

Mobilizing Timely Location-Based Advertising: A Study of Effectiveness on Persuasion

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ABSTRACT

Various studies have examined the effects of SMS (e.g. Carroll, Barnes, and Fletcher, 2007; Varnali, Yilmaz, and Toker, 2012). However, the effectiveness of MMS, especially those focusing on how features such as localized search and real time services influence the psychological aspects of users, has received little attention. Moreover, due to the ubiquitously accessible and portable features as well as highly personal devices, it would be valuable to gain insights into consumers' perceptions of the impact of mobile advertising. Taken together, the goal of this study is to explore effect of mobile advertisements on persuasion. A two (type of mobile ads: SMS vs. MMS) \times two (location feature: with location-based service vs. without location-based service) \times two (timeliness feature: with immediate message vs. non-immediate message) between-subjects design was set up. The results showed that mobile phone users have greater attention, interest, desire and exhibit more favorable attitude for the brand as well as greater purchase intention when exposed to MMS with location-based and timely services than MMS with location-based but have no timely service. Interestingly, irritation mediates the relationship between the type of mobile advertisement and (1) attention, (2) interest, (3) desire, (4) attitude toward the brand and (5) purchase intention.

Keywords: SMS, MMS, Mobile advertisements, Location-based Service, Timeliness

INTRODUCTION

In an article from *The Economist* (2007), it was predicted that mobile advertising will be the next big thing. Mobile advertising returned to the spotlight since Google acquired AdMob in November, 2009. Due to ubiquitously accessible and portable features as well as highly personalized tools, mobile communication devices have become one of the most popular platforms to deliver advertisements today (Dhar and Varshney, 2011). Based on data released from International Telecommunication Union (ITU, 2013a), the number of global mobile subscribers in 2013 is expected to reach 6.8 billion. In other words, 96 percent of the world's population has a mobile cellular phone. In addition, in the U.S., there will be more than 1000 million cell phone subscribers in 2013 (ITU, 2013b). In Taiwan, according to the report from the National Communications Commission (NCC, 2013), the number of mobile phone subscribers in February 2013 had reached 29.4 million and the mobile phone penetration rate was 126.4 percent. With such a huge base of mobile subscribers, mobile phones can be viewed as yet another exploitable channel for marketers to reach consumers.

Over the past year, with advancements in information technologies, the mobile phone is more than just a tool to make and receive phone calls. With mobile phones capable of wireless services, users can utilize their phone to browse the web, read the news, send and receive e-mails, listen to radio stations, watch videos, engage in social networking, among many other uses. Based on a report from ComScore (2012), in July 2012, 110 million people in U.S. had a smartphone. It has grown 33 percent from 2011. In the mobile phone market, smartphone usage is the fastest growing. With the rapid increase of smartphone users and their advanced technological capabilities, it

can be said that smartphones boost the market of mobile advertising. The introduction of smartphones also enables marketers to develop better target marketing strategies.

Unlike mass media such as television and radio, mobile phones are a highly personalized medium. As personal devices, most people continuously and unconsciously carry one mobile phone 24 hours a day. Furthermore, under the trend of 3G and 4G mobile broadband and with the popular of Smartphone, mobile devices have ubiquitous features which enable users to use it flexibly depending on time and location (Barnes and Huff, 2003; Chen and Hsieh, 2012). Therefore, advertising can be delivered via mobile handsets along with ringtones, wallpapers, game downloads, web pages, video clips, short message service (SMS), multimedia message service (MMS), and various other innovative means. According to Gartner's report (2010), the value of the mobile advertising market is expected to grow to \$13.5 billion by 2013 from \$1 billion in 2009, which is more than a 10-fold increase. In the U.S., the mobile advertising market was valued at approximately \$416 million in 2009. Due to their ubiquitous nature, mobile phone marketing is continuously growing. As such, its potential cannot be ignored.

Based on Portio's research (2010), the value of global mobile messaging is expected to reach \$223 billion by 2014. Compared to other mobile messaging services (including multimedia messaging services, mobile e-mail and mobile instance message), short messaging services (SMS) are still the most widely used. According to the Portio Research (2010), global SMS traffic topped five trillion messages by 2009 and will be expected to exceed 10 trillion in 2013. In addition, due to the increased uses of camera phones and smart phones, multimedia messaging services (MMS) has seen significantly grown. MMS will amass revenue exceeding \$183 billion between 2012 and 2016 (cellular-news, 2012). For these reasons, it is important to learn whether MMS will become a critical part of marketing campaigns in mobile advertising.

Various studies have looked at the effects of SMS (e.g. Carroll, Barnes, and Fletcher, 2007; Muk, 2007; Ranjbarian, Gharibpoor, and Lari, 2012; Zhang and Mao, 2008). However, the effectiveness of MMS, especially those focusing on how features such as localized search and timeliness influence the psychological aspects of users has received little attention. Furthermore, today, with advanced mobile devices, mobile phones are capable of supporting complex advertising, leading to more innovative, customized, personalized, relevant and interactive mobile advertisements. Therefore, the impact of MMS advertising via mobile advertising deserves attention. Furthermore, based on media richness theory, the capacity of information delivery perceived by the user is the media's capacity for instant feedback, multiple cues, and level of personal focus (Trevino, Legel, and Deft, 1987). Greater media richness results in superior advertising effectiveness (Hopkins, Raymond, and Mitra, 2004). This research is poised to extend this line of research by examining whether mobile advertisements with photos, location-based services (LBS) and timely services are more likely to attract attention, induce interest, inspire desire, and provoke purchase actions than without. Furthermore, we also investigate whether irritation mediates the type of mobile advertisement and attention, interest, desire, attitude toward the brand and purchase intention. In previous interactive advertisement study (Wolin and Korgaonkar, 2003), researchers found that female consumers felt more annoying and offensive regarding web advertising than traditional advertising, because they were more likely to worry the privacy issue. In the same vein, the current study, the negative affect such as irritation from the personalized advertising can be a possible mediator in the persuasion process.

