# EXPERIMENTAL STUDIES ON

# DIGITAL MARKETING:

# AN INVESTIGATION INTO MOBILE MARKETING

# AND ADVERGAME MARKETING

**PING WENJIE**

**NATIONAL UNIVERSITY OF SINGAPORE**

**2014**

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# AND ADVERGAME MARKETING

**PING WENJIE**

*(Bachelor of Science), Fudan University*

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# DECLARATION

I hereby declare that this thesis is my original work and it has been written by me in its entirety.

I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

Ping Wenjie

04 March 2014

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# SUMMARY

With the escalating digitalization of the e-marketplace, digital marketing has taken center stage as the widely accepted mode of dealing on the e-market. The emergence of many digital marketing channels is providing great opportunities for marketers to improve the effectiveness of their marketing promotions. In this thesis, we particularly focus on two digital marketing channels, mobile marketing and advergame marketing. Accordingly, in this thesis, we conduct two empirical studies: Study One explores the impacts of distance factors on customer response to mobile marketing, and Study Two evaluates the effectiveness of the design elements of advergames.

In particular, Study One (Chapter 2) highlights the importance of spatial distance, social distance, and temporal distance in mobile marketing. It examines the impacts of these factors on customer response to mobile marketing and also proposes the interaction effects among these factors. A field experiment is conducted with an apparel company to test the hypotheses. First, the spatial distance is recorded as the distance from the place where customers view a mobile promotion to the nearest store. Second, the social distance is manipulated by showing the popularity information of people who are socially proximate to or distant from the customer in the promotional message. Third, the temporal distance is operationalized by varying the expiry dates of the mobile promotion. The findings validate the main effects and suggest interesting interaction effects. When the spatial distance is low, decreasing either the social distance or the temporal distance increases the probability and the hazard rate of response to mobile promotions. On the other hand, when the spatial distance is high, increasing either the social distance or the temporal distance stimulates the probability and the hazard rate of response to mobile promotions. However, the interaction effect between social distance and temporal distance only has a significant effect on the probability but not on the hazard rate of response to

mobile promotions. The findings provide useful guidance for both researchers and practitioners.

Study Two (Chapter 3) sheds light on the effectiveness of advergames by studying three design factors of advergame: interactivity, fit, and expectancy. It examines customers' attitude toward advergame, attitude toward brand, and purchase intention to evaluate the effectiveness of advergames. Based on the engagement theory and transportation theory, the main effects of the three design factors and their two-way interaction effects are proposed. A positive mediating relationship from attitude toward advergame to attitude toward brand, and to purchase intention is also hypothesized. Furthermore, a $2 \times 2 \times 2$ factorial design experiment is designed in a 3D virtual world environment to evaluate our hypotheses. The findings show that in the high fit condition, both high interactivity and low expectancy lead to a more favorable attitude toward advergame. However in the low interactivity state, low expectancy generates a more positive attitude toward advergame. Interactivity and attitude toward advergame have significant positive effects on attitude toward brand, which in turn positively impacts purchase intention. This study provides important insights on the optimal design of advergame marketing.

Generally, Study One develops a better understanding of how customers respond to mobile promotions with different distance settings, and Study Two reveals the important impacts of the design factors for advergames. Chapter 4 summarizes the theoretical contributions and practical implications of the studies. Directions for future research are also discussed in the same chapter.

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# Chapter 1 Introduction

## 1.1 Importance of Digital Marketing

With escalation of digitalization, digital marketing is gaining momentum and attracting much attention. According to the Gartner report on digital marketing expenditure, digital marketing budgets amount to 2.5% of company revenues, with an average 125 million in dollar value for each surveyed company.[1] This spending is estimated to increase by 9% in the year 2013 (Gartner 2013). The rise of digital marketing has created a tremendous opportunity for marketers to improve their marketing strategies. In a Gartner interview with 98 marketing executives, it was found that 75% of respondents believe digital marketing to be important to the future of their organization (McLellan 2012).[2]

Enabled by the development of technology, digital marketing has spawned an impressive array of channels for new marketing opportunities, such as web marketing, social media marketing, mobile marketing, and advergame marketing. Digital marketing is experiencing downward spiraling of costs along with the added benefits offered by these channels. The various channels offer marketers unprecedented opportunities for better reach of the customers. At the same time, customers are provided with a previously unimaginable quantity and quality of marketing information (Wind et al. 2002). Digital marketing is currently widely

[1] Gartner's U.S. Digital Marketing Spending report is based on a survey of 253 marketers from U.S.-based companies with more than $500 million in annual revenue.

[2] All the 98 executives are from companies with revenues of over $1 billion.

adopted by practitioners; however, the knowledge of what factors drive the success of digital marketing is still limited. It is important for researchers to identify the critical factors in digital marketing. From the theoretical perspective, we can explore the underlying mechanisms of the influences of the identified factors. Understanding how customers respond to digital marketing is of great importance in enabling the development of effective digital marketing strategies. Therefore, this thesis aims to conduct an in-depth investigation of digital marketing, specifically, with special emphasis on mobile marketing and advergame marketing.

## 1.2 Definition of Digital Marketing

Digital marketing has been continuously evolving since its advent in the early 1990s[3]. In fact, many attempts have been made to define digital marketing. The early definitions for digital marketing focused on its interactive nature and described digital marketing as aiming to leverage the unique capabilities of new interactive media to create new forms of interactions between customers and marketers (Parsons et al. 1998). Later, the personalization feature was added to the definition of digital marketing, and it came to be defined as an addressable communication tool which enables marketers to experience a continuous, two-way, personalized dialogue with customers (Wertime et al. 2011).

More recently, the advances of technology have enabled new digital marketing channels with more promising features, such as social media marketing and mobile marketing. With the emphasis on the new marketing features, Gartner (2013) defined digital marketing as "a set of techniques, enabled by technology, which allows marketing to improve its processes to engage in a dynamic

[3] The first clickable banner ad was displayed online in 1993.

conversation with people who are influencers and buyers and ultimately target, acquire and retain customers".

By engaging in digital marketing, marketers can interact with their customers using personalized promotional messages through various digital channels, such as the Web, social media, mobile, and game channels. In this thesis, we define digital marketing as the marketing approach that makes use of digital channels to promote brands or products to customers and business partners in a timely, relevant, personal and cost-effective manner.

## 1.3 Digital Marketing Channels

Advancing technology sees the appearance of an increasing number of digital channels in the digital marketing world. These digital channels have expanded and are enabling marketers to engage their customers more effectively and swiftly (Choudhury et al. 1998). The evolution of digital marketing cannot be separated from the emergence of various digital channels, such as the Web, social media, mobile, and advergame channels.

### 1.3.1 Web Marketing

Basically, web marketing includes promotional or informative websites, e-commerce websites, and online advertising on search engines. Web marketing first and foremost removes the geographical barriers and enables marketers to promote their brand or products to customers who have Internet access (Albert et al. 2004). Compared to traditional television or print advertisements (ads), web marketing has eliminated the spatial constraints of marketing. Such unparalleled convenience makes web marketing the first successful venture of the digital

marketing world (Grandon et al. 2004). With its emergence, web marketing, has become a powerful marketing channel.

Researchers in information systems (IS) conceptualized convenience as the advantage of web marketing over traditional marketing. Li et al. (1999) found that customers who choose to shop on the Web are convenience oriented. D'Ambra et al. (2001) concluded that web marketing reduces the traveling costs through online shopping. Choudhury et al. (2008) defined convenience as customers' perception of the efficiency of interaction with a seller. They showed that convenience is an important consideration for customers when they interact with a digital channel.

IS researchers have devoted much attention to identifying the factors influencing the effectiveness of web marketing. Mckinney et al. (2002) found that the website information and system quality also positively influences customer satisfaction. Palmer (2002) demonstrated the impacts of website usability, design and performance metrics on customer satisfaction. Tam et al. (2005) evidenced the influence of web personalization on customers' attitudes and their behavior.

Although considerable attention has been focused on web marketing in the early 2000s, researchers are persisting in studying the factors which can improve the effectiveness of web marketing. Everard et al. (2006) reported that website quality influences customers' perceptions of product quality and subsequently affects online purchase intention. Gregg et al. (2008) found a positive influence of website quality on customer purchase behavior in the online auction context. Deng et al. (2010) presented the impacts of website visual complexity and order on customer response.

Owing to the remarkable convenience it presents, the web marketing channel has played a pivotal role in digital marketing world by providing more and better marketing opportunities. Consequently, both researchers and practitioners are

enthusiastically seeking new features or factors which can enhance web marketing performance.

### 1.3.2 Social Media Marketing

Social media marketing transpires on social networking sites like Facebook, Twitter, and YouTube. In social media marketing, the success of a transaction depends not only on the marketer-generated content (MGC) but also heavily relies on the user-generated content (UGC). In web marketing, MGC usually plays a dominant role in promoting successful marketing. However, in social media marketing, the UGC, which can be shared among customers through online word-of-mouth, becomes increasingly critical for achieving successful social media marketing.

Social media marketing is fundamentally changing the interactions between marketers and their customers. In social media marketing, marketers are able to converse about their promotions with customers and encourage them to share information about their products (Agarwal et al. 2008). On their part, customers have the ability to observe and influence other customers' purchase decisions (Gallaugher et al. 2010).

