements are added to the text-only advertisement, information processing of such advertisement should decrease as some of the attentional resources are spent on processing the extra modalities (DeFleur et al., 1992; Lang et al., 2002). According to this perspective, the MMS advertisements, compared to the SMS advertisements, will impose a higher cognitive load on the user by eliciting stronger orienting responses, thereby triggering greater disbursement of attentional resources for encoding messages with multimedia elements. Hence, we hypothesise:

H6c: MMS advertisement format results in greater irritation compared to SMS advertisement format.

2.5   Control variables

Prior research on advertising and information technology adoption studies point to a number of additional factors that should be included in the research model because of their potential influence on dependent and mediating variables. Therefore, we control for the following effects:

1   *Prior experience with mobile applications.* In examining direct marketing usage, individuals who have prior experience with direct or targeted marketing are more likely to understand the benefits of profiling (Culnan, 1995). Likewise, individuals who have prior experience with mobile applications (e.g. sports news alerts) are more likely to appreciate the value of LBA. Therefore, we treat this factor as a control variable.

2   *Personal innovativeness*. Different individuals possess different propensities for learning about or adopting innovations, and these tendencies have been found to have a positive influence on subsequent adoption behaviour (Agarwal and Prasad, 1998). In particular, innovators have been found to be early adopters of mobile commerce (Pedersen, 2005). Hence, we model personal innovativeness as a control variable.

3   *Coupon proneness* is defined as an increased propensity to respond to a purchase offer because the coupon form of the purchase offer positively affects purchase evaluations (Lichtenstein, Netemeyer and Burton, 1990). People who enjoy collecting coupons might be more likely to adopt the LBA application – mobile coupon (m-coupon) service used in our experiment. Hence, we model coupon proneness as a control variable.

3   Research method

3.1   Instrument development, conceptual validation and pilot study

Scale development for the constructs was based on an extensive survey of the literature on consumer behaviour studies, 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 LBA context. Purchase intention is a common effectiveness

measure and often used to anticipate response behaviour. Respondents were often 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 use was assessed based on three questions adapted from Ajzen and Fishbein (1980) and Baker, Levy and Grewal (1992). Attitude was measured using five questions adapted from Zhang (1996) and Chen and Wells (1999). Value and its contributing factors (entertainment, informativeness and irritation) were measured by the scales taken from Ducoffe (1996) and Chen and Wells (1999). For control variables, personal innovativeness was assessed with four questions taken from Agarwal and Prasad (1998), and coupon proneness was measured with four questions taken from Lichtenstein, Netemeyer and Burton (1990). Prior experience in using mobile applications was measured with questions on the number of times in the previous year the subjects had used a mobile application, and their average monthly SMS/MMS usage.

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. Next, a pilot study involving 16 information systems postgraduate students was conducted using the improved questionnaire. The main objectives of the pilot study were to test the workings of the experimental system, assess the clarity and conciseness of the experimental instructions and questions, and gauge the duration of the experiments. The respondents were also contacted for a face-to-face interview so that their opinions on the experimental instructions and questions could be gathered. Following an analysis of the feedback, a number of revisions were made to the experimental instrument: Terms were clarified, the layout of the question was reorganised, and instructions that the respondents found unnecessary were removed. Cronbach's alpha computations and factor analyses (Kerlinger, 1986) confirmed the stability and validity of these constructs. All items in the questionnaire were anchored to appropriately labelled seven-point Likert scales (see Table 1).

3.2 *Experiment design*

This study utilised the controlled laboratory experiment method to test the research hypotheses. In contrast to most mobile commerce research that was conducted through survey, an experimental approach allows for precision of measurement and control over extraneous sources of variance. In our study, one specific permission-based push LBA application – the m-coupon service was used as the scenario in the experiment. 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 for receiving m-coupons. The profiling information is then used to target the subscribers and they will be sent relevant coupons when they approach the vicinity of the merchants. The consumers can bring their phones to the stores and redeem the coupons.