LITERATURE REVIEW

Mobile advertising

Mobile advertising is a form of advertising delivered on a mobile phone or other mobile devices (Aalto, Göthlin, Korhonen, and Ojala, 2004). Generally, each mobile phone has one user so mobile phone is viewed as a highly personal device which allows users to be reached anywhere and anytime (Tsang, Ho and Liang, 2004). Mobile phones are not only a personal device, but also an accurate target communication channel since advertisements can be delivered to mobile phone users in the appropriate time and place using interactive interfaces, compared to other media, mobile phones facilitate more precise targeting and tracking (Bauer, Barnes, Reichardt, and Neumann, 2005). Specifically, advertisers can design more measurable, precise, customized, personalized, relevant, and interactive advertisements compared to traditional media. It appears that mobile phones are a unique platform for advertisements. Regarding delivery formats, mobile advertisements can be sent in some forms such as SMS, MMS, mobile video and TV advertising, and mobile gaming advertisements (MMA, 2011). As SMS and MMS are the major types of mobile messages, the current research focuses on these two formats of mobile advertisements.

Short Messaging Service (SMS) & Multimedia Messaging Service (MMS)

Mobile telecommunications can be viewed as an advertising medium. The types of mobile advertisements include: 1) static text or clickable text advertisements; 2) static graphical banners or clickable graphical banners which are similar to banners on websites; 3) mobile video advertising; and 4) mobile TV advertising (MMA, 2011). In addition, mobile advertisements can be coupled with ring tones or wallpapers and placed within games on mobile devices. More amusing advertising such as “advergaming” can increase the entertaining effects and thus enhance consumers’ acceptance of the advertisements (Cheng, Blankson, Wang, and Chen, 2009). Therefore, the mobile phone can be viewed as a prominent personal media and as an entertainment platform (Saadeghvaziri and Hosseini, 2011). As shown, advertising messages are delivered in several different formats. There are two major types of mobile-message advertising: short messaging service (SMS) and multimedia messaging service (MMS). Short message service (SMS) is a text-only messaging service and is limited 160 characters (Raacke and Bonds-Raacke, 2011).

Compared to SMS, MMS is a more advanced and complex messaging service that supports multimedia – photos, audio, or video along with a text message (Trappey III and Woodside, 2005). In order to accommodate MMS, mobile devices must have functions such as a digital camera, color screen, and media player (iReach, 2005, cited from Nasco and Bruner, 2008). Both SMS and MMS enable individual users to send messages to one or more receivers at simultaneously. Prior research has investigated the effect of SMS and MMS (e. g. Koo, Knight, Yang, and Xiang, 2012), rare research further investigate SMS and MMS with specific characters of mobile advertisements. Time and distance are two crucial aspects when commercial messages are delivered. Therefore, the current research examines the effect of SMS and MMS with location based service (LBS) and timely service.

Mobile Local Search

Pertaining to location-based services, mobile phones with location-based service features can accurately detect and identify users’ current locations due to Global Position System (GPS) technology that can ascertain users’ positions with accuracy (Iddris, 2006). With these location-based search services, users can enter search criteria pertaining to their current locations into their mobile phones (Li and Du, 2012). The search engine will respond with a list of relevant locations and contact details based on users’ current locations so that they can easily find a restaurant, store or movie theater close to their current location via their mobile phones (Barnes, 2002). Furthermore, consumers’ can be informed about new and relevant product information in order to induce impulse purchases (Bauer, Barnes, Reichardt, and Neumann, 2005). Advertisers can therefore exploit users’ locations to send localized relevant information to them to various marketing benefits (Gao, Rau, and Salvendy, 2009). According to the literature review, the conceptual definition of LBS in the current research is to detect the locations of users’ position and the advertised restaurants and to show the map or direction.

Timeliness

The essential attribute of m-commerce is ubiquity which indicates that receiving or delivering message is quick and immediate no matter in which location (Okazaki, and Mendez, 2012). A timely service is important in avoiding consumers’ perception of intrusiveness (Javid, Namin, and Noorai, 2012). For purposes of the study, the concept of timeliness is different from the concept of real time. An effective advertisement does not have to be viewed in real time to be timely. Importantly, as long as the advertising message is still immediately relevant to the recipient and within the immediate effective time period of the message, it is considered timely. For this reason, we use the term timeliness in this study to capture a broader concept since the use of real time advertisements may be misleading: a timely advertisement may not be seen entirely in real time, perhaps even with a lag of just a few seconds. Such short time lags are often critical in today’s viral advertisements on platforms. Carroll et al. (2007) found that participants consider time as a key factor in their acceptance of mobile messages. When a mobile message is delivered at times suitable for consumers, this can reduce perceived intrusiveness. Specifically, when the immediate message fits customers’ temporal and special circumstances, the chance of accepting advertisement increases. Therefore, timing is essential when delivering mobile advertisements. In addition, Barwise and Strong (2002) pointed out that mobile advertising should not only provide tailored information based on individuals’ needs, wants, and desires, but also offer instantaneous access to product information. This is dependent on users’ willingness to share personal information such as age, gender, interests, position, and income levels. Coupons are often the best way to convince consumers to provide personal information (Mahatanakoon, Wen, and Lim, 2005). The timely mobile message can be viewed as information that fits consumers’ temporal circumstance. Therefore, the conceptual definition of timeliness is immediate and related instantaneous.

According to these attributes of mobile phone, minimal attention has been given to the effect of SMS and MMS with special features such as location-based service and timeliness service in relation to advertising effects in the context of mass communication. It would be valuable to investigate whether the type of mobile advertisements with location-based service and timeliness have an impact on persuasion effects. In addition, owing to the small screens and mobile-formatted content, generally only one page with one advertisement can be displayed at any one time. The means to draw viewers' attention and interest is important. With a wide variety of mobile advertising, it is critical to understand consumers' attitudes towards different types of mobile advertising and their purchase intention towards the mobile advertised brand. It would be interesting to explore how consumers react to those types of mobile advertising and which type of mobile advertising has great persuasion effect. Furthermore, based on media richness theory, greater media richness results in superior advertising effectiveness (Hopkins, Raymond, and Mitra, 2004). The theory was introduced in the following section.