Because UGC is self-revealing, it can accurately and truthfully represent customer feedback and recommendations (Luo et al. 2013). Thus, UGC is a strong manifestation of customer satisfaction of a brand (Hanson et al. 2007). With close monitoring of UGC, marketers are able to adopt proactive approaches to leverage MGC and interact with their customers in order to enhance customer satisfaction.

Attracted by the double appeal of MGC and UGC, marketers are increasingly proactive in their efforts to strategically capitalize on social media marketing. At the same time, researchers have also been studying how customers behave in the social media context and how marketers can positively influence customer response towards social media marketing.

Recent studies on social media marketing examined how peer-to-peer targeted marketing techniques work in a social media environment (Aral et al. 2011; Aral et al. 2012). Susarla et al. (2012) found that social interaction has a strong influence on the success of YouTube videos. Goh et al. (2013) showed that social media contents affect consumer purchase behavior. More importantly, they found a stronger impact of UGC than MGC on customer purchase behavior. Rishka et al. (2013) showed that customer participation in social media efforts leads to an increase in profitability. Oestreicher-Singer (2013) demonstrated that customers' levels of participation in social media influences their willingness to pay and this influence is stronger than the influence of the volume of content consumption. Their findings imply potential opportunities for marketers to enhance customers' social experience with the aim of encouraging them to spend.

With the capability of encouraging interaction between MGC and UGC, social media marketing has great potential to develop into a powerful market tool. Marketers are keen on discovering how to interact with customers through social media marketing, to encourage interaction among customers, and ultimately, to increase customer response to their promotions. Researchers are also exploring the underlying mechanisms which explain how customers respond to social media marketing.

In the next two sections, we will briefly introduce the mobile marketing channel and the advergame marketing channel. The detailed motivation and research focus for these two channels will be discussed subsequently.

### 1.3.3 Mobile Marketing

We refer to mobile marketing as a marketing approach using the mobile medium as the means of marketing communication. If web marketing eliminates the distance between customers and marketers, mobile marketing deems the role of

distance as vital. In mobile marketing, customers can receive promotions anywhere and on the go (Wertime et al. 2011). Thus, the distance from the customer to the store is no longer the distance from the home or office to the store. Rather, the distance to the store depends on where the customer is when they view the mobile promotion.

In mobile marketing, marketers possess unique opportunities to reach their customers. First, the ubiquitous Internet access makes it possible for marketers to send mobile promotions to their customers anywhere as and on the go (Scharl et al. 2005). Second, social networking applications (apps) installed in mobile phones have made it easier for people to be connected with their friends (Moth 2012). With access to customers' social networks, marketers can send personalized promotions to customers with information about their friends' promotion exposure or product endorsement. Third, with the help of location-based services (LBS), marketers can calculate the distance between the customer and the nearest store (Bauer et al. 2005). Depending on the distance, marketers can customize the expiry date of a mobile promotion when it is sent to the customer.

These unique opportunities make mobile marketing yet another powerful digital channel through which marketers can interact with their customers. However, few empirical studies have sought understanding on how customers respond to mobile promotions when marketers are leveraging these new mobile marketing techniques. Hence, an in-depth investigation of mobile marketing is crucial and meaningful.

### 1.3.4 Advergame Marketing

Advergame marketing makes use of video games to promote brands or products. The word "advergame" itself is a portmanteau of "advertising" and "gaming".

Researchers have defined advergame marketing as an integration of advertising messages in a custom-built game aimed at promoting a product or brand to potential consumers who are engaged in playing the game (Buckner et al. 2002; Mallinckrodt et al. 2007).

Advergames aim to provide customers with an interactive engaging experience. Thus, the interaction with advertising messages can bring about positive advertising responses. Compared with other digital marketing channels, advergame marketing offers marketers great opportunities to rely on the interactive nature of advergames and enhances the interaction between customers and the promotional messages (Alba et al. 1997; Hoffman et al. 1996; Peterson et al. 1997). Therefore, the challenge for marketers is to design an interactive advergame that is sufficiently engaging to arouse positive feeling from customers towards the brand or product.

## 1.4 Motivations and Research Focus

Advances in technology have introduced new digital marketing channels, each with its own unique features. Identifying the unique features for each channel enables marketers to better leverage such a channel for building their marketing strategies and also assists researchers to gain better insights into the influential factors of that channel. More importantly, the impacts of these features are yet to be explored. An in-depth investigation into each digital channel can enhance understanding of how customers respond to promotions designed on the basis of these features.

In this thesis, we focus on mobile marketing and advergame marketing and identify the unique features of these two digital channels. We further explored how marketers can leverage the features of each of these digital marketing

channels and build their marketing strategies to influence customer response. Therefore, our main research questions are:

*What are the features that affect the effectiveness of mobile marketing and advergame marketing?*

*What are the impacts of these features on customer response to mobile marketing and advergame marketing?*

In this section, we identify the research gaps for mobile marketing and advergame marketing respectively. We believe these research gaps serve well as the motivations for the two empirical studies of this thesis.

### 1.4.1 Mobile Marketing

Despite the prevalence of mobile marketing, prior research on mobile marketing mainly focused on the acceptance of mobile marketing (Haghirian et al. 2005; Leppaniemi et al. 2005). A few empirical studies also attempted to study the effectiveness of mobile marketing (Goh et al. 2009; Merisavo et al. 2006; Scharl et al. 2005). However, these studies researched mobile marketing using SMS (Short Message Services). The introduction of smartphones has resulted in new features for mobile marketing. In the first study of this thesis, we intend to identify the influential factors in mobile marketing based on these features. We investigate the impacts of these factors by studying customer response to mobile promotions. More specifically, two aspects of customer response to mobile promotion are addressed. The first aspect is whether customers respond to mobile promotions. The second aspect is how fast customers respond to mobile promotions.

Although marketers are still exploring methods of conducting effective mobile marketing, researchers have made some early efforts in the conceptualization of the key features and unique propositions of mobile marketing.

In the early stages of mobile marketing, researchers identified four value propositions of mobile marketing—ubiquity, personalization, localization, and convenience (Clarke 2001; Siau et al. 2001; Watson et al. 2002). Similarly, a proposed taxonomy for mobile marketing described mobile marketing in terms of three dimensions: location sensitive, time critical, and information controllable (Anckar et al. 2003; Balasubramanian et al. 2002). However, these studies lack a theory that explains how these factors influence the effectiveness of mobile marketing. In our first study, we apply the construal level theory (Liberman et al. 1998; Trope et al. 2003) and identify three distance factors essentially important in mobile marketing, i.e., spatial distance, social distance, and temporal distance. We believe these three distances are linked with the concepts proposed in the past studies.

First, the spatial distance depicts the ubiquity of mobile marketing. As customers are able to receive mobile promotions anywhere, and on the go, the spatial distance from the place where they view the promotion to the store varies in the mobile marketing context. Second, customers can receive personalized mobile promotions with popularity information about their socially connected friends. The popularity information can include other customers' promotion exposure or product endorsement. The social distance vividly describes the closeness between the customer and their friends in the popularity information. Third, the localization feature enables marketers to send tailored mobile promotions according to a customer's current location. Depending on whether the customer is near or far away from the store, marketers can send them promotions with the expiry date customized for their locations. Thus, the temporal distance illustrates the period from the time a customer views the promotion to the time the

promotion expires. With the distance factors identified, the first research question to address in Study One is:

*What are the fundamental effects of distances (i.e., spatial distance, social distance, and temporal distance) on customer response to mobile promotions?*

Although past research has examined the role of mobile marketing features in accessing their effectiveness (Scharl et al. 2005), the interplays between factors have yet to be studied. Most importantly, the setting of one distance factor can largely affect the influence of another distance factor. Therefore, the second research question to address in Study One is:

*What are the two-way interaction effects of the three distances on customer response to mobile promotions?*

Hence, Study One examines the impacts of distances on customer response to mobile marketing and reveals the underlying mechanisms of how these distances interact with each other. The objective of this study is to provide a sound theoretical underpinning of the main effects of the distances and their interaction effects from the psychological distance perspective.

### 1.4.2 Advergame Marketing

The escalating popularity of advergames evidently underpins the importance of a detailed investigation on the effectiveness of advergames. Pioneer studies on advergames have made their effort in accessing the effectiveness of advergames.

Using a sample of 215 Hispanic subjects, Hernandez et al. (2004) examined the negative effects of intrusiveness and irritation on attitude towards advergame. Nevertheless, the advergames they used for the experiment were more like games with in-game advertising placements because the subjects did not need to interact

with the brand related elements in the advergames. Later, Youn et al. (2005) conceptualized a list of motivations and estimated their influence on customers' attitudes towards the advergame. These factors include escapism, competition, boredom relief, fun, and curiosity. However, these factors are more related to the nature of games rather than the capturing of the characteristics of advergames. Winkler et al. (2006) explored brand integration in the advergame by studying customers' attitudes towards product placement in the advergames. Mallinckrodt et al. (Mallinckrodt et al. 2007) examined the children's responses after they had played an advergame and found that childern's preferences for the advergame significantly differed according to age.

