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# Mobile = location = effect

The effect of location of perceived intrusiveness of mobile ads

By Arief Ernst Hühn, Vassilis-Javed Khan, Marnix van Gisbergen, Paul Ketelaar and Koos Nuijten

We report on two studies researching the effect of mobile location-based ads to perceived intrusiveness of those ads. For the reported studies, shoppers received an ad on a smartphone in a simulated 3D supermarket (projected in 4 rear-projection screens each 3.6 meters wide by 2.6 meters high). Participants received either a location-congruent ad (showing a product on a shelf near the consumer), or a location-incongruent ad (the advertised product was not near the consumer). Our results show that consumers perceive less intrusiveness when receiving location-congruent ads.

## Introduction

How can you reach your consumer? Not so easy. Consumers have a common tendency towards advertising avoidance (Li, Edwards and Lee, 2002; McCoy, Everard, Polak and Galletta, 2008). Why? Well, why not? Consumers consider persuasive messages as a nuisance because they do not take into account the wishes of the consumer and the (precise) moment consumers want to learn more about the advertised products. As such, the best thing consumers can -and will- do is to avoid advertising (Li et al, 2002, McCoy et al., 2008). But hey, if that is true 'Location Based Advertising' might be an effective solution to counter avoidance. After all, an ad that takes into account the location of the consumer might be perceived as less intruding. Would it not be nice if you were standing in front of a shelf deciding what kind of soup to buy when all of a sudden you receive a mobile message with a discount of your favourite soup? Or, what if you are in a shop ready to buy a new flat screen, when all of a sudden you receive a mobile ad with a discount offer from a competing brand. Would you not be curious to see what the mobile ad has to offer?

### Location Based Advertising

We define Location Based Advertising (from now on referred to as LBA) as a way of mobile advertising by which advertisers are able to send location-congruent advertisements to the mobile phone of the consumer by means of 'location tracking'-technology (such as GPS). An advertisement which adjusts to the location of the consumer might be considered as more relevant and less inconvenient (Xu, 2007; Banerjee and Dholakia, 2008).

### Stimulating developments for Location Based Advertising

There are several developments that seem to support the expectation that LBA will increase severely. First of all because of the increase in consumers that will be online 24 hours a week through a mobile connection. For the new generation 'not being online' will be the exception. Globally, mobile data traffic will double every year through 2014, increasing 39 times from 2009 to 2014 (Cisco, 2010). By 2014, over 400 million of the world's internet users will access the network solely through a mobile connection (Cisco, 2010). By the end of 2011 more than 449 million consumers will have a smartphone (RBC Capital Market Report, 2008). Also, new techniques based for instance on GPS, WLAN (Wireless Local Area Network), WiMax, Bluetooth, RFID (Radio Frequency Identification) and NFC (Near Field Communication) enable advertisers to apply LBA in indoor-contexts with high precision (Liu, Darabi, Banerjee & Liu, 2007; Dhar and Varshney, 2011). These new techniques make it possible to use LBA indoors in commercially interesting spaces such as department stores and supermarkets (see Hosbond and Skov, 2007).

### Location Based Advertising Barriers

However, the aforementioned developments do not mean that every advertiser will start his own LBA programme (when done reading this ESOMAR paper). There are

some barriers to overcome and questions concerning the effectiveness of LBA. Dhar and Varshney (2011) explain several thresholds concerning the terminal equipment, infrastructure, logistics, application-development, costs, the search for a suitable business model and, last but not least, privacy. But as said, and maybe even more important, little is known about the effectiveness of mobile location-based advertisements (Xu, Oh & Teo, 2009). The mobile ad that adapts to the location of the consumers might be perceived as less intruding and therefore might not be avoided. This study investigates whether this assumption is true. So what do we know about the effects of mobile location based advertising?