Media Richness Theory

Media richness theory (MRT) was proposed by Daft and Lengel in 1984. Their study was the first to discuss the concept of information richness by exploring whether the media is capable of transmitting rich information. The results lead to the emergence of MRT, which is also known as information richness theory. The main concept of this theory is that the selection of media should be based on two criteria: media richness and information complexity (Daft and Lengel, 1984). In other words, when organization members anticipate reducing information ambiguity and uncertainty, they reduce the gap between the amount of information required and the amount of information actually received by selecting appropriate communication channels. Information with high media richness is a key factor for ensuring effective communication and achieving organizational goals (Daft and Lengel, 1984). When extended to marketing strategies, this concept indicates that the level of media richness also affects the effectiveness of marketing advertisements. For example, Jacob, Guéguen, and Petr (2010) examined the relationship between the level of media richness on travel websites and user evaluations. Their results indicated that travel websites with the highest level of media richness and received greater evaluations from users featured 360° mouse navigation and incorporated various types of street sounds into the browsing process (e.g., birds chirping and human voices). This shows that media richness has a significantly positive effect on travel websites, which further benefits city tourism.

MRT theory classifies media according to richness. When the degree of task ambiguity and uncertainty is high, a richer media rather than a leaner media should be selected. The level of media richness can be determined using the following criteria: instant feedback, multiple cue, language variety, personal focus (Trevino, Legel, and Deft, 1987). This study verifies whether comparatively richer mobile advertising media achieves greater advertising effectiveness by applying the MRT. In this study, media richness was measured by defining the number of multiple cues provided by the mobile advertisement, the ability to generate instant feedback, and the level of personal focus. These three indices were defined in this study as follows. (1) instant feedback: whether the media provides the user with the perception of instant information transmission and reception; (2) multiple cues: the level of non-verbal cues perceived by the user from the mobile information, including photo and maps; and (3) personal focus: the user's ability to locate personalized information through mobile phone functions, such as location-based service.

Few studies have looked at the application of MRT to examine the effect of mobile advertising. One recent study examined if media richness increase positive affect of mobile device usage (Li, Dong, and Chen, 2012), and found that high-quality and timely information carried by mobile communication did generate positive emotion and enjoying feeling. Even though those study focused on the general mobile device usage rather than mobile advertising which is targeted in current study, that finding provided an interesting perspective that media richness brings a positive impact on the users' cognition process, especially for information and entertainment seeking behaviors on mobile device. In this paper, we expect new communication technologies to provide the material capacity to drive the perception of information richness. This facilitates the persuasive cognition process, especially with the combined effect of different media to achieve a bigger impact. As an extension of the literature, we explore more recent technologies, such as MMS, LBS and timeliness services on mobile communication to examine the effects on persuasion.

Attention/Interest/Desire/Action

Attention, interest, desire and action were treated as dependent variables in this research. The AIDA (Attention, interest, desire, action) model was proposed by Elmo Lewis in 1898 (Strong, 1925). The model demonstrates

that individuals process messages in three hierarchical stages, (including attention, interest, and desire) towards a purchase decision on advertised products (Ungerer, 2004). The first stage of the AIDA linear model is to gain attention. Everyday consumers are bombarded with plenty of commercial messages. Due to consumers' limited cognitive capacities, individuals have to selectively process such information. In order to get consumers' attention, advertisers strive to design more attractive messages. Upon capturing consumers' attention, the next step is to generate interest. The means to raise the consumer's curiosity about commercial messages and to have an obsession with the advertised product is a challenging task for marketers (Schaefer, Parker, and Haytko, 2010). The third stage in the continuum is to create individuals' desires and to convince consumers that the advertised products can fit their needs and satisfy their wants. Lastly, the final stage is about making a purchase decision. All promotions attempt to stimulate consumers' purchase intentions on the product or service advertised.

The reason for applying this model to demonstrate dependent variables is that the AIDA formula is considered a conventional prototype for marketing strategy in traditional media (Preston, 1982). The goal of each advertisement is expected to achieve these four stages in order to be considered as persuasion effect (Ungerer, 2004). Furthermore, limited studies have used the AIDA framework to examine the effects of mobile advertising on persuasion. Therefore, it would be valuable to applying this model to investigate whether mobile advertisements that utilize pictorial texts, location-based services, and timeliness are more likely to attract consumers' attention, arouse their interest, generate interest, and thus transform their desires into enhancing consumers' purchase intentions, compared to typical SMS. Based on the preceding literature review, the hypotheses were tested in this study.

HYPOTHESES

Advertising messages are generally viewed as intrusive when receivers feel that they are interrupted (Tsang, Ho and Liang, 2004). However, if the messages are instantaneously relevant to consumers and they can get some benefits such as coupons, consumers' irritation will be reduced and are more inclined to accept the messages (Patel, 2001). Moreover, multimedia messages lead to more favorable attitude compared to text messages (Xu, Oh, and Teo, 2009). Therefore, whether consumers accept mobile phone advertisements depends on whether the messages are attractive, related, and instant to them. Three attributes of mobile advertisements are examined in this current research. First is the type of mobile advertising. Capturing consumers' attention is important when delivering commercial messages via a mobile phone. Message which is concise, funny, along with vivid pictures would be effectively increase consumers' interests (Kalakota and Robinson, 2002). Based on the finding of Liu and Stout (1987), words with pictures are more likely to induce more favorable attitudes than words alone. Similarly, Nasco and Bruner II (2007) indicated that text with pictures in mobile content is more likely to provoke positive attitudes than content involving text only. Koo, Knight, Yang, and Xiang (2012) demonstrated that MMS evokes more perceived entertainment than SMS. Sung and Cho (2012) also found that motion pictures on mobile advertising have more influence on advertising attitudes than only text-based SMS. Consequently, based on these rationales, the first hypothesis was developed as follows:

H1: Mobile phone users are likely to have more attention, interest, desire and more favorable attitude for the brand as well as greater intention to purchase the product when exposed to MMS than SMS.