Despite the great effort in the past literature, few studies have ever identified the design elements which are unique to advergames. We find it highly important to identify the unique design factors for advergames. Hence, the first research question in Study Two is:

*What are the fundamental design elements that influence the effectiveness of advergames?*

We identify three design elements which are unique and yet crutial to advergames. First, interactivity is considered as a crucial feature for the design of the games (Berman et al. 1995; Bezjian-Avery et al. 1998; Nicovich 2005). Much attention has been focused on the interactivity construct in the Human-Computer Interaction (HCI) literature (Jiang et al. 2005; Palmer 2002; Shneiderman et al. 1998). In the context of the advergame, advertisers aim to persuade consumers with advertising messages. Thus, the interaction occurs between consumers and advertising messages. We define interactivity as the extent to which customers can interact with brand components and get feedback on the advertising messages accordingly. We believe it is of great importance for the advergame to achieve an appropriate level of interactivity so that customers can fully engage in the

advergame and experience positive feelings about the brand or products featured in the advergame.

Second, marketers chose games with different themes on which to build their advergames. For example, Red Bull, an energy drink company, has built the *Formula Face* advergame based on a racing game which allows customers to compete by driving a Red Bull Formula One car. Researchers have identified themetic connections to a brand's product to be an important factor in influencing customers' attitudes towards the advergame and the brand (Wise et al. 2008). Based on this study, we reconceptualize themetic connections from an IS perspective and refer to it as fit.

In IS literature, task-technology fit is defined as "the degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue et al. 1995). Prior researches have emphasized that technologies should have a good fit with the work tasks that are supported by them (Dennis et al. 2001; Liu et al. 2012; Sarker et al. 2010; Suh et al. 2005). In Study Two, we extend the concept of task-technology fit to the context of online advertising, where the advergame is the "technology" and the "task" is to communicate the brand image. Specifically, the task in the advergame context is conducted from the brand marketer perspective rather than from the customer perspective. For advergames, a fit design requires the context of the game to match the brand image. For example, sports games are more appropriate for a sports brand compared to puzzle games. Therefore, we define fit as the extent to which the advergame fits the theme or image of the advertised brand.

Third, in advertising literature, a novel, creative yet unconventional element in an advertisement can enhance customers' engagement with it. Expectancy of the advertisement is identified as an important element in engaging consumers (Wells et al. 1992). Research has found advertisements with unexpected information to elicit more favorable attitudes (Lee et al. 1999). In the advergame context,

marketers can integrate unexpected information in the design of the advergame and this unexpected information can potentially arouse favorable attitudes toward the advertised brand or products. However, few empirical studies have focused on the impact of expectancy in advergame marketing. In Study Two, we explore the influence of expectancy on customers' attitudes towards the advergame and the brand. Specifically, we define expectancy as the extent to which the design of an advergame is within the expectations of customers when comparing their existing knowledge in similar conventional games.

The main objective of advergames is to get customers fully engaged in the advergame they are playing so that they can form a positive attitude towards the advergame. Subsequently, the favorable attitude towards the advergame can be transferred to the brand or products advertised in the advergame. In this sense, customers' engagement with the advergame plays a central role in generating the subsequent feelings about the advertised brand or products. Nonetheless, few studies have attempted to explain the role of customers' engagement in advergames. Thus, our second research question in Study Two is:

*How and to what extent do the three design elements (i.e., interactivity, fit, and expectancy) influence the effectiveness of advergames?*

In Study Two, we use the engagement theory (Kearsley et al. 1998) and the transportation theory (Green et al. 2000; Green et al. 2004) as our main theoretical foundation. Based on the two theories, we aim to provide an integrative view of the underlying mechanisms that can enhance the effectiveness of advergames. The engagement theory explains how customers are engaged in an advergame. Complementing the engagement theory, the transportation theory explains that when customers are engaged in a narrative world such as one portrayed in an advergame, the personal enjoyment derived from the advergame can affect their attitudes and beliefs (Green et al. 2004).

Therefore, Study Two explores the influence of the three design elements on customers' attitude toward advergame and brand. The purpose is to shed light on the effectiveness of advergames and propose effective design methods for brand marketers.

## 1.5 Research Methodology

The method of experimentation is highly suggested as the primary research methodology for achieving effective digital marketing (Wind et al. 2002). In the current fast-changing, dynamic, and uncertain digital marketing environment, experimentation can help explore the impacts of the identified key marketing variables. The purpose of experimentation is to understand the relationship between independent and dependent variables, and further optimize the underlying process. Berger et al (2005) in their book, postulate that the primary purpose of an experimental design is to answer three questions:

*Which factors should be studied?*

*How should the levels of these factors vary?*

*In what way should these levels be combined?*

Essentially, the above questions are of great significance in building optimal digital marketing strategies. First, marketers are keen to discern the unique factors that can enhance the success of each digital marketing channel. Experimentation helps to establish the causal relationship between the identified factors (independent variables) and factors of interest to marketers (dependent variables). With rigorous experimental design, marketers are able to find out whether the identified key variables have significant impacts on the dependent variables. This

is because the well-controlled experimental settings can minimize the influence of other confounding factors.

Second, to integrate these identified variables into the marketing strategy, marketers need in determining the appropriate levels of these factors. Experimentation assists to determine the causal relationship which indicates the direction of the effects resulting from the independent variables. With awareness of the direction of the effects, marketers are able to choose the most suitable level for each factor in their marketing strategies.

Third, to achieve the optimal marketing strategy, marketers are enthusiastic in gaining insights into the combined influence of the identified key factors. Experimentation serves to access the interaction effects of these factors and reveals the impacts of two or more factors when they are taking effect at the same time. With the interaction effects ascertained, marketers can be confident of building their optimal marketing strategy with all key variables functioning at their suitable levels.

In the fast-changing scenario of the digital marketing world, new rules are being written daily. With new technologies or functions emerging increasingly, marketers have ample opportunities to leverage new features in their digital marketing strategies (Wertime et al. 2011). Conducting rigorous experiments serves as a good tool to help marketers determine the effectiveness of these new features. Furthermore, experimentation is the best way to reduce the risk and accurately assess market responses to new strategies (Wind et al. 2002). Most importantly, advances in tracking the customers' marketing activities allow for in-depth analysis of experiment results at more refined level. From the analysis, marketers are capable of perceiving further insights into the market response.

From the research perspective, experiments enable us to isolate and target the impacts that arise from the causal variables we are interested in. We first

conceptualize the unique features for each digital marketing channel and aim to verify their effectiveness. Based on theories, we establish the causal relationships between the constructs and the marketing metrics of interest to us. Through experimentation, we rigorously control the levels of the independent variables and test the causal relationships. The results of the experiments provide the evidence to help us falsify the causal relationships. The relatively unbiased causal estimates offer insights into building optimal digital marketing strategies.

Therefore, we adopt the experimental approach to address our research questions in the digital marketing environment. In Study One, we conduct a randomized field experiment in the form of a marketing campaign with an apparel company. In Study Two, we conduct an experiment via a racing game in an online 3D virtual world. We believe the rigorous experimental approach serves as a powerful tool to test the hypotheses and provide valuable insights.

## 1.6 Potential Contributions

This thesis seeks to be of benefit to and contribute to both academics and practitioners by investigating the impacts of distance factors and design elements in mobile marketing and advergame marketing respectively. Specifically, by addressing the research questions, the two studies are expected to make the following contributions.

First, by identifying the importance of distance factors in mobile marketing, Study One manifests the unique characteristics which influence the effectiveness of mobile marketing. Among the three proposed distance factors, the role of spatial distance is specially highlighted and verified by the results. Through experimentation, we establish causal relationships between these distances and customer response to mobile marketing.

Second, we emphasize the roles of distances and their impacts in mobile marketing. Based on the construal level theory, we explain how customers respond to a mobile promotion when their psychological distances change spatially, socially, and temporally. By demonstrating how the distance factors work in mobile marketing, we provide theoretical guidance for researchers to study the unique phenomenon of mobile marketing.

Third, the existing literature has mainly focused on the acceptance of new features in mobile marketing (Haghirian et al. 2005; Leppaniemi et al. 2005). How customers respond to the new features of mobile marketing has yet to be fully understood. We extend this stream of research by studying the effectiveness of distance factors on customer response in mobile marketing. Furthermore, Study One is among the first to empirically quantify the effectiveness of distance factors in mobile marketing. This approach enables us to understand the impacts of varying distance settings on the response to mobile promotions.

Fourth, Study Two extends the theoretical boundary in the HCI literature (Jiang et al. 2007; Jiang et al. 2010) by incorporating interactivity into the advergame marketing context. In addition, we also extend the concept of cognitive fit and task-technology fit in the IS literature (Goodhue et al. 1995; Liu et al. 2012; Vessey et al. 1991) to the context of advergame marketing from the brand marketers' perspective. We further extend previous research in the advertising literature and demonstrate the combined effects of expectancy together with interactivity and fit of advergames on customers' attitudes toward the advergame and the brand.

Fifth, by incorporating the engagement theory and transportation theory, Study Two provides fresh insights to the underlying mechanism of how the interactivity, fit and expectancy of advergames can influence the components of emotion, mental imagery and attention in a transportation experience. We provide theoretical underpinnings to highlight the interaction effects amongst the three

design factors of advergames. This is an important contribution to the extant literature on both HCI and advertising (Jiang et al. 2007; Jiang et al. 2010; Lee et al. 1999).

For practitioners, this thesis provides important insights into the design of mobile marketing and advergame marketing. Both studies offer useful guidelines for marketers to optimize their marketing strategies.

First, Study One verifies the important role of spatial distance in mobile marketing. With knowledge of customers' locations, marketers can send mobile promotions to their customers when they are near the store. By providing certain incentives, marketers can not only boost their store traffic by attracting customers near them, but also reduce the marketing costs by sending promotions to a target group of customers who have been deemed potentially responsive to mobile promotions. For example, Subway has already taken the initiative to attract spatially close customers through mobile promotions (Murphy 2011).