Table 1   Psychometric properties of the measurement model

Measures of constructs (measured on seven-point, Likert scale unless otherwise stated)	Item loading	Composite reliability	Cronbach's alpha	Variance extracted
Entertainment (ENT). The location-based advertising is		0.950	0.937	0.792
Entertaining	0.790			
Enjoyable	0.908			
fun to use	0.919			
Cool	0.895			
Exciting	0.930			
Informativeness (INF). The location-based advertising		0.876	0.804	0.586
is a good source of product information	0.766			
supplies relevant product information	0.769			
is a good source of up-to-date product information	0.754			
makes product information immediately accessible	0.733			
is a convenient source of product information	0.803			
Irritation (IRR). The location-based advertising is		0.893	0.831	0.738
Cumbersome	0.707			
Annoying	0.937			
Irritating	0.914			
Value (VAL). The location-based advertising is		0.845	0.707	0.647
Useful	0.811			
Valuable	0.884			
Important	0.708			
Attitude (ATT). Please indicate on the scale your attitude toward the location-based advertising		0.941	0.929	0.760
1-boring; 7-interesting	0.853			
1-unimpressive; 7-impressive	0.864			
1-not-attractive; 7-attractive	0.869			
1-unappealing; 7-appealing	0.876			
1-unlikable; 7-likable	0.897			
Intention to Use (USE)		0.906	0.845	0.762
How likely would you reuse such services?	0.895			
How likely would you recommend your friends to use?	0.909			
Would you actively seek out more information about such services from the service provider's website?	0.812			

Table 1 Psychometric properties of the measurement model (continued)

Measures of constructs (measured on seven-point, Likert scale unless otherwise stated)	*Item loading*	*Composite reliability*	*Cronbach's alpha*	*Variance extracted*
Purchase Intention (PUR)		0.881	0.821	0.652
How interested would you buy movie tickets within today?	0.743			
How likely would you buy movie tickets within today?	0.707			
How interested would you buy Bossini™ products within today?	0.885			
How likely would you buy Bossini™ products within today?	0.880			
Advertisement format type. 1-SMS; 2-MMS				
The m-coupon is delivered to me via: SMS/MMS	1.000	1.000	1.000	1.000

The study was designed as a one-factorial experiment manipulating LBA format type (MMS and SMS) 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 randomisation. The permission-based push m-coupon service was operationalised in the experiment. A popular brand of casual fashion wear and a well-known cinema from a large and reputable 'brick-and-mortar' shopping mall were selected based on the subjects' interest subscription.[2] In doing so, we excluded the potential effects of credibility (Tsang, Ho and Liang, 2004) on the research model. 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!"

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 manipulation of the LBA advertisement format (MMS/SMS) was carried out as follows. For the MMS treatment group, a mobile phone with MMS function (shown in Appendix A) was simulated by using Macromedia Flash to display the advertising message with pictures; for the SMS treatment group, the subjects received the advertising message in plain-text format. The MMS and SMS treatment groups received the same text content with the MMS message having an additional colour image of the product.

3.3   Participants

A total of 82 (41 females, 41 males) computing undergraduates were recruited in a large university. The recruitment advertisement provided some background about the researchers, the study without revealing the experimental treatments, and specified that participants must own a mobile phone. They were required to complete an online registration by providing their background information and choosing three of their interested shops or merchants located in a large 'brick-and-mortar' shopping mall. Most of the subjects had used mobile devices for at least two years (90%). As mobile devices and mobile applications have become part of young people's daily routines

(Pedersen, 2005), we believed that the use of undergraduate students as potential LBA users was appropriate. As an incentive for their participation, each subject received US\$9 upon completion.

3.4   Experiment task

After completing the questions about their personal information that will serve as control checks, the subjects were asked to assume the role of an m-coupon service subscriber and the m-coupon service was simulated in the lab environment. They were presented with a scenario that they were shopping in a mall. When they were within the vicinity of their interested merchant A, an advertising message was sent to the subjects through the animated simulation of mobile phones on the computers. 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 the merchant B, a second advertising message was sent to the subjects. Upon receiving both advertising messages, the subjects were asked to answer a post-session questionnaire that contained the questions measuring research constructs, control variables and other information for manipulation check.