Second, to clarify whether this message is intrusive or helpful can be determined by whether operators identify users' location and deliver individuals' message through GPS technology (Mahatanankoon, Wen, and Lim, 2005). With GPS technology, location-based service enable users actively search or select their prefer information (Mahatanankoon, Wen, and Lim, 2005). The location-based service empowers the consumer to personalize relevant information. This design can reduce the number of irrelevant and spam messages (Gao, Rau, and Salvendy, 2009). Shoaibi and Rassan (2012) found that mobile advertising using location based services (MALBS) active a two-way communication between user and marketers to deliver high-personalized messages. Therefore, the current research considered that embedding location services within mobile advertisements further increases the likelihood of a relevant relationship with consumers. Thus, mobile advertisements providing location-based services are more persuasive than those without location-based services. Drawing from this perspective, the following hypothesis is advanced:

H2: Mobile phone users are likely to have more attention, interest, desire and more favorable attitude for the brand as well as greater intention to purchase the product when exposed mobile advertisements presenting location based service than those without location-based service.

Third, whether the mobile commercial message is immediate and related instantaneous plays an important role in influencing consumers' perception of intrusiveness because the immediate and timely messages may help to minimize the time consumers spend on finding a good deal during shopping (Ververidis and Polyzos, 2002). Bauer, Stuart, Reichardt, and Neumann (2005) indicated that there is a positive correlation between consumers' perceived utility of timely and their willingness of receiving mobile advertisements. If mobile user can choose when they would like to receive commercial messages, then this kind of service can decrease the level of intrusiveness. Based on literature review, it is expected that when consumers receive related mobile advertisements instantaneously, the advertisements are more likely to increase consumers' attention. The timely advertisements can enhance the positive impact on consumers' perception of mobile advertisements and thus further increase consumers' positive attitudes towards them. In other words, mobile advertisements delivering relevant and just-in-time messages can increase, strengthen, and maintain relationships between consumers and brands. Therefore, there is a greater persuasion effect when mobile advertisements deliver relevant and just-in-time messages. Thus, the following hypothesis is advanced:

H3: Mobile phone users are likely to have more attention, interest, desire and more favorable attitude for the brand as well as greater intention to purchase the product when exposed mobile advertisements with timely services than those that are not.

With respect to interaction among type of mobile advertisements, location feature, and timeliness feature, Conti, Jennett, Maestre, and Sasse (2012) based on grounded theory model to demonstrate that location and timeliness are two important factors to determine whether receiver accepting and rejecting an mobile message. Xu, Liao, and Li (2008) also considered that based on users' location, delivering timely personalized advertising can improve users' attitude toward mobile advertisements. Furthermore, in addition to increased perception of usefulness, richer content may result in users having more positive affective responses toward persuasive content (Hopkins, Raymond, and Mitra, 2004). Current studies imply perception of satisfaction (Sun and Cheng, 2007) and sense of flow to interpret the influence of media richness (Liu, Liao and Pratt, 2009). Even though these two theoretical constructs may be different, both suggest that rich media leads to positive and pleasant experiences. It is reasonable to argue in this study that mobilizing timely location-based advertising provides rich information, thus letting users exhibit a more positive attitude for the brand as well as a greater willingness toward media exposure. This exposure encompasses attention, interest, desire, and purchase intention. Therefore, this paper raised the point that mobile advertisements with location-based and timely services can fulfill consumers' needs and wants. Delivering timely and location-sensitive targeted mobile advertisements will not only draw consumers' attention but also heighten their interests in the advertisements. In this way, greater persuasion effects will be induced. Specifically, the mobile advertisement that is offering timely personalized services and applying the LBS function is more convincing than mobile advertisements without those services. Consequently, the following hypothesis is proposed.

H4: Mobile phone users are likely to have more attention, interest, desire and more favorable attitude for the brand as well as greater intention to purchase the product when exposed MMS with location-based and timely services than MMS with location-based but without timely services.

Irritation, perceived usefulness, and entertainment are the essential factors of young people' mobile advertising acceptance (Marti-Parreño, Sanz-Blas, Ruiz-Mafe, and Aldás-Manzano, 2013). Especially, irritation in advertising has a complicated influence on advertising effectiveness (Aaker and Bruzzone, 1985). Scholars argue that commercial density, commercial type and individual differences such as the need to evaluate are three factors to cause irritation (Fennis and Bakker, 2001). Irritation in advertising should not be taken as an absolute negative for persuasion effectiveness. On the one hand, the perception of irritation may lead to consumers' negative affect and dislike for commercials, products, or brands, which may reduce the effectiveness of the advertisement. On the other hand, empirical evidence shows that an irritating advertisement has stronger persuasion effectiveness than a neutral one. Nonetheless, a well-liked advertisement is still the most effective. A plausible explanation is that consumers might forget the association between the perception of irritation and the advertisement, but the deep impression of that advertisement leaves a sleep effect on the consumers. But the

explanation of sleep effect seems unsuitable to explain consumers' immediate responses to an irritating message. Some scholars consider irritation as a double-edged sword. Ducoffe (1996) contended that irritation has an indirect and positive impact on attitudes toward web advertising, even though the irritation itself lowered the advertising value, which has a mediating effect between irritation and attitudes toward advertising. Similarly, Xu et al. (2009) examined the role of irritation in location-based advertising, and found that multiple media did increase irritation but two other values – informativeness and entertainment – were increased at the same time. This benefited the effectiveness of advertising. Their results also suggested that irritation has an indirect impact on attitude as well as intentions to purchase and to use.