Second, by understanding the impact of social distance in mobile marketing, marketers can optimize the use of popularity information from customers' friends to increase the response to their promotions. For example, marketers can show product endorsement of close friends to customers when they are trying to promote experience products.

Third, the findings of temporal distance should encourage marketers to limit the validity periods of a promotion when they observe customers to be close enough to their stores. Essentially, for customers who are already in a shopping mall, the temporal distance can be reduced to such a level that the mobile promotion will expire within hours so as to urge the customer to respond on their current shopping trip.

Fourth, Study Two shows that the design combination of high fit coupled with high interactivity of an advergame can enhance the attitude toward advergame,

compared to a low interactivity baseline. This implies that advergame marketers should strive to achieve a good fit between the image of the advertised brand and the theme of the advergame.

Fifth, the findings in Study Two reveal that an advergame with high fit and low expectancy can increase the attitude toward advergame, in contrast to a high expectancy condition. This result suggests that besides aiming for high fit in advergame elements, marketers should also strive to achieve customer enjoyment in novel game play elements. Thus, creating unexpected game elements or game plots is critical to marketers when designing their advergames.

Sixth, results in Study Two also demonstrate that high interactivity advergames may not always lead to a more positive attitude toward the advergame, especially when the advergame is designed with low expectancy. This result points to the value proposition of incorporating casual games with novel creative game elements. Thus, marketers can capitalize on the popularity of casual games to enthuse customers with advergames that include unique game play elements. A good example of such an approach is Rovio's development of the Angry Birds Season game with a unique Mid-Autumn Moon Cake Festival theme for the Chinese market, coupled with an advertising campaign of Angry Birds Moon Cake pastries (Takahashi 2011).

Overall, this thesis presents novel implications and provides new insights on the building of strategies in mobile marketing and advergame marketing.

## 1.7 Thesis Structure

In Chapter 1, we begin by highlighting the importance of digital marketing. This is followed by an overview of four important digital marketing channels, i.e., the web marketing, social media marketing, mobile marketing, and advergame

marketing. With the research focus on mobile marketing and advergame marketing, we identify the research gap and present the research questions. The research methodology and potential contributions are also discussed. The subsequent chapters of the thesis are organized as follows.

Chapter 2 provides a detailed description of Study One. It first highlights the importance of three distance factors in mobile marketing context. Based on the construal level theory, the effects of the distances are proposed. A randomized field experiment is conducted to test the hypotheses. Econometric models are specified and estimated. Discussion on data analysis and implications are then presented.

Chapter 3 describes Study Two in detail. It first builds the theoretical foundation by elaborating on the engagement theory and the transportation theory. The literature of the three proposed design features is reviewed. A laboratory experiment using a 3D virtual world racing game is conducted to test the hypotheses. Discussion and implications are finally presented.

Chapter 4 concludes this thesis by first revisiting the objectives of the thesis. A summary of the findings and implications of the two studies is then discussed, followed by discussion of the future research directions.

# Chapter 2

# Investigating the Impacts of Spatial, Social and Temporal Distances on Mobile Marketing

## 2.1 Introduction

Mobile marketing is growing exponentially worldwide with its expected revenue to hit $24 billion by 2013 (ABI Research 2008). The expenditure of US mobile advertising was $2.6 billion in 2012 (Johnson 2012). Technological advances have also introduced new features for mobile marketing, such as ubiquity, personalization, and localization. Indeed, the surge in the popularity of mobile marketing has attracted considerable attention among marketers. An increasing number of companies are using or planning to use mobile marketing tactics (Marketing Charts 2010). They want to leverage on the mobile marketing features to improve their marketing effectiveness. Despite the prevalence of mobile marketing, few empirical researchers have empirically studied the effectiveness of mobile marketing which incorporates the new features. We have identified three critical aspects that motivate our study.

First, while marketers express great interest in mobile marketing, many of them are using mobile marketing as just another available channel in addition to online marketing. Significantly, we find the spatial distance between the customer and the store to be one of the fundamental differences between mobile marketing and online marketing. In online marketing, customers usually view a promotion either at home or in the office. In online marketing, the spatial distance between the customer and the store is fixed (i.e., it is either the travel distance from the home

to the store, or from the office to the store). However, in mobile marketing, customers can view the promotion wherever they are. Thus, the spatial distance is no longer fixed and it depends on where the customer is when the promotion is viewed (i.e., it is the travel distance between where customers view the promotion and the store). Therefore, the introduction of varying spatial distances provides the opportunity for us to investigate the effectiveness of spatial distance in mobile marketing.

Second, with the incorporation of more social features into mobile devices, more smartphone owners are seamlessly connected with their friends (Moth 2012). For example, the integration of Facebook with iOS6 enables iPhone users to be closely connected with their social network friends (Geron 2012). With access to customers' social networks, marketers are optimizing the use of popularity information from socially connected customers to better customize their mobile promotions. The popularity information includes promotional exposure or product endorsement from other customers (see Figure 2-1). Furthermore, Facebook, with its daily $500,000 revenue of sponsored stories from mobile advertisements provides boundless exposure for mobile promotions with popularity information (Tode 2012). For example, in the promotional message, customers have access to the popularity information about other people who have viewed the promotion, or purchased the advertised product. Indeed, Facebook's recent $19-billion purchase of WhatsApp shows more evidence of practitioners' belief of the success of social elements in the mobile context (Albergotti et al. 2014). We define social distance to be the closeness between the customer and people in the popularity information. Research findings show that promotions containing popularity information are more effective than those without it (Edwards 2012). Despite the findings, it is not yet apparent in the literature as to what role social distance plays in influencing customer response to mobile promotions.

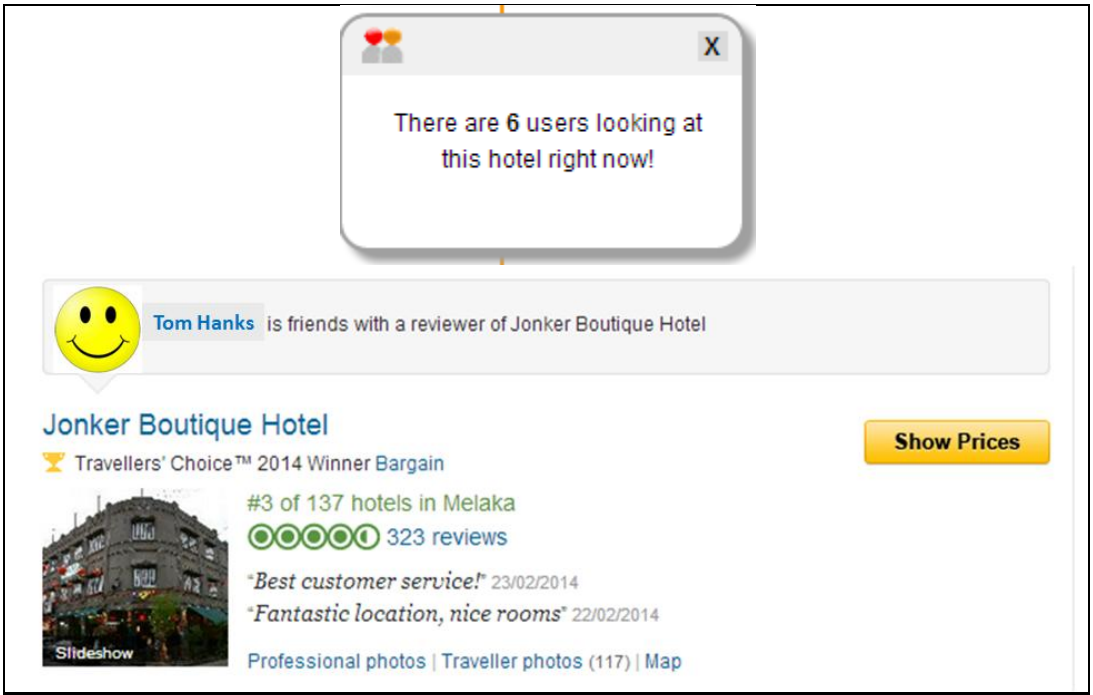



**Figure 2-1 Examples of Popularity Information**

Third, mobile marketing offers ample opportunity for marketers to send promotions to the right people in the right place, and at the right time (Ghose et al. 2011). With the advent of Location Based Service (LBS) in the early 2000s, marketers have since gained opportunities to increase the effectiveness of their mobile promotions. With knowledge of customers' locations, marketers can compute the distance from the customer to the nearest store. Depending on the distance, marketers can dispatch mobile promotions with customized expiry dates to customers. For example, customers who are close to the store are provided with a mobile promotion with same-day expiration. On the other hand, customers are provided with a mobile promotion with a week long duration when they are remotely located from the store. In this case, the valid period for the mobile promotion is no longer the same for all customers. We consider temporal distance as the period from the time customers view the mobile promotion to the expiration of the mobile promotion. In this study, we examine the role of temporal

distance and explore its interplay with the other two distances in mobile marketing.