This experimental setting ensured that we have simulated the scenario of LBA to be as realistic as possible. The assumed role as a LBA 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[3] were significantly different from the neutral value of 4 ($t = 16.81$, $p < 0.001$).

4   Analyses and results

4.1   Manipulation and control checks

One question about LBA format type was asked for the purpose of manipulation check. All the subjects correctly answered this 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. In addition, ANOVA tests revealed that subjects assigned to the two treatments did not differ significantly in terms of their age, mobile application experience, innovativeness, and coupon proneness. Hence, the random assignment of subjects to the two treatment groups appeared to be effective.

4.1.1   Partial Least Squares analysis

Partial Least Squares (PLS), a second-generation causal modelling statistical technique developed by Wold (1982), was used to test the research hypotheses. PLS possesses many advantages over traditional statistical methods such as regression. Firstly, it is not contingent upon data having multivariate normal distributions and interval scales (Fornell and Bookstein, 1982). This makes PLS suitable for handling manipulated constructs. Secondly, PLS has the ability to simultaneously test the measurement model and the structural model. This will provide a more complete analysis for the inter-relationships in the model. Thirdly, PLS is appropriate for data analyses in the early stages of theory development (Fornell and Bookstein, 1982), and is therefore suitable for this study that represents an early attempt to explore the impacts of two different advertisement formats (SMS and MMS) in the new LBA context.

Table 2 Discriminant validity of constructs

Construct	*ENT*	*INF*	*IRR*	*VAL*	*ATT*	*USE*	*PUR*
Entertainment (ENT)	0.890						
Informativeness (INF)	0.691	0.765					
Irritation (IRR)	− 0.479	− 0.421	0.859				
Value (VAL)	0.739	0.693	− 0.500	0.804			
Attitude (ATT)	0.778	0.674	− 0.500	0.723	0.872		
Intention to Use (USE)	0.603	0.465	− 0.467	0.583	0.628	0.873	
Purchase Intention (PUR)	0.594	0.456	− 0.380	0.432	0.512	0.603	0.808

4.1.2 Testing the measurement model

The measurement model of PLS is evaluated by examining the convergent validity (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 constructs. Table 1 presents an assessment of the measurement model. Given that all questions had reliability scores above 0.5, and 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%. Cronbach's alphas were also > 0.7. These results of the convergent validity tests provided evidence for convergent validity of the measurement model.

Discriminant validity is the degree to which measures of different constructs are distinct (Campbell and Fiske, 1959). To test discriminant validity, the square root of the variance shared between a construct and its measures should be greater than the correlations between the construct and any other construct in the model. 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.

4.1.3 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 hypothesised paths. The explanatory power of the structural model was determined based on the amount of variance in the endogenous constructs (intention to use and purchase intention) for which the model could account. Our model could explain 43% of intention to use and 33% of purchase intention. Figure 2 shows the structural model. Hypotheses were tested at 5% significance level. Each hypothesis corresponded to a path in the structural model. Bootstrapping techniques were used to obtain the corresponding *t*-values in order to assess the significances of the path coefficients.
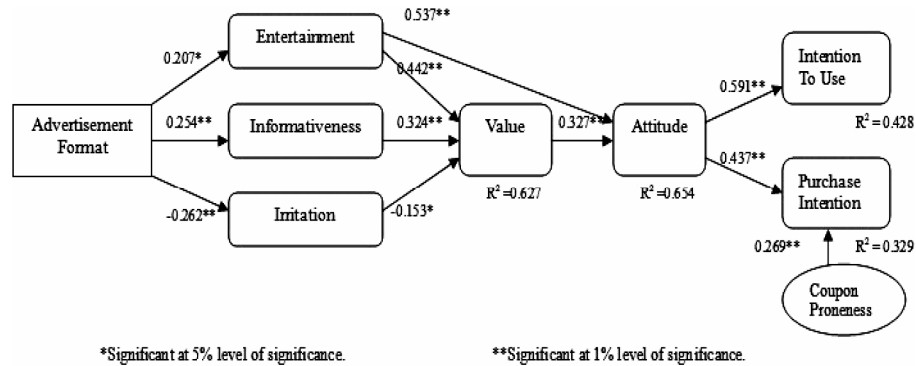
Figure 2   Structural model

*Significant at 5% level of significance.   **Significant at 1% level of significance.