Based on the literature, we argue that irritation can influence the cognition processes of attention, interest, desire, attitude, and purchase intention. Furthermore, in this study, the types of advertising (timely and location-based MMS advertisements and general SMS advertisements) are also deemed to cause varied levels of irritation. The former type of advertisement is more immediate and fits consumers' needs better than the latter; however, an annoying feeling or a worry about privacy may be generated simultaneously. To sum up, we sought to explore whether the effectiveness of the type of advertisement on the variables - attention, interest, desire, attitude, and purchase intention - is mediated by irritation. More specifically, this study looks at whether timely and location-based MMS advertisements may cause higher irritation and higher levels of attention, interest, desire, attitude toward the brand, and purchase intention. From the preceding discussion, the following research question was advanced:

RQ1: Will irritation mediate the relationship between the type of mobile advertisement and (1) attention, (2) interest, (3) desire, (4) attitude toward the brand and (5) purchase intention.

RESEARCH METHODS

Design & Procedures

A 2 (type of mobile advertisements: SMS vs. MMS) × 2 (location feature: with location-based service vs. without location-based service) × 2 (timeliness feature: with immediate service vs. non-immediate service) between-subjects design was conducted. A total of 163 participants were recruited from undergraduate courses at a national university in Taiwan. All of participants were randomly assigned into one of the eight conditions. This experimental design is aimed at examining the impact of mobile advertising on attention, interest, desire, purchase intention, attitudes towards the brand and purchase intention.

In regards to the manipulation of the variable timeliness service, in order to let the mobile message to fit consumers' temporal circumstance and to be considered as an immediate and related instantaneous mobile message, in timely conditions, participants were asked to imagine the following dining out scenario: "*It is the beginning of the new semester. Teachers and students will dine out to enhance teacher-student relationships. This activity will be held tomorrow night. The budget for this activity is limited. In addition, a location near the main campus is encouraged. In order to select a good restaurant, each student, including you, will be asked to suggest one venue. Please suggest a good restaurant with affordable prices for this activity.*" On the other hand, in the non-immediate condition, participants were not provided the scenario-dining out in order to let the mobile message to be not viewed as an advertisement that immediately fits consumers' needs.

The four versions of messages in the immediate and the non-immediate conditions, respectively, were designed in the same way with an exception to the two factors. First, they differ based on the manipulation of the types of mobile advertisements, SMS vs. MMS. In half of the versions, the advertisements are text messages only, whereas in the other half, the advertisements are text messages with pictures of the pizza and chicken drumstick were provided (See Appendix A). Text message is that *Pizza Hut National Chiao Tung University store celebrates the start of the new semester. Enjoy 50% off with free fried chicken within 7 days. Limited availability. Hurry!* Second, concerning location-based services, in half of the versions, messages with LBS was provided. When participants click the bottom-map or direction (map is show in the MMS condition whereas direction which is only text is presented in the SMS direction. See Appendix A and B), LBS function will be activated and then the map or the direction will be demonstrated on next screen. In addition, the map will show participant's current location and the location of *Pizza Hut*. On the other hand, in the other half, the message does not provide LBS.

Measures: Dependent Variables Attention/Interest/Desire/Action

From the preceding literature review, there is no specific scale to measure attention, interest, desire, and action (AIDA). Therefore, regarding the AIDA framework, each of items was developed to measure those variables using modified scales (e.g. Waldt, Beer, and Plessis, 2007; Schaefer, Parker, and Haytko, 2010). Attention, interest, and desire was measured on six 7-point Likert-type scale from 1 (not at all) to 7 (very much), respectively. Participants were asked to indicate degree what they perceive the mobile advertisement. The questions are as follows: *This mobile advertisement attracted my attention to the product advertised; I gave more attention to the mobile advertisement. I am interested in this mobile advertisement. I want to know more about this mobile promotion. I desire this mobile advertisement. Advertisements delivered via mobile device are more desirable to me.* The scores were averaged to generate mean scores of attention and desire (Cronbach's α was .87 and .87). Regarding action, this study measured purchase intention instead. Purchase intention was assessed using two Likert-type scales from 1 (not at all) to 7 (very much), asking the extent to which they would consider buying the product soon and in the future (Meyers-Levy and Maheswaran, 2004). The scores were averaged to become a mean score of intention to purchase the product (Cronbach's α = .87).

Brand Attitude

Except for attention, interest, desire and purchase intention, brand attitude was also assessed on three 7-point Likert-type scales anchored by (1=*negative, unfavorable, bad*; 7=*positive, favorable, good*) (Lee and Aaker, 2004). The scores were averaged to generate a mean score of brand attitude (Cronbach's α = .92).

Irritation

Irritation was measure by the scale from Ducoffe (1996) and Chen and Wells (1999). This variable was assessed on a Likert-type scale from 1 (not at all) to 7 (very much), asking the degree to which the participant perceived the advertisement to be: cumbersome, annoying, and irritating. The scores were averaged to generate a mean score of irritation (Cronbach's α = .78).

RESULTS

The participants were recruited from a major university. Among the total number of participants, two participants who did not complete the study were excluded from the analysis. Therefore, 163 participants were assessed (64 males; 99 females). Within this sample, ages ranged from 18 to 31 years ($M = 21.12$). With respect to majors, 31.3% reported being in mass communication, 23.3% were in humanities and social sciences, 20.2% were in foreign languages, engineering management were 19.6, and 5.6% were in other majors. Manipulation checks, t-test and MANOVA tests were used to examine the hypotheses.