The objective of our study is to discover the impacts of the three proposed distances on customer response to mobile promotions. Based on the construal level theory (CLT) (Liberman et al. 1998; Trope et al. 2003), we aim to provide a sound theoretical underpinning of the main effects of the distances and their interaction effects from the psychological distance perspective. The application of the three distances in mobile marketing provides us ample opportunity to explore the underlying mechanisms of underlying customers' responses to mobile promotions. In this light, we address two research questions:

*1) What are the fundamental effects of distances (i.e., spatial distance, social distance, and temporal distance) on customer response to mobile promotions?*

*2) What are the two-way interaction effects of the three distances on customer response to mobile promotions?*

In terms of customer response to mobile promotions, we aim to investigate two aspects, the probability of responding and the hazard rate of response. The first aspect considers whether customers respond to mobile promotions and the second aspect focuses on how rapidly customers respond to mobile promotions.

To address the above questions, we designed and conducted a randomized field experiment. We fit our field experiment into a marketing campaign with an apparel retailer. We specially designed a mobile application (app) for this campaign and customers could adopt the free app. With the mobile app, customers could receive mobile promotions and respond to the promotions by downloading the coupons.

The spatial distance was measured as the travel distance from the location where customers viewed a promotion to the nearest store. We manipulated the social

distance by showing popularity information of different people in the promotional messages (i.e., these people could be friends of the customers or complete strangers). The social distance was quantified as the reciprocal of the average number of Facebook mutual friends shared by the customer and the people in the popularity information. We also operationalized the temporal distance by varying the expiry dates of the promotions so that the valid duration of a promotion was different across all customers. The temporal distance was computed as stores' number of remaining opening hours for the promotion. We used a joint estimation of a logit model and a hazard model to address the questions of whether and how fast customers responded to the mobile promotions.

The findings suggest that a decrease in any of the distances leads to a higher probability and hazard rate of response to mobile promotions. In addition, robust two-way interaction effects of the three distances were validated as we proposed in our hypotheses, i.e., when the spatial distance is low, decreasing either the social distance or the temporal distance results in a higher probability and a higher hazard rate of customer response to mobile promotions. On the other hand, when the spatial distance is high, increasing either the social distance or the temporal distance leads to a higher probability and a higher hazard rate of response to mobile promotions. One interesting finding is that when the social distance is low, decreasing the temporal distance results in a higher probability but not a higher hazard rate of response to mobile promotions. In addition, when the social distance is high, increasing the temporal distance leads to a higher probability but not a higher hazard rate of response to mobile promotions.

Overall, our study makes the following contributions. First, our study is the first attempt to empirically test the effectiveness of mobile marketing through assessing the impacts of distances on customer response to mobile promotions. Second, based on the construal level theory, our study provides a clear understanding of the detailed mechanisms of how multiple distances interact with each other to influence customer response to mobile promotions. Third, with the

rigorous design, our randomized field experiment provides relatively unbiased causal estimates of the impacts of distances in mobile marketing. Fourth, we used a single framework to empirically estimate both the probability and the hazard rate of response to mobile promotions. Fifth, from a methodology perspective, we explicitly demonstrated that customers from different segment groups behave fundamentally different in terms of the hazard rate of response to mobile promotions. Finally, the econometrically identified estimates of the distances provide important implications for both researchers and practitioners.

## 2.2 Literature Review

### 2.2.1 Mobile Marketing

With the rapid development of mobile technology, multiple definitions have been assigned to mobile marketing. Mobile marketing was first defined as, "Using a wireless medium to provide customers with time- and location- sensitive, personalized information that promotes goods, services and ideas, thereby benefiting all stakeholders." (Scharl et al. 2005). Subsequently, the Mobile Marketing Association defined mobile marketing as, "A set of practices that enables organizations to communicate and engage with their audience in an interactive and relevant manner through any mobile device or network." (MMA 2008a). In the same year, the mobile marketing industry glossary published by MMA described mobile marketing as "the use of wireless media as an integrated content delivery and direct response vehicle within a cross-media or stand-alone marketing communications program" (MMA 2008b). In our study, we define mobile marketing as time- and location- sensitive, personalized marketing through mobile devices.

In the early stages, mobile marketing was merely perceived as SMS (Short Message Service) and MMS (Multimedia Messaging Service) telecommunication.

During that period, Leppaniemi et al. (2005) predicted that mobile marketing had "strong promises to become the best-targeted advertising medium offering fresh ways to target messages to users that existing advertising channels (e.g., television, radio, print, and mail) can never do". Compared to the well-established online marketing, mobile marketing is expected to be a more effective marketing channel (Tsang et al. 2004).

The rapid development of mobile phone technology has seen the mobile phone evolve from a feature phone for making calls and messaging texts to a smartphone equipped with applications providing a variety of functionalities. The penetration rate of smartphones continues to increase and the rate in Singapore has peaked to 88% (Balckbox Research 2012). The increasingly high penetration rate of smartphones reflects the potential growth of mobile marketing. Faced with such a promising future, marketers are eager to maximize profits from this business potential and have initiated engagement in mobile marketing. At the same time, researchers have also expended considerable effort in studying different phenomena in mobile marketing.

Although the academic literature on mobile marketing remains at an early stage, some pioneer studies have conceptualized the key features and unique value propositions of mobile marketing.

Initially Clarke (2001) identified four value propositions of mobile marketing, ubiquity, personalization, localization, and convenience. In the same year, Siau et al. (2001) also highlighted ubiquity and personalization as the inherent characteristics in mobile marketing. We posit that the first three value propositions are closely related to the three distances. First, the ubiquity feature enables customers to receive mobile promotions at virtually any location. This results in the varying of spatial distances when customers receive the mobile promotion. Second, personalization enables the promotional messages for each customer to contain information about that customer's socially connected friends.

This suggests the importance of social distance when personalized information is being dispatched. Finally, localization allows marketers to provide customized mobile promotions to customers based on their current locations. Depending on a customer's distance to the nearest store, marketers can tailor the expiry date of the promotion. Thus, the validity of the promotion can be short or long depending on a customer's distance to the store. This is thus the role temporal distance plays in mobile marketing.

Balasubramanian et al. (2002) proposed a taxonomy for mobile marketing applications with three dimensions: 1) the extent to which the application is location sensitive, 2) the extent to which the application is time critical, and 3) the extent to which the application is controlled by the information recipient or provider. We believe these three dimensions can also be linked to the three distances in our study. First, the spatial distance is necessary in driving the sensitivity of the location. Second, the social distance illustrates how customers perceive the provided popularity information. Thirdly, the temporal distance essentially determines the criticality of time for the mobile promotion.

Subsequently, Anckar et al. (2003) conducted a survey on a sample of 478 Finnish subjects and suggested the value-creating features for mobile marketing. By examining customers' willingness to embrace mobile marketing, three of the value-creating features they identified are strongly related to the three distances we propose. First, mobility related needs, believed to be the core of the mobile marketing value proposition, suggest the importance of varying spatial distance. Second, the personalization of services highlighted by the authors illustrates the potential influence of social distance when popularity information is input into mobile promotions. Third, the time-critical needs which form a third dimension in mobile marketing are closely associated with the temporal distance.

Aside from the conceptualization of mobile marketing, some researchers have also focused on the empirical issues of mobile marketing. Bauer et al. (2005)

made the first attempt to develop a model of customer acceptance for mobile marketing. They investigated the factors that induce customers to accept mobile marketing. Their findings suggest the entertainment value and information value to be the strongest drivers for the acceptance of mobile marketing.

Initially, most of the empirical studies on mobile marketing focused on the effectiveness of SMS (short message service) marketing. Scharl et al. (2005) shed light on the successful factors for mobile marketing using SMS. They found personalization to be one of the critical factors for the success of mobile market messaging. Merisavo et al. (2006) used data from 5,500 Finnish customers and showed that exposure to mobile marketing results in a significantly higher expenditure.

Eventually, more studies started examining at the design issues and the unique features of specific mobile marketing applications. These studies expanded the horizon of mobile marketing by offering innovative mobile marketing solutions, including GPS-based applications (Malladi et al. 2002), location-based services (LBS) (Barnes 2003), mobile payment (Chen 2008; Ondrus et al. 2006), mobile game advertising (Salo et al. 2007), and mobile coupons (Kondo et al. 2007).

Empirical studies on mobile marketing also highlight that both utilitarian value and hedonic value can encourage mobile marketing adoption (Bruner et al. 2005; Kleijnen et al. 2007). Furthermore, trust has been found to play an important role in mobile marketing and deemed to have a positive influence on attitude toward mobile advertising (Merisavo et al. 2007).

Despite the previous findings on mobile marketing, we find that a theoretical foundation in understanding customer response to mobile marketing is lacking. In this study, we identified the three distances as the important factors in mobile marketing. Based on the construal level theory, we explained the role of these three distances in influencing customer response in mobile marketing.

### 2.2.2 Construal Level Theory

The construal level theory explains how individuals make decisions by forming abstract mental construals of distal events (Trope et al. 2010). The theory suggests that mental construal processes serve to traverse psychological distances and switch between proximate and distant perspectives on events. In other words, individuals use increasingly higher levels of construal to represent an event as their psychological distance from the event increases. The construal level theory originated from the temporal construal theory, which particularly focused on how temporal distance from future events influences representation and judgment (Liberman et al. 1998).

In construal level theory, psychological distance is defined as the subjective distance between an actor and an event in the actor's psychological space. The construal level theory posits that different distance dimensions can be unified under one psychological space. Psychological distance is considered as egocentric. For example, the reference point for the individual is the here, self and now. An event might be removed from the reference point in the three distance dimensions accordingly, that is, the spatial distance, the social distance, and the temporal distance. These three distances constitute the most important elements of the construal level theory. In the development of the theory, hypothetical distance, the fourth distance dimension, was introduced. In our study, our focus is on only the first three distances which are well developed and relevant to our mobile marketing context.