Table 3   Results of hypotheses testing

Hypothesis (path)	Path coefficient (b)	t-Value	Supported[a]
H1: Attitude → Intention to Use	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**	Yes
H6a: Advertisement Format Type → Entertainment (MMS > SMS)	0.207	1.922**	Yes
H6b: Advertisement Format Type → Informativeness (MMS > SMS)	0.254	2.610*	Yes
H6c: Advertisement Format Type → Irritation (MMS > SMS)	− 0.262	− 2.757*	Yes

*Significant at 1% level of significance; **significant at 5% level of significance.
[a]Hypotheses were tested at 5% level of significance.

Attitude was a significant predictor for intention to use (*H1*) and purchase intention (*H2*). The path coefficient from attitude to intention to use was significantly stronger ($b = 0.591$) than that of attitude to purchase intention ($b = 0.437$). Both value (*H3*) and entertainment (*H4*) were significant predictors of attitude. The two hypothesised positive relationships of entertainment (*H5a*) and informativeness (*H5b*) as predictors of value were both significant. Results showed that the effect of entertainment on value had a stronger path coefficient ($b = 0.442$) than informativeness ($b = 0.324$). Irritation (*H5c*) as a negative predictor of value was significant. Advertisement format was a significant predictor of entertainment (*H6a*). As hypothesised, advertisement format was a significant positive predictor of informativeness (*H6b*) and negative predictor for irritation (*H6c*). Table 3 summaries the results of hypotheses testing. Among the control variables, coupon proneness was significant toward purchase intention.

4.2 Analyses on purchase intention: spontaneous vs. deliberate purchases

While consumers may enter a store planning to make specific planned purchases, they may end up making some unplanned purchases. In his typology of purchase intentions, Baumgartner (2002) lists two distinct forms of purchase intentions:

1 *Deliberate purchases*. These purchases are typically classified as being predictable, repeatable, and routine and usually include:

- extended purchase (e.g. making a purchase based on objective, logical criteria and for utilitarian reasons)

- symbolic purchase (e.g. making a purchase to project a certain image or because it meets with social approval)

- repetitive purchase (e.g. making a routine purchase or buying something because you are loyal to it)

- hedonic purchase intention (e.g. buying something because you like it).

2 *Spontaneous purchases*. These purchases are typically classified as being unpredictable, non-repeatable, and non-routine and usually include:

- promotional purchase (e.g. buying something because it is on sale)

- exploratory purchase intention (e.g. buying something out of curiosity or because of a desire for variety)

- casual purchase intention (e.g. buying something without thinking much about it)

- impulsive purchase intention (e.g. buying something on impulse).

Drawing on Baumgartner's (2002) typology of purchase intentions, we further analysed consumer purchase intention for those subjects who intended to purchase the products in this study (i.e. their ratings on purchase intentions were greater than the neutral value of 4). 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 purchase intention classified by Baumgartner (2002). There were altogether twelve measurement items adapted from Baumgartner (2002) and Tam, Hui and Tan (2002) to assess the eight types of purchase intentions. Among those who intended to buy the apparel product, 41% of the subjects receiving MMS advertisements and 38% of them receiving SMS advertisements were spontaneous purchases; 10% of the subjects receiving MMS advertisements and 11% of them receiving SMS advertisements were deliberate purchases. Among those who intended to buy the movie ticket, 42% of the subjects receiving MMS advertisements and 28% of them receiving SMS advertisements made the purchases spontaneously; 12% of the subjects receiving MMS advertisements and 18% of them receiving SMS advertisements were considered deliberate purchases. Table 4 summarises the responses of the two types of purchase intentions.