Manipulation Checks

Manipulation checks were conducted to ensure that the location feature (with location-based service vs. without location-based service) and timeliness feature (with immediate service vs. non-immediate not-just-in time service) are manipulated successfully. Manipulation checks on location-based service were measured by asking participants to indicated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree) the degree to which they felt "*this message shows you the location of the Pizza Hut; this message shows you the direction from your current position to the Pizza Hut.*" Manipulation checks on timely message were assessed on a Likert-type scale from 1 (strongly disagree) to 7 (strongly agree), asking participants the degree to which they felt "*this message is delivered at times suitable for you; this message is delivered instantaneously based on your need*" Independent sample t-tests were used separately. The analysis yielded a significant effect for location and timeline features, respectively. Participants who received a message which is location-based service were more inclined to agree that the message was shown location-based service, compared to those who got a message without a location-based service (\bar{X} : 3.94 vs. 3.41, $t = 3.16$, $p < .01$). Participants who received a message that was a timeliness-based service were more likely to agree that this is a immediate message, compared to those who got a message that did not incorporate a just-in-time service (\bar{X} : 3.81 vs. 3.47, $t = 2.05$, $p < .05$). These results suggest that the manipulations worked as expected.

Hypothesis Testing

To test the hypotheses, a 2 (type of mobile advertisements) \times 2 (location feature) \times 2 (timeliness feature) multivariate analysis of variance (MANOVA) was used to examine several dependent variables, including

attention, interest, desire, purchase intention, and brand attitude. Follow-up planned contrasts were also conducted to investigate the differences in the means among dependent variables across conditions. Results from the MANOVA indicated that there were significant main effects of type of mobile advertisement and the timeliness feature (*Wilks' Λ* = .80, $F(5, 146) = 7.31$, $p < .001$, partial $\eta^2 = .20$ and *Wilks' Λ* = .92, $F(5, 146) = 2.51$, $p < .05$, partial $\eta^2 = .08$, respectively). These results are summarized in Table 1.

Subsequent univariate analyses indicated that type of mobile advertisements had significant effect on attention, $F(1, 150) = 37.20$, $p < .001$, partial $\eta^2 = .20$, interest, $F(1, 150) = 16.18$, $p < .001$, partial $\eta^2 = .10$, desire, $F(1, 150) = 19.56$, $p < .001$, partial $\eta^2 = .12$, brand attitude, $F(1, 150) = 4.91$, $p < .05$, partial $\eta^2 = .10$ and purchase intention, $F(1, 150) = 16.81$, $p < .001$, partial $\eta^2 = .10$. Follow-up planned contrasts separately showed that mobile phone users were more likely had greater attention $\bar{X} : 4.63$ vs. 3.49 , $t = 6.10$, $p < .001$, interest $\bar{X} : 4.33$ vs. 3.60 , $t = 4.02$, $p < .001$, desire $\bar{X} : 4.00$ vs. 3.13 , $t = 4.42$, $p < .001$ and more favorable attitude for the brand $\bar{X} : 4.82$ vs. 4.43 , $t = 4.10$, $p < .001$ as well as greater purchase intention $\bar{X} : 4.22$ vs. 3.48 , $t = 2.22$, $p < .05$ when the message was an MMS than when it was an SMS. Therefore, there was sufficient evidence to support H1.

Similarly, subsequent univariate analyses indicated that the timeliness feature had a significant effect on attention, $F(1, 150) = 9.73$, $p < .01$, partial $\eta^2 = .06$, interest, $F(1, 150) = 9.77$, $p < .01$, partial $\eta^2 = .06$ and desire, $F(1, 150) = 5.42$, $p < .05$, partial $\eta^2 = .04$. Follow-up planned contrasts separately showed that mobile phone users were more likely had greater attention $\bar{X} : 4.35$ vs. 3.77 , $t = 3.12$, $p < .01$, interest $\bar{X} : 4.25$ vs. 3.68 , $t = 3.13$, $p < .05$ and desire $\bar{X} : 3.80$ vs. 3.33 , $t = 2.33$, $p < .05$ when the message contains a timeliness feature than when the message does not. However, subsequent univariate analyses showed that the timeliness feature did not have a significant effect on attitude towards the brand, $F(1, 150) = 1.39$, $p = .24$, partial $\eta^2 = .01$ and purchase intention, $F(1, 150) = 2.85$, $p = .09$, partial $\eta^2 = .02$. Therefore, there was insufficient to support H2. However, the pattern exists in which mobile phone users were more likely to have more favorable attitude for the brand $\bar{X} : 4.73$ vs. 4.52 , $t = 1.18$, $p = .24$ and greater purchase intention $\bar{X} : 4.00$ vs. 3.70 , $t = 1.69$, $p = .09$ when the message had a timeliness feature than when the message did not. Therefore, H2 was mostly supported.

With respect to interaction effects, the MANOVA indicated that there was significant three-way interaction among type of brand, location feature, and timeliness feature, *Wilks' Λ* = .92, $F(5, 146) = 2.51$, $p < .05$, partial $\eta^2 = .08$. Subsequent univariate analyses indicated that three-way interaction had significant effect on attention, $F(1, 150) = 8.61$, $p < .01$, partial $\eta^2 = .05$, interest, $F(1, 150) = 4.71$, $p < .05$, partial $\eta^2 = .03$, desire, $F(1, 150) = 5.51$, $p < .05$, partial $\eta^2 = .04$, brand attitude, $F(1, 150) = 8.67$, $p < .01$, partial $\eta^2 = .06$ and purchase intention, $F(1, 150) = 6.52$, $p < .05$, partial $\eta^2 = .04$. Follow-up planned contrasts separately showed that mobile phone users were more likely had greater attention $\bar{X} : 5.82$ vs. 4.08 , $t = 6.66$, $p < .001$, interest $\bar{X} : 5.05$ vs. 3.80 , $t = 3.97$, $p < .001$, desire $\bar{X} : 5.18$ vs. 3.48 , $t = 5.64$, $p < .001$ and better favorable attitude for the brand $\bar{X} : 5.24$ vs. 4.52 , $t = 3.23$, $p < .01$ as well as the greater purchase intention $\bar{X} : 5.08$ vs. 4.20 , $t = 5.52$, $p < .05$ when the message was an MMS with location-based and timely services than when the message was an MMS with location-based but without timely services. Furthermore, MMS with location-based and timely services have the greatest persuasion effect than other 7 formats of the messages including MMS with LBS but without timely service, MMS with timely service but without LBS, MMS without location-based and timely services, SMS with location-based and timely services, SMS with LBS but without timely service, SMS with timely service but without LBS, SMS without location-based and timely services.