According to the construal level theory, construals would become more abstract with an increase in distance. Subsequently, the psychological distance individuals initially envisage would also increase. The various distances should also influence prediction, evaluation, and action so that outcomes are mediated by the construals (Liberman et al. 2008; Liberman et al. 2007; Trope et al. 2007). For example, it has been shown that spatially distant events occurring in a foreign country are

associated more with high-level construals than events occurring in the local city of a customer (Fujita et al. 2006). Similarly, it has been shown that when the social distance to another person increases from an in-group member (low social distance) to an out-group member (high social distance), individuals will construe the target person using abstract, primary concepts such as stereotypes and traits. Consequently, they will be more influenced by these stereotypes and traits in forming their evaluations (Idson et al. 2001; Linville et al. 1996). Temporally, distant future events are construed as abstract, primary, and global aspects that center on why the event needs to be executed (i.e., high-level construals), whereas near future events are construed as concrete, secondary, and local aspects, which center on how the event is executed (i.e., low-level construals).

### 2.2.3 Spatial Distance

Spatial distance refers to the distance between the individual and the focal place (Dholakia 2000; Mischel et al. 1972; Sreedhar et al. 2004). Research has shown that representations of spatially near objects are linked to body orientation and visual input (Bryant et al. 1999). In contrast, representations of spatially distant events rely on schematic knowledge. At the same time, the representations also lead to systematic biases in judgments of spatial distance (Huttenlocher et al. 1991; McNamara 1986).

The construal level theory proposes that increasing the reported spatial distance of events leads to individuals representing the events by their central, abstract, global features (high-level construal) rather than by their peripheral, concrete, local features (low-level construal). Research has shown that increasing spatial distance enhances the tendency to represent social events using a high-level construal while decreasing the spatial distance enhances the tendency to represent social events using a low-level construal (Fujita et al. 2006). In other words, a higher

spatial distance leads individuals to represent events more abstractly while lower spatial distance causes individuals to represent events more concretely.

Past research has shown that customers' behavior will be influenced by their spatial distance to the retail stores (Ter Hofstede et al. 2002). Research also suggests that spatial distance can efficiently influence customers' preferences, product adoption and their consumption patterns (Jank et al. 2005). Specifically, in the mobile marketing context, we believe that spatial distance plays a critical role because it potentially wields a strong influence on customers' subjective construal when they are receiving a mobile promotion. Customers with different spatial distance to the store can have different perception of the mobile promotion and respond accordingly.

### 2.2.4 Social Distance

Social distance was first defined as the degree of reciprocity that exists within a social interaction between individuals (Hoffman et al. 1996). It refers to the distance between self and others (Chandran et al. 2004). According to the construal level theory, social distance is defined as the perceived distinctions between an individual and another individual (Liberman et al. 2007). For example, whether two individuals are socially close to or distant from each other determines the social distance between them.

According to the construal level theory, an individual tends to perceive socially proximate others using the low-level construal and perceive socially distant others using the high-level construal (Fiedler et al. 1995; Nisbett et al. 1973; Trope et al. 2003). Individuals treat the socially proximate others as in-groups while the socially distant others are regarded as out-groups (Trope et al. 2007). Furthermore, socially proximate others are usually considered as similar others and socially distant others are considered as dissimilar others (Trope et al. 2007).

Consequently, when interacting with socially proximate others, individuals will be more influenced by the low level construals and are more influenced by high level construals when interacting with socially distant others (Idson et al. 2001; Linville et al. 1996).

Various studies have contributed empirical findings on the impacts of social distance. For example, Akerlof (1997) studied the relationship between social distance and social decision and found that socially close agents interact strongly while socially distant agents have little interaction. Chandran et al. (2004) showed how health risk judgment varies as social distance changes. They found that individuals perceive socially close others to be less prone to negative events. Kim et al. (2008) demonstrated the impact of social distance on customers' product evaluation. They found that customer evaluations are more influenced by values associated with low-level construals when they perceive the social distance to be proximal. Borneman et al. (2011) analyzed the effects of social distance on customers' perception of quality, and perceptions of monetary sacrifice and product evaluation. They found a significant interaction effect between social distance and price level on perception of quality. Their findings verify that increases in social distance contribute to abstractness of thought and lead to a stronger focus on high-level considerations. Importantly, social distance can have its unique influence in the mobile marketing context. That is, social distance can potentially have a large impact on customer response to a mobile promotion when customers' socially connected friends appear in the popularity information in the promotional messages.

### 2.2.5 Temporal Distance

The construal level theory defines temporal distance as the perceived proximity of an event in time. In other words, temporal distance is the distance between a

reference point (typically today) and the point of occurrence of the event under consideration (e.g., the next day or next year) (Ariely et al. 2001; Karniol et al. 1996).

The construal level theory suggests that individuals have distinct psychological associations with different temporal distances (Liberman et al. 1998; Trope et al. 2000). In other words, temporal distance changes individuals' perceptions of an event by altering the way they mentally construe it. The theory also suggests that a higher level of abstraction is associated with distant future events (Liberman et al. 1998; Trope et al. 2000). Accordingly, individuals view the distant future in more abstract terms and the near future in more concrete terms (Sagristano et al. 2002).

To manipulate temporal distance, Liberman et al. (1998) designed scenarios with actions taken either tomorrow (low temporal distance) or the next year (high temporal distance). They subsequently examined the level of abstractness with which subjects evaluated the same action taken in the two time frames. Findings suggest that subjects described "moving into a new apartment" as "starting a new life" (a high-level construal) in the "next year" time frame, while they described the action as "packing and carrying boxes" (a low-level construal) in the "tomorrow" time frame.

Many studies have examined the impacts of temporal distance on different aspects. Meyers-Levy et al. (1992) investigated the influence of temporal distance on customers' affective and persuasive responses to advertising appeals. They found that variations in temporal distance can alter people's motivations and thoughts. Pennington et al. (2003) studied the influences of temporal distance on regulatory focus. They found that promotion focus increases with temporal distance to a goal, while prevention focus remains stable. Zhang et al. (2007) explored how temporal distance affects people's goal pursuit. By looking at people's mental framing of saving effort and studying effort, they found that temporally distant goal pursuit

signals more goal commitment, whereas temporally proximal goal pursuit signals more goal progress. Kim et al. (2008) studied the effects of temporal distance on customers' product evaluation. The results showed that when temporal distance is low, customers' product evaluations were more influenced by the values associated with low-level construal features rather than high-level construal features. Kim et al. (2009) researched the effects of temporal distance in the political realm. Their findings showed that when voters' decisions are temporally distant, "why" appeals are more persuasive than concrete "how" appeals. They also concluded that the effect is a result of a match between temporal distance and the abstractness of the message that leads to perceptions of fluency, and ensuing "feels right" experience. Kim et al. (2009) tested the influence of temporal distance on customers' evaluations of a product. They found that customers weigh the feasibility of purchasing and using a product more heavily when they consider it for immediate consumption (low temporal distance) than when they do not. We believe the temporal distance to have important impacts on mobile marketing. That is, temporally distant or proximal mobile promotion can impose different influences on customers' perceptions and yet the influence largely depends on the level of spatial distance and social distance.

### 2.2.6 Response to Mobile Marketing

In this study, we consider coupon downloading as customers' response to mobile marketing. Researchers have expended considerable effort in understanding how customers respond to coupons in the marketing literature. Shimp et al. (1984) used the theory of reasoned action to explain the behavior of coupon usage. Their definition of coupon usage includes the effort to clip, save, and use coupons. They believed that coupon usage represents a highly involved activity though it is the most trivial of behaviors. They showed that customers' intentions to use coupons are determined by their attitudes and perception of others' expectations. Later,

Lichtenstein et al. (1990) found that coupon-responsive behavior is a manifestation of both value consciousness and coupon proneness. Leclerc et al. (1997) used customers' coupon clipping behavior as the indicator for customer response to marketing promotions.

Particularly, in mobile marketing, we consider coupon downloading in the mobile app as the equivalent of clipping the coupon in the past studies. We believe coupon downloading to be a good indicator of customer response to mobile promotion for three reasons. First, the coupon downloading indicates that customers have perceived high utility of a promotion and have decided to take subsequent action (Eagly et al. 1993). Second, coupon downloading manifests customers' coupon attitudes and also has a direct causal link to coupon use (Mittal 1994). Third, coupon downloading is the immediate action customers can take after viewing a promotional message. It can best capture how customers are directly influenced by the mobile promotion (Shimp et al. 1984). Therefore, we evaluate customer response to mobile promotions by testing whether and how fast they download the coupon after viewing a promotion.

## 2.3 Hypotheses and Models

In the mobile marketing context, we believe the three distances (i.e., spatial distance, social distance, and temporal distance) are well represented and incorporated in the marketing strategies. In the following section, we will explore how these three distances influence customer response in mobile marketing.

### 2.3.1 Spatial Distance

In traditional online marketing, customers usually view a promotion when they are at home or in the office when they have access to the Internet. However, in mobile marketing, because of the ubiquitous Internet access, the place where customers view the promotion varies with mobility. Therefore, the spatial distance between the customer and the nearest store can vary with the location of the customer.