### **Previous research in favor of negative LBA effects**

Despite the possibilities to start 'mobile advertising' even today, a major part of the conducted mobile research focuses on SMS- and MMS-based ways of advertising (for an overview of these studies contact the authors). Another limitation is the shortage of data based on user-experience. On the one hand, this is due to the small number of mobile advertising initiatives (Wehmeyer, 2007). On the other hand, because of the practical and methodical complications which occur as a consequence of the mobile character of the medium (Kjeldskov, 2004). Hence, most studies are based on general expectations measured by surveys or based on mental representations of hypothetical user-situations by means of scenarios. A study done by Drossos et al. (2007), based on scenarios ('what if' questionnaires), showed that a context-congruent ad does not lead to more positive attitudes towards the ad and brand and does not increase a consumers intention to buy the advertised product. Banerjee and Dholakia conducted a study, also by means of scenarios, concerning the effects of location-congruent versus location-incongruent ads which showed similar results. Consumers did not expect location based advertisements to be more useful. However, the results indicated that consumers where more inclined to respond to mobile location based ads in public locations (compared to private spaces). This seems in line with a study done by Edwards et al (2002) showing that ads that are congruent with the context of the website reduce perceived intrusiveness.

### **A new research method**

Previous research on the effects of LBA mainly used (online) questionnaires in which a scenario was given on how LBA works. Although these are interesting studies, there is a chance that the results do not reflect effects in 'real life'. It seems plausible that a direct LBA experience differs from a mental representation or expectation of that experience. Schwarz (2007) claims that the human evaluation is context-sensitive, because this is grounded in the psychical contextual experience. Xu (2006/2007) establishes through a survey-study that consumers might not have an image of what personalised messages mean for them in real life, because of the lack of user experience. Also Wehmeyer (2007) takes into account the possibility that results of the conducted scenario-study differ from how users react when they actually experience a mobile ad. An indirect measure cannot take into account the (1) cognitive processes which occur during a user experience and (2) the contextual factors which influencing these processes. Needless to say that for our study we prefer an evaluation based on a direct contextual experience with a mobile location based advertising.

# Method

## Background

Perceived intrusiveness is the psychological reaction to ads that interfere with a consumer's ongoing cognitive processes (Li et al., 2002, p. 39). Previous studies already showed intrusiveness as a relevant indicator for ad irritation and advertising avoidance (e.g. Li et al., 2002; Wehmeyer, 2007; McCoy et al., 2008;). Location Based Advertising seems the ultimate strategy to decrease the perceived intrusiveness of an ad. A location based ad takes into account the location of the consumer and by doing so might connect with the cognitive processes of the consumer at that moment. Hence, the consumer might perceive these type of ads as less intrusive and as a consequence be more open to the (persuasive effects of the) ad. However, research on this topic is scarce and the limited research that has been conducted showed no effects or a small positive effect. Also, literature review of, in-situ experiments that include contextual variables like time and location has shown that it is challenging to accurately control and measure (Khan et al., 2011). Previous location based studies lack contextual experience and as such do not offer insights in the effects which directly follow from receiving a location-congruent ad. However, effects of LBA-advertisements might not be measurable by means of general evaluative (attitude) and behavioural intentions.

## Objective

The aim of our studies was to research the effect of location on perceived intrusiveness of mobile ads, taking into account the level of cognitive processes and perception involvement which take place during an actual interaction with LBA. We conducted two experiments: an initial pilot study with students and a larger scale study with shoppers.

## Research Instrument

For the reported studies in this paper we used a novel way of reconstructing users' experience to evaluate mobile computing applications such as location-based ads. A virtual supermarket environment (Figures 1 & 2) running on a CAVE installation that interacts with a mobile phone was used. A supermarket seemed to be the most suitable setting since mobile ads are more effective if they are aimed at low-priced and frequently bought products (Barwise and Strong, 2002).

## [Figure 1]

The virtual supermarket is a simulated 3D environment (modeled in Maya and rendered in OGRE) and projected on 4 back-projection screens (each 3.6 meters wide by 2.6 meters high). The interior of the supermarket, with regards to corporate style and spatial arrangement, was based on common denominators found in stores of popular Dutch supermarkets. Although the virtual supermarket is fully developed about twenty percent of the shelves were filled with products.

Participants can move in the setting with the help of a head-tracking device (Figure 2). This solution does not block out the physical world, which offers the opportunity to use physical objects and the representation of the participant's own physical body in comparison to head-mounted displays used in virtual reality applications. For the reported studies, it gave us the opportunity to use an Android-based smartphone, which connected through Bluetooth socket to the virtual environment, in which participants were able to receive location-based ads.