However, results from the MANOVA indicated that the main effect of the location-based feature was not significant as expected (*Wilks' Λ* = .95, $F(5, 146) = 1.42$, $p = .30$, partial $\eta^2 = .05$). These results are summarized in Table 1. In sum, the preceding results revealed the main effects of different types of mobile advertisements. Mobile advertisements with a timely service, and those with interactions among the types of mobile advertisements, timeliness features and location features have a significant effect on persuasion.

In RQ1, irritation was hypothesized as a mediator between types of advertisement and the dependent variables, including attention, interest, desire, willingness to purchase, and attitude toward brand. The type of mobile advertisement was operationalized in two conditions. The first condition comprised timely and location-based MMS advertisements. The second condition comprised general SMS advertisements without location-based services. The latter were delivered to recipients at random times without consideration given to recipients' needs and wants. In the data analysis, the timely and location-based MMS condition was coded as 1, while the general SMS condition was coded as 0.

A series of regression analyses were conducted. The results showed that the types of ad had significant direct effects on attention ($\beta = 2.49, p < .001$), and irritation ($\beta = 1.63, p < .001$). After controlling for irritation, the type of ad continued to have a significant effect on attention ($\beta = 1.79, p < .001$). However, irritation as a partial mediator was confirmed by the Sobel test ($z = 2.51, p < .001$). Similar procedures were conducted for testing the mediational effect of irritation on between type of ad and other dependent variables, including interest, desire, willingness to purchase, and attitude toward brand. The results showed that the types of ad had significant direct effects on interest ($\beta = 21.79, p < .001$), desire ($\beta = .73, p < .001$), willingness to purchase ($\beta = 1.87, p < .001$), and attitude toward brand ($\beta = 1.10, p < .05$). After controlling for involvement, the type of ad ceased to show a significant effect on attitude ($\beta = .37, p > .05$). However it continued to show a significant effect on interest ($\beta = .65, p < .05$), desire ($\beta = 1.28, p < .01$), and willingness to purchase ($\beta = 1.29, p < .01$). The Sobel test confirmed the above partial mediating effects, interest ($z = 4.39, p < .001$), desire ($z = 2.85, p < .001$), and willingness to purchase ($z = 2.20, p < .05$) (See Figure 1). In conclusion, with the type of ad as a predictor, irritation had significant mediating effects on attitude, and partial mediating effects on attention, interest, desire, and willingness to purchase.

DISCUSSION AND CONCLUSION

This study examined the impact of mobile advertisements on persuasion. Specifically, the goal of this investigation was to assess whether the type of mobile advertisements (SMS and MMS), location-based services, and timely services influence the persuasiveness of mobile advertising. In the study, SMS and MMS on a pizza promotion were manipulated through the location feature (location-based service vs. without location-based service) and the timeliness feature (with immediate service vs. non-immediate service). Participants' assessments of the mobile advertisements were measured in terms of attention, interest, desire, purchase intention, and brand attitude. The interpretation of results, theoretical and practical implications, limitations, and possible directions for future research are described in this section.

Type of Mobile Ads/Location Feature/Timeliness Feature on advertising Effect

The results provided sufficient evidence to support some of the hypotheses. Pertaining to the type of mobile advertisements, the findings were consistent with H1, demonstrating that mobile phone users were more likely to be persuaded by MMS than SMS. Specifically, mobile phone users exhibited more attention, interest, desire and more favorable attitudes towards the brand, as well as greater intention to purchase the product when exposed to MMS compared to SMS advertisements. The results are consistent with MRT and support Lin and Stout (1987) and Nasco and Bruner II (2007) perspectives, which postulated that text with pictures was more likely to induce positive attitudes. Therefore, although SMS messages are more heavily utilized in mobile advertisements today, MMS messages are expected to become the primary approach in mobile marketing campaigns. Transforming the mobile phone into a persuasive medium is an important dimension in mobile marketing campaigns.

Pertaining to the timeliness feature, partial support was found for H3, demonstrating that mobile phone users were more likely to be persuaded by mobile advertisements with a timely service than those without. The results reveal that mobile phone users were more likely to exhibit greater attention, interest, and desire when the message contained the timeliness feature than when the message did not. The findings are conceptually consistent with Barwise and Strong's (2002) argument: In order to have a greater persuasive effect, mobile advertising should contain timely, personalized messages and also offer consumers instantaneous access to product-related information. Furthermore, based on the MRT, instant feedback and personal focus are two criteria of the level of richness in media content (Trevino, Legel, and Deft, 1987). The findings suggest that mobile messages should be instantly delivered at a time that is suitable for receivers. This result echoes the theory, which demonstrates that the level of instant feedback and personal focus can influence the level of media richness.

However, mobile advertisements with a timeliness feature did not significantly yield a stronger attitude towards the brand and purchase intention, but the pattern exists in which mobile phone users were more likely to exhibit a stronger attitude for the brand when the message contained a timeliness feature than when it did not. A plausible explanation is this may have been caused by participants not being interested in this brand, but were attracted by the mobile message due to the timeliness feature. If the mobile advertisement is related to another restaurant promotion and this mobile message also immediately fits customers' temporal and special circumstances, participants might exhibit a more favorable attitude towards the message rather the brand. Therefore, regardless of the brand, once the messages are immediate and the information based on consumers' need is timely, consumers will have a positive attitude towards those advertisements.

With respect to location-based services, the findings in this study did not provide sufficient evidence to support H₂. However, a pattern was found, showing that mobile phone users were more likely to be persuaded by mobile advertisements presenting location-based service than those without. An explanation of this result is that while exploring mobile advertisements without location-based services, participants might have already known about the Pizza Hut restaurant near the main campus. This made the means of the condition of mobile advertisements with location-based services and the condition of mobile advertisements without no different from each other. In order to demonstrate an effective location-based service, a feature study can show a list of relevant locations to allow participants to choose the restaurant that they are interested in to show that providing location-based personalized services is an important dimension of mobile advertising (Chae and Kim 2003).