Researchers have found that many customers still opt to buy offline despite the well-known benefits of electronic commerce (Forman et al. 2009). One main reason is that inspecting non-digital products is often difficult. More importantly, the different spatial distances lead to different transportation costs to the store (Forman et al. 2009). Thus, when customers decide to buy from offline stores, the spatial distance will be especially important in their decision making process.

According to the construal level theory, when viewing a promotion, customers are more likely to think of “how” in terms of buying the product if the spatial distance is low; rather than “why” in terms of buying the product if the spatial distance is high. When the spatial distance is low, location convenience encourages customers to form a low-level construal. We attribute this low-level construal to the feasibility of getting to the store and buying the product (Choi et al. 2011). However, when the spatial distance is high, the long travel distance causes

customers to form a high-level construal. We attribute this high-level construal to the desirability of buying the product (Fujita et al. 2006). In other words, when viewing a promotion, customers are more likely to think of the ease of getting to the store if they are close to it; rather than of whether they really want to buy the product if they are not near the store.

Thus, depending on the spatial distance, customers are expected to have different evaluations of a mobile promotion. We expect customers to be more responsive to a mobile promotion when they are conveniently located from the store. Hence, we hypothesize:

***H1a:*** *The probability that customers respond to a mobile promotion will be higher when the spatial distance to the store decreases.*

***H1b:*** *The time it takes for customers to respond to a mobile promotion will be shorter when the spatial distance to the store decreases.*

### 2.3.2 Social Distance

With the increasing preponderance of popularity information in mobile marketing (Indvik 2012), researchers are motivated to learn how customers respond to popularity information. In a promotional message, the popularity information indicates other customers' promotion exposure or product endorsement. We believe the relationship between the customer and the people appearing in the popularity information can influence customer response to a promotion. In the mobile marketing context, we define the social distance as the perceived distinctions between the customer and the people who appear in the popularity information. Research shows that popularity information about friends' endorsement has a significant influence on customer response to promotions (Tucker et al. 2011). We argue that the influence of friends is further dependent

on the social distance between the customer and the people appearing in the popularity information. For example, customers will feel socially proximate if the people in the popularity information are their familiar friends. On the other hand, customers will feel socially distant if the people in the popularity information are strangers.

When customers view the popularity information, they treat people in the popularity information as in-group others if the social distance is low, whereas they would treat them as out-group others if the social distance is high. Research has indicated that customers are more likely to focus on the detailed content when they consider that a message is from in-group others (Mackie et al. 1990). We believe the detailed content is represented by the low-level construal which is perceived as the persuasive aspect of the popularity information (Chaiken 1980). In contrast, customers are more likely to perceive it as general information when the message is from out-group others (Markus et al. 1991). We believe the general information is represented by the high-level construal which is perceived as the informative aspect of the popularity information (Bauer et al. 1968).

Studies have also found that proximate social distance engenders trust among individuals (Castaldo 2007; Putnam 2001). Thus, proximate social distance renders the popularity information from similar in-groups to be more influential (Trope et al. 2010). Therefore, we expect customers to be more responsive to a mobile promotion which shows the popularity information of their close friends. Thus, we hypothesize:

***H2a:*** *The probability that customers respond to a mobile promotion will be higher when the social distance to the people in the popularity information decreases.*

***H2b:*** *The time it takes for customers to respond to a mobile promotion will be shorter when the social distance to the people in the popularity information decreases.*

### 2.3.3 Temporal Distance

In traditional marketing, all customers receive a promotion with the same expiry date. However, in the mobile marketing context, this is no longer the case. With the location-based service (LBS), marketers are now able to identify the locations of their customers. Depending on a customer's current location, marketers can send customers mobile promotions with different expiry dates. Thus, the period from customers viewing the promotion to the expiry date is no longer the same across all customers. We define the temporal distance as the period between customers viewing the mobile promotion and the expiry date.

When customers view promotions with different expiry dates, their evaluations of the promotion are believed to be different. According to the construal level theory (Trope et al. 2003), customers' attraction to a purchase opportunity depends on whether they plan to immediately take advantage of it or at a later point in time (Kim et al. 2009). When the temporal distance is low, the imminently expiring promotion creates time pressure on customer choice and it stimulates customers to think of the low-level construal. We attribute this low-level construal to the urgency of buying the product (Beatty et al. 1987; Katona et al. 1955).

The low temporal distance suggests customers to take 'for-sure' action while a high temporal distance allows for more contingency to take action (Meyers-Levy et al. 1992). Furthermore, customers become more optimistic when the temporal distance is high and become pessimistic when the temporal distance is low (Pennington et al. 2003). The urgency of responding to a promotion causes the pessimistic feeling of losing the opportunity to enjoy the promotional discount.

Customers would regret forgoing the opportunity of getting the discount if they choose not to respond to the promotion (Loomes et al. 1982). It is only by responding to the promotion that its value will be achieved (Tsalgatidou et al. 2001). We believe the anticipated regret stimulates customers into making a more immediate response when the expiry date of the promotion approaches (Zeelenberg 1999). Therefore, customers are more responsive to a mobile promotion if the promotion ends in a short period of time. Thus, we hypothesize:

***H3a:*** *The probability that customers respond to a mobile promotion will be higher when the temporal distance to the expiry date decreases.*

***H3a:*** *The time it takes for customers to respond to a mobile promotion will be shorter when the temporal distance to the expiry date decreases.*

After proposing the main effects of the three distances, the more interesting question we intend to address is what would be the joint influence of multiple distances on customer response to mobile promotions. Trope et al. (2010) in their paper, suggested that changes in distance in one dimension would have a greater impact when the focal event is proximate on another dimension than when it is distant on that other dimension. Past research has also explored the interaction effect between social distance and temporal distance (Kim et al. 2009; Kim et al. 2008). However, both studies focused on customer evaluations which were based on subjective measures using lab experiments. In this thesis, we investigated how social distance and temporal distance will interactively influence customers' behavior in responding to mobile promotions. In the following sections, we will discuss the two-way interactions between the three distances.

### 2.3.4 Spatial Distance and Social Distance

Similarly, we intend to also consider the situation where customers are spatially proximate to the store and view a promotion with popularity information from socially proximate others. In this case, customers tend to consider the persuasive aspect of the popularity information (Chaiken 1980). At the same time, the low spatial distance reminds customers about the feasibility of buying the product (Choi et al. 2011). Thus, when both of the low-level construals are formed, the construal level of spatial distance is congruent with that of the social distance. Research has shown that the effect of one distance can be more influential when its level of representation matches with the construal level of the other distance (Thomas et al. 2007). In this case, the feasibility of buying the product enhances the persuasive aspect perceived from the popularity information. Customers perceive stronger social influence from close friends in the popularity information when it is easy for them to buy the product (Kumar et al. 2006; Senecal et al. 2004). Therefore, when the spatial distance is low, we expect customers to be more responsive to mobile promotions if the social distance decreases.

On the other hand, we take into consideration the situation where customers are spatially distant to the store and view a promotion with popularity information from socially distant others. In this situation, the high spatial distance and high social distance encourage customers to think of high-level construals when responding to the mobile promotion. Thus, customers tend to think of the desirability of buying the product and the informative aspect perceived from the popularity information (Bauer et al. 1968; Fujita et al. 2006). We believe the informative aspect will stimulate the desirability of buying the product. The popularity information from the general audience is likely to serve as unbiased information on the attractiveness of the promotion and subsequently increases customers' desirability of buying the product. Thus, when the spatial distance is high, we expect customers to be more responsive to the mobile promotion if the social distance increases. Therefore, we hypothesize:

***H4a:*** *When the spatial distance is low, the probability that customers respond to a mobile promotion will be higher if the social distance decreases. On the other hand, when the spatial distance is high, the probability that customers respond to a promotion will be higher if the social distance increases.*

***H4b:*** *When the spatial distance is low, the time it takes for customers to respond to a mobile promotion will be shorter if the social distance decreases. On the other hand, when the spatial distance is high, the hazard rate that customers respond to a promotion will be higher if the social distance increases.*

### 2.3.5 Spatial Distance and Temporal Distance

In this section, we consider the situation when customers are spatially proximate to the store and the mobile promotion expires in a temporally proximate future. In this situation, customers tend to think of the feasibility of buying the product and the temporally proximate expiry date reminds customers about the urgency of responding to a promotion (Choi et al. 2011). Thus, when both the low-level construals are in place, the feasibility of buying the product provokes the urgency of responding to the promotion. Customers feel compelled to respond to the promotion because they would regret losing the opportunity to enjoy the fleeting promotional discount. Further, grabbing the opportunity is so effortless because a close distance to the store makes it convenient for customers to buy the product. Therefore, when the spatial distance is low, we expect customers to be more responsive to the mobile promotion if the temporal distance decreases. Therefore, we hypothesize:

***H5a:*** *When the spatial distance is low, the probability that customers respond to a mobile promotion will be higher if the temporal distance decreases.*

***H5b:*** *When the spatial distance is low, the time it takes for customers to respond to a mobile promotion will be shorter if the temporal distance decreases.*

### 2.3.6 Social Distance and Temporal Distance

Finally, we consider the scenario where the customer is socially proximate to the people in the popularity information and the mobile promotion expires in a temporally proximate future. In this scenario, we believe customers tend to perceive the persuasive aspect of the popularity information (Chaiken 1980). At the same time, the low temporal distance reminds customers about the urgency of responding to the promotion. Thus, when both low-level construals are present, the persuasive aspect of the popularity information stimulates the urgency of responding to the promotion. The influence from the others has shown to be more relevant when there is a match between the social distance and the temporal distance (Zhao et al. 2011). When the expiry date is approaching, we believe the urgency caused by the time pressure strengthens social influence from the close friends in the popularity information. Therefore, when both dimensions are proximal, customers are more influenced by low-level construals (Kim et al. 2008). That is, when the social distance is low, customers are believed to be more responsive to the mobile promotion if the temporal distance decreases.