Table 4   Percentage of two types of purchase behaviours

Product type	Purchase behaviour	High purchase intention (> 4) by % of subjects	
Apparel	Spontaneous purchase	SMS – 38	MMS – 41
	Deliberate purchase	SMS – 11	MMS – 10
Movie ticket	Spontaneous purchase	SMS – 28	MMS – 42
	Deliberate purchase	SMS – 18	MMS – 12

5   Discussions

In line with prior research reporting positive outcomes of multimedia in various fields, our exploratory findings provided some support for its application towards mobile advertising. Our proposed model is able to explain 43% of the total variability of intention to use, 33% of purchase intention, and 65% of attitude, which possesses enough explanatory power to make the interpretation of path coefficients meaningful. This research has uncovered the potential impacts of SMS vs. MMS on LBA usage intention and consumer spontaneous purchase intention. As shown in Table 4, more than two-thirds of the subjects would buy the product spontaneously and the percentage could be even higher in a real-life situation. It was also interesting to observe that the impacts of SMS and MMS on consumer purchase intention are different upon the product types (apparel product and movie tickets). Future research could be conducted to explore the potential effects of product type on applicability of SMS and MMS LBA.

The entertainment value of using LBA contributes predominantly to advertising value and favourable attitude formation. Among the two factors that were hypothesised 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 LBA as valuable if the advertising messages are perceived to be fun and entertaining. Nevertheless, targeted messages should also be of value in terms of relevance, personalisation and timeliness. The level of perceived irritation was found to negatively influence value perception. This finding is consistent with previous research in traditional and web-based advertising. However, the interpretation of this outcome needs to take into consideration of the limitations that the laboratory experiment was not able to fully operationalise the irritation factor in using LBA.

Our findings confirm the positive effects of multimedia on entertainment and informativeness in the context of LBA. 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. It is noteworthy that the path coefficient of format type to irritation is significantly strong. This finding supports our hypothesis that the level of perceived irritation toward MMS is high because of distraction and cognitive overload brought by multimedia elements.

As is the case with all laboratory experiments that simulate real-world decision making contexts under controlled conditions, there are limits to the generalisability of our findings. Nevertheless, our exploratory efforts represent one of the first attempts to examine LBA format types and its associated effects. Future researchers are encouraged to build upon our work and overcome its limitations in their future studies. Firstly, actual

adoption behaviour was not measured. Rather, we assumed, based on a significant body of prior work in technology adoption (Venkatesh and Speier, 1999) that intention was a good predictor of actual behaviour. To the extent that LBA is still at an early stage of diffusion, examining adoption intention instead of actual behaviour is appropriate and could yield more meaningful and fruitful lessons for marketers, consumers and providers of LBA alike. Secondly, our laboratory experimental design was also limited in its ability to study LBA adoption behaviour and purchase intention over a period. As the use of SMS and MMS become more widespread, a natural extension to our study would be to conduct a field experiment, possibly with the involvement and participation of a shopping mall. Thirdly, this current study only examines one form of multimedia (image) in comparison to text. Ample opportunities abound for researchers to vary the depth of multimedia content of LBA content, for instance contrasting the effects of image, banner-type animation and video clip. This will advance our understanding of the role of multimedia in LBA.

Our study has adapted the advertising value model formulated for the web context (Ducoffe, 1996) to the LBA domain. Results have contributed fresh insights to advertising literature through empirically testing it in a LBA context. As mobile devices become ubiquitous, it is imperative for marketing researchers to explore relevance of prior knowledge in the context of LBA setting. Ample future research opportunities exist to explore the potential effects of novelty (Berlyne, 1970; Lynch and Srull, 1982) on the effectiveness of LBA. Since the information channel of LBA could be relatively novel compared to other advertising channel, it may appear to be more salient and thus may capture larger amount of attention. While it is possible that the MMS format may be perceived as more novel than the SMS format and thus resulting in more favourable attitudes, we believe that this concern is somewhat mitigated in our study because more than 90% of our participants reported that they were very familiar with using SMS, MMS and other mobile applications. Thus, the novelty effects of MMS should not be a concern to this study. The findings also offer some insights for human–computer interface researchers. The current study examined the effects of format type upon entertainment, informativeness and irritation, and it should be noted these outcomes pertain mainly to the advertising message itself. LBA is truly unique in the sense that it involves the operation of a device (the mobile phone) to retrieve the advertising message. Hence, there can potentially be usability issues that can affect the perceptions of the entertainment, informativeness and irritation of the message. These are challenging research issues that should be examined.