In regards to the interaction among different types of mobile advertisements, there was sufficient evidence to support H₄ which hypothesized that mobile phone users are more likely to have greater attention, interest, desire and exhibit a more favorable attitude for the brand as well as greater purchase intention when exposed to MMS with location-based and timely services than MMS with location-based but have no timely service. The information processing theory provides a further explanation. The degree of consumers' perceived relevance influences their need for information and also shapes their positive attitudes towards the information when the advertisement tailors to their interests (Burnkrant and Sawyer, 1983; Wang, 2006). Rau, Zhang, Shang, and Zhou's (2011) findings show that a higher degree of message relevance would generate more positive attitudes towards the message and yield stronger intentional behaviors. Based on current findings, the means to transform an intrusive message to one that is effective is a big challenge for marketers in running mobile marketing campaigns. According to multi-dimensional-personalization perspective, studies pointed out that individual interest, location which and time are the three dimensions for personalization (Schilke et al, 2004), and mobile advertising is ideal to combine all three dimensions. Effective personalized mobile advertising should avoid overloading receivers with irrelevant and annoying commercial messages (Chae and Kim, 2003; Ho, 2010). Therefore, the marketer should design these campaigns based on the features of timely and location-based services. With just-in-time and location-based service, mobile messages can be personalized or customized to fit different needs and wants among various consumers. Specifically, by applying MRT to examine the effect of mobile advertising, the findings suggest that through a mobile device, consumers can be provided with timely information that is relevant and personalized to their current location. Delivering the right service to the right customers in a right place in a right time is more likely to enhance engagement and thus trigger heightened persuasion effects.

Mediator Effect on Type of Mobile ad and Advertising Effect

The mediator, irritation, was examined and was found to be significant in this study. In fact, as the preceding discussion shows, the mediator seem to be associated with the perception of relevance and intrusiveness, which were caused by MMS with location-based and timely service. When advertisements become more tailored, and thus specific, to individuals' needs, recipients may experience both positive and negative affective responses. Consumers can be easily involved in a relevant product message, at least when their need of information is high. However, we cannot ignore consumers' feelings of intrusion and annoyance toward the mobile advertisements, especially if it is perceived to have invaded consumers' privacy (Baek and Morimoto, 2012). But, interestingly, irritation was found to be positively associated with attention, intention, desire, attitude, and purchase intention. In other words, although recipients experienced a negative affect on the highly intrusive message, they were still willing to process that message, and even generate a purchase intention. On the surface, our findings seem conflicting, because irritation is traditionally considered as a negative impact on advertising effectiveness (Aaker and Bruzzone, 1985; Fennis and Bakker, 2001). First, according to prior studies, scholars might have explained by using a sleeper effect to contend that consumer forget the association between irritation and the advertising

message over time. However, in our cross-sectional design, the sleeping effect was not the best explanation. We thus provide an alternative and plausible explanation: consumers using mobile services may be more concerned about the informativeness, convenience and entertainment of these messages rather than perceiving them as a threat in the use of mobile technologies. Nowadays consumers even actively search personalized recommendation of shopping from alternative channels such as bloggers, and trust on the personalized persuasive information was found to positively connect with perceived usefulness of information and purchase intention (Hsu, Lin, and Chiang, 2013). The estimation of usefulness can be the key factor while consumer perceive persuasive message. This does not mean consumers are not concerned about privacy nor does it imply that they do not experience feelings of intrusion, at least in this study, because the perception of irritation was reported. But, as a whole, consumers appreciate timely and personalized messages provided by mobile services, even an advertisement. The perception of personalization highly correlates with relevance between user and message, and thus it benefits users to overcome the information overflow (Schilke et al, 2004). Our argument seems to echo recent studies regarding e-mail and text messaging, which suggest that consumers who experience personalization in advertisements tend to have a lower degree of avoidance from these advertisements (Baek and Morimoto, 2012).

Implications, Limitations and Future Directions

Taking into account these findings, there are various implications. From a research point of view, although previous studies compared the persuasion effects between SMS and MMS, this study extended prior research on short message service (SMS) by integrating associated features, including multimedia messaging service (MMS), location-based services, and timeliness features to provide a more comprehensive explanation for persuasive effects of mobile advertising. As an industry-related implication, these findings can be used as a guide for marketing communication practices in relation to mobile phone advertising, including the type of advertisements and the mobile versus non-mobile platforms. Especially, with the increased ubiquity of smart phones, marketers can develop a database of consumers that includes their interests, needs, wants, financial status, behavior, and purchase transactions for analysis. Combining GPS systems to obtain customers' location, marketers can send personalized messages in an appropriate timing. Nonetheless, privacy is a prime concern and some users may not favor the idea of disclosing their demographics and psychographics, as well as their whereabouts. To sum up, due to a lack of empirical studies related to this topic, in extending prior studies of mobile advertising by incorporating new features of mobile advertisements, this study sheds light on the role of location-based advertising on persuasion. It also appeals to advertisers by providing a guide to design successful mobile advertisements so as to enhance persuasion effects.

With respect with the limitations and directions of future research, first, as some participants' phones cannot receive MMS or do not run the Android OS, they were unable to receive the messages designed by this experiment. Thus, during the experiment, participants were provided a cell phone to receive the mobile advertisements. This might have caused participants to feel a certain degree of disorientation since they are used to receiving mobile advertisements via their own cell phones, which as we established, are very personal devices. Second, in the current research, the stimuli were tested on college students. Other types of mobile advertisements such as those utilizing QR codes or augmented realities can be further examined. Finally, future studies can also explore the possible moderators and mediators that could be considered in predicting mobile advertisement effects. These include for instance the need for cognition or message-response involvement.

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