## [Figure 2]

### Design

Both of the studies had a between-subjects research design. Participants received either the Location-congruent ad or the Location-incongruent ad. The location-congruent ad showed the advertised product that was on a shelf near the consumer. When the consumers received a location-incongruent ad, the advertised product was not near the consumer. Both groups received the mobile ad in the same (central) spot in the virtual supermarket. In both studies the mobile phone application would sound an audio message, vibrate and present the ad to participants, when the participants were within a certain radius (half meter from the manipulated shelf) of pre-selected products

In the first study, participants were asked to pick up five predetermined products. That was done to ensure that participants would pass the area we had predetermined for the ad to go off. In the second study we decided not to have a list of predetermined products and asked them to choose five different food products of their choice and then to go to the counter. The central location of our trigger area, the shopping target of five products and the limited product set ensured that both groups visited the trigger area. In this way we did not have to constraint participants' choice of products.

In both studies immediately after the virtual shopping experience, participants filled out a questionnaire that assessed their perceived intrusiveness.

### Measures

In the second study, along with intrusiveness (measured on a 7-point scale), we also measured the attitude towards the mobile application, the intention to use the application and purchase intention in response to the application. In order to take into account the complexity of an everyday commercial setting we also measured several control variables that have proven to affect the evaluation of mobile advertising. Based on our literature study we included the following scales: product involvement, attitude towards advertising in general and Personal Innovativeness which points to the interest of a person in new technologies.

### Material

For the first study the mobile ad was presenting a chewing gum product. For the second study, the ad was presenting a soup product. In both cases, the application offered the option of receiving or rejecting more information about the product

offer. In the first study, the location, which triggered the chewing gum ad, was at the counter number 3 of the supermarket for the location-congruent group of participants whereas the location, which triggered the same chewing-gum ad, was at the soups shelf of the supermarket for the location-incongruent group of participants.

In the second study, the location, which triggered the soup ad, was exactly the same for both location-congruent and location-incongruent group of participants. The difference for the location-incongruent group of participants was that the shelf was presenting meal-mixes instead of soups (Figure 3).

### **[Figure 3]**

The main reason for changing the product displayed in the ad was to control possible interaction effects of confounding variables. In the first study the location-congruent ad was presented next to a counter whereas the location-incongruent ad was presented next to a product shelf. A counter at the supermarket is a location which is different from product shelves. While standing at a counter a shopper is almost done with purchasing products and is probably on a different state while being busy in thinking, searching and choosing for products. One might hypothesize that the supermarket counter can be a location in which participants would perceive less intrusiveness compared to next to a shelf precisely because they have finished their shopping and are now in a more relaxed state. Therefore, we decided to pick the exact same location for the larger scale experiment and instead change the products that were visible on the shelf.

This is manifestation of the advantage of the novel method of mobile ad evaluation we are proposing. The ability to modify one part of the environment while keeping the rest of the aspects precisely identical is an apparent advantage for quantitative, experimental research.

### **Participants**

All participants in both studies owned a mobile phone and were familiar with smartphones equipped with a touch screen interface. For their effort participants received a gift certificate as incentive.

For the first study, while having recruited 27 participants, the final analysis included the 12 participants whose experiment proceeded according to protocol; i.e. they noticed the ad on the mobile phone. These 12 consisted of 8 who witnessed the location-incongruent setup (4 male and 4 female; average age: 23) and 4 who witnessed the location-fit (2 male and 2 female; average age: 21). All of them were international university students.

For the second study, while having recruited 70 participants through a marketing research company, 15 of them received the ad outside the perimeter as a consequence of an unstable Bluetooth connection and 2 participants did not notice

the ad. Of the 53 participants 58 percent was male. Their age ranged from 17 to 64 years (average age: 26). The location-incongruent reached 26 shoppers and 27 shoppers received the location-congruent ad. No significant differences were found between both groups concerning age, gender and education.

## Results

In spite of the aforementioned changes of the setup, as we will present in the results section, we find statistically significant differences for both studies.

For the first study, all 12 respondents rated more or less homogeneous with regards to the control variables, thereby excluding the possibility of these variables explaining the measured effect. The median scores on the ad intrusiveness scale for the location-congruent and location-incongruent group were respectively 2.64 and 4.57 (on a 7-point scale). Based on the Mann Whitney U test we conducted we can conclude that the median scores on the intrusiveness scale differed significantly ( $z = -2.722$   $p=0.003$ ). Thus, it can be further tentatively concluded that (virtual) location based ads lead to less ad intrusiveness than non-(virtual) location based ads.