With the availability of multimedia-enabled mobile devices in the market as well as advancements in the precision of location-based technologies, merchants who are eager to jump onto the LBA bandwagon should be mindful of the findings from this study. The LBA application designers need to be aware of the potential impacts of advertisement formats (SMS vs. MMS) on LBA usability and consumer purchase intention. This research sends contradictory signals to LBA application designers and marketers. On the one hand, it suggests that adding multimedia may impose a higher level of irritation. But, on the other hand, we have some evidence that MMS does enhance the informativeness and entertainment value of LBA. Hence, with multimedia as a double-edged sword, further research is needed to understand the tradeoff between reach and richness, which could help LBA designers and advertises realise when they need to overcome unfavourable attitudes toward the advertisement format – through a compelling creative approach, for example. To further explore the impacts of advertisement formats

(SMS vs. MMS) in the wireless marketing context, the dual persuasion model (Petty and Cacioppo, 1986; Booth-Butterfield et al., 1994) may be particularly useful.

LBA practitioners should also appreciate the dual role of mobile consumer as both a shopper and a technology user. This means that appropriate use of multimedia, interface design, and other elements of human–computer interaction may be just as important to retaining customers as good customer relationships and lower prices (Koufaris, 2002). Our results have provided some preliminary evidence to indicate that relevant, personalised and location-sensitive multimedia advertisements delivered to a consumer's mobile device will entice impulse buying to a certain extent. Limited by the simulated LBA experience, the effects of multimedia on spontaneous purchase in our study could be largely under-estimated. Despite this, the results have sufficiently indicated that MMS has vast potential to increase the entertainment value of LBA. It should also be noted that consumers still place high expectations on the information value of LBA, which suggests that merchants should personalise advertisements according to the consumers' preferences. In this study, we are concerned specifically with the value perceptions derived from the interaction with LBA advertisements delivered through SMS and MMS, which only form part of the overall perceived value of LBA. Practitioners should be aware that other factors such as social norms, personal characteristics, privacy concerns, location data quality and service dependability may also affect overall perceived value of LBA (Barnes, 2002; Katasonov, 2004).

6   Conclusions

Location-based technologies that are aware of the circumstances of the user can deliver advertisements in a productive, personalised and context-relevant way, deepening customer relationships. The convergence between marketing, customer relationship management and mobile commerce represents a potentially powerful platform for LBA. Notwithstanding, the key to success is the management of the content delivery upon user expectations. As an exploratory study, the findings of this research have provided preliminary empirical evidence about the possible effects of multimedia on consumer behaviour in a mobile commerce context. This research focuses on permission-based LBA via the 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. As we are just beginning to explore the advertising possibilities enabled by the 3G mobile networks, many parts of Asia and Europe have already launched 3.5G networks based on High-speed Download Packet Access (HSDPA) offering data rate up to 14.4 Mbps. Furthermore, the trend of convergence has also seen the increased adoption of smartphones with large PDA-type screen size equipped with data and voice communication capabilities. With such technological developments, the potential to offer multimedia location-based advertisements is truly immense and boundless. Hence, it would also be a challenge to continue improving the operationalisation of multimedia effects in a mobile commerce context and observe its impacts on entertainment, informativeness and irritation. More important, field research along the directions of this study is certainly a fruitful pursuit that will contribute towards validating our findings.

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Notes

[1]From this point onwards, we use the term LBA to mean permission-based push LBA. Our study focuses only on permission-based push LBA.

[2]The subjects were required to choose three of their interested shops or merchants located in a large 'brick-and-mortar' shopping mall when they were doing registrations. Ninety-seven percent of them showed interests in the apparel shop A and 99% of the subjects showed interests in cinema B.

[3]The three 7-point Likert scale items used as task check are: (1) I feel involved when I am completing the task, (2) the role that I am asked to assume is meaningful and (3) I enjoyed completing the task.

Appendix A (see online version for colours)