### **Mobile Location-Congruent ads are perceived as less intrusive**

For the second, larger-scale study, the independent t-test for both groups shows intrusiveness having a significantly higher score for the location-incongruent group ( $M=3.15$ ,  $SD=0.90$ ) compared to the location-congruent group ( $M=2.45$ ,  $SD=1.07$ ); ( $t(51, N=53)=-2.546$ ,  $p<0.05$ ). This significant result was also found when both groups were controlled for attitude towards advertising and product involvement. However, product involvement had unexpectedly no effect on the perceived amount of intrusiveness.

### **Less intrusiveness = positive effects**

The results also revealed that consumers who experienced relatively low intrusiveness showed a more positive attitude towards the mobile application and, as such, were more inclined to use the mobile application. Furthermore, consumers with a positive attitude towards the application showed a higher intention to buy the advertised product.

**[Figure 4]**

## Conclusion and discussion

### Practical implications

The main goal of the two aforementioned studies was to investigate whether mobile, location-based advertisements would have an effect on perceived intrusiveness of the ad itself. Both studies point to the direction that mobile, location-congruent advertisements are indeed perceived as less intrusive compared to location-incongruent ads. Consequently, we expect that location based advertising would lead to a more positive attitude and increase the intention to use the mobile application as well as the intention to buy the product in response to the ad. This result is important for advertisers because it shows that mobile advertising has the potential to break through the natural defences of a (potential) consumer. The study seems to confirm the hypothesis that a consumer is more open to a persuasive message when the message is send in a relevant context for the consumer. The relevant context in this study was an advertised product that was near the consumer the moment the consumer received the mobile ad. So the practical implication seems simple. New investments in location based technologies combined with mobile marketing campaigns seem fruitful. The implications of this result might extend to other location based services. For example, push notification messages of news items or customer recommendations of restaurants or cafes. Of course this was not included in this study, but why would it not work? Maybe because different media content and circumstances altogether could possibly elicit different reactions.

### Research implications

Another conclusion we can draw based on our experience of the reported studies concerns the novel test-bed for evaluating location-based ads. Although needing lots of resources to setup a virtual environment like the one we used, once such an environment exists a series of studies can be executed. The advantage of having such an environment is in conducting rigorous experimental research.

Some benefits using a virtual instead of a real life setting: *A controllable environment* with advanced research instruments. Adjustments of the environment and within the environment (context) are more easily, controllable and faster compared to an experiment in a real life setting. Measurements are relatively easily done. *An interactive environment* between virtual environment and the participant without 'harassing' the participant to much (a lot of the instruments are placed in the cave and not 'on' the participant). Also the participant is not ashamed because he or she is being looked at by other shoppers as would have happened in a 'real'. *An independent environment*: the virtual environment makes it possible to easily change for instance the environment (e.g. supermarket), the setting (e.g. packages, products or routing within a supermarket). This also concerns products and environments of the competitors. *Repetition benefits*. Because the environment is virtual, follow-up measurements that take place in the CAVE can easily be reproduced. Hence, one can more easily control variables compared to a real setting. Finally, the cave has

organisational and financial benefits for researchers. Also, it makes it possible to do research within environment that would normally not be accessible for a researcher.

Another remark, which can be supported with the reported studies, is on the potential halo-effect that such a setup might impose to participants. The halo-effect is generally defined as the influence of a global evaluation on evaluations of individual attributes of a person (Nisbett&Wilson, 1977). In our case, the potential disadvantage of having a futuristic virtual environment is that participant's perceptions would be influenced by the setup itself warranting the research output as invalid. The statistically significant differences between groups for both studies indicate that even if there is an initial halo-effect it does not affect the actual perceptions of the mobile ad as was in our case. Moreover, the setup is very useful to examine for instance to test different concepts. The goals for experiments in a virtual setting are dual; on the one hand, to corroborate qualitative findings of previous research endeavors and on the other hand to explore new research directions

Although we strongly believe that our findings have direct implications for real-life mobile advertisements, we still want to underline that whatever results and conclusions we make are unequivocally valid for the setup itself. If a supermarket chain would decide to actually offer a virtual environment, such as ours, as an interface to their clients, our research would obviously have direct benefits. Although such a scenario might currently be in the sphere of science fiction, several technologies, such as self-scanning of products, mobile apps and online purchase of products are currently a reality for many supermarket chains around the world. Such technologies were also in the sphere of science fiction a few years ago and yet are now a reality, which enhances the shopping experience of people.

## Authors

Arief E. Hühn, master student Radboud University

Vassilis-Javed Khan (PhD) Senior Lecturer and researcher NHTV Breda University of Applied Sciences

Marnix van Gisbergen (PhD) Research Director at De Vos & Jansen Marketresearch

Koos Nuijten (PhD) Senior Lecturer and researcher NHTV Breda University of Applied Sciences

Paul E. Ketelaar (PhD) Assistant Professor in Communication Science at the Radboud University and the catholic University of Leuven

### We would like to thank our sponsors

De Vos & Jansen Marketresearch

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**Figure 1**  
A participant in the virtual supermarket

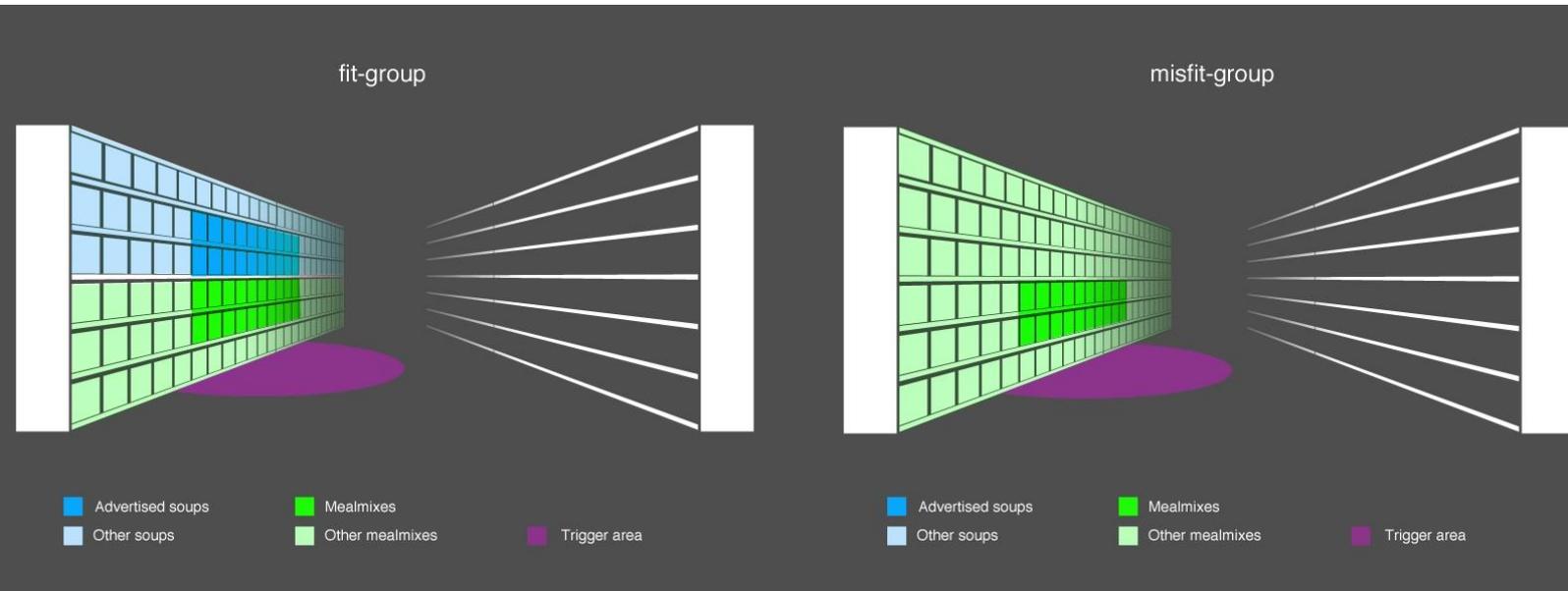


## Figure 2

A participant with headtracking device in the virtual supermarket



**Figure 3**  
**Experimental Design Study 2**



**Figure 4**

Results within the empirical model (\*p<0,05 \*\*p<0,001)