On the other hand, we consider the scenario when the customer is socially distant to the people in the popularity information and the mobile promotion expires in a temporally distant future. Thus, the high social distance is congruent with the high temporal distance. In this scenario, customers are more likely to treat the popularity information to be informative when they are socially distant to the people in the popularity information. At the same time, the temporally distant expiry date provides adequate time for customers to consider responding to the promotion. Given more time to respond, customers are more likely to judge the

popularity information from strangers to be unbiased opinions from the general public. Accordingly, herd behavior suggests customers will choose to follow the public and respond to the promotion (Banerjee 1992; Bikhchandani et al. 1992). Therefore, when the social distance is high, we expect customers to be more responsive to the mobile promotion if the temporal distance increases. Therefore, we hypothesize:

***H6a:*** *When the social distance is low, the probability that customers respond to a mobile promotion will be higher if the temporal distance decreases. On the other hand, when the social distance is high, the probability that customers respond to a mobile promotion will be higher if the temporal distance increases.*

***H6b:*** *When the social distance is low, the time it takes for customers to respond to a mobile promotion will be shorter if the temporal distance decreases. On the other hand, when the social distance is high, the time it takes for customers to respond to a mobile promotion will be shorter if the temporal distance increases.*

Figure 2-2 shows the research model. The spatial distance, social distance, and temporal distance are the three independent variables. Customers' coupon download will be the binary dependent variable. We also included customers' app usage, as well as customers' Facebook profile information as control variables in our model

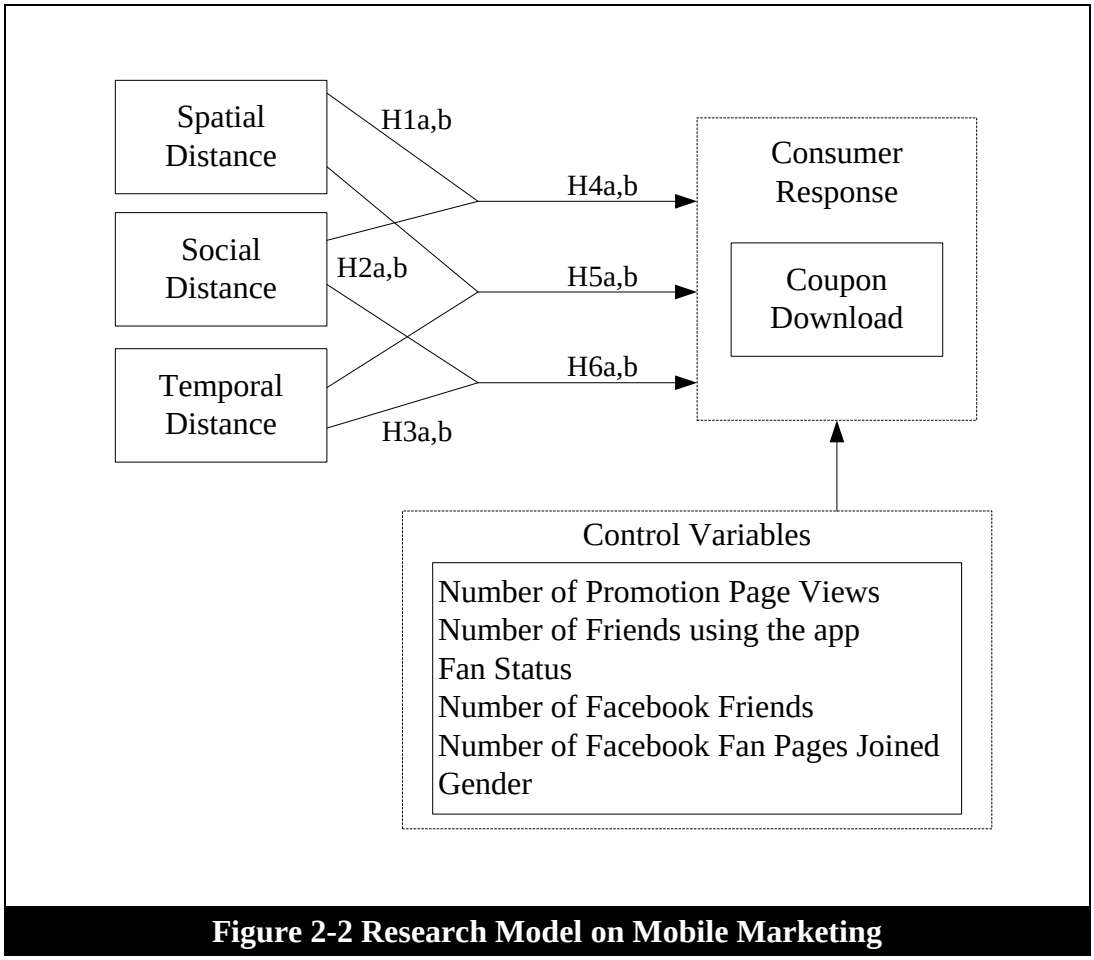



**Figure 2-2 Research Model on Mobile Marketing**

## 2.4 Field Experiment

### 2.4.1 Experimental Setting

A randomized field experiment was conducted by fitting our experimental design into a marketing campaign of an apparel retailer, ABC[4]. The retailer, running a chain of 20 stores, is one of the largest fashion apparel retailers in an Asian country. We designed and developed a mobile application (app) for the campaign and applied all our experimental designs in the mobile app. The mobile app served as the mobile marketing channel for ABC. Adoption of the mobile app was free for customers and they need to log in using their Facebook account to receive promotions. We used the app to collect customers' personal attributes, their locations, and their friends list on Facebook[5]. With access to customers' locations, our server recorded customers' precise locations with the latitude and longitude.

During the experiment, customers received promotions from ABC through the mobile app. We randomized the promotion customers received such that the promotion has different expiry dates and different popularity information.

### 2.4.2 Experimental Design

Because we developed the entire mobile app ourselves, we had full control in implementing the operationalization of the independent variables (i.e., spatial distance, social distance, and temporal distance). We recorded the spatial distance

---

[4] For reasons of confidentiality, we refer to this apparel retailer by the pseudonym of ABC.

[5] The mobile app can only access part of customers' profiles if they have changed the default privacy settings. This is unlikely to have a significant effect on the study because less than 2% of Facebook users change their default privacy settings (Gross, R., and Acquisti, A. Year. "Information revelation and privacy in online social networks," Proceedings of the 2005 ACM workshop on Privacy in the electronic society, ACM2005, pp. 71-80.)

in our server and manipulated the social distance and temporal distance in the promotional message. Figure 2-3 presents an illustration of the promotional message with our experimental design. The underlined texts indicate the randomly assigned expiry date. The popularity information shows the Facebook profile pictures of three people who also received the promotion.

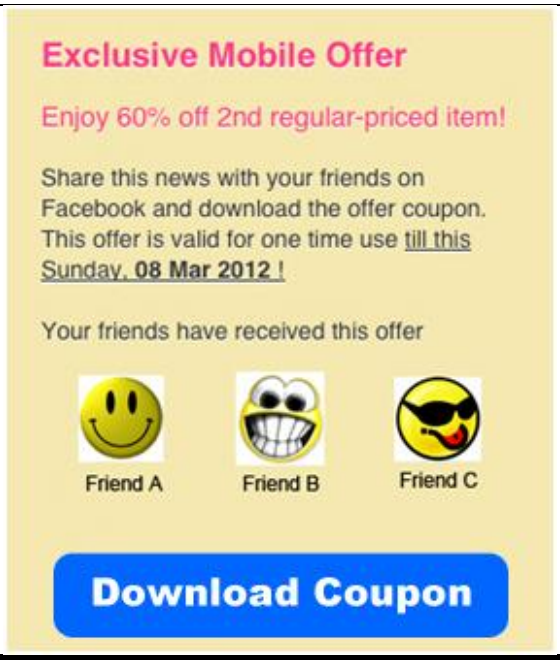



**Figure 2-3 Illustration of the Promotional Details**

We had three rounds of the promotion during the marketing campaign. Each round of the promotion offered different discount types but had the same discount percentage for each transaction.[6] At the beginning of each round of the promotion, we dispatched the promotion to customers who had installed our mobile app. Customers could view the details of the promotion on receiving it. After viewing the promotional message, that is, after they were exposed to the treatment design, customers could decide whether to download the coupon. For each round of the

[6] Because of the non-disclosure agreement, we cannot reveal the details of the discount types.

promotion, customers were only allowed to download the coupon once. The following paragraphs describe how we manipulated each of the independent variables and how they were measured.

#### 2.4.2.1 Spatial Distance

Our mobile app asked for access to customers' location data when they initially launched the app. If the customers permitted us to access their locations, we could then obtain customers' precise location data along with the exact latitude and longitude. Thus, each time customers used our mobile app, we recorded their exact location data in our server.

The spatial distance was measured by the travel distance in kilometers from the place where the customer viewed the promotion to the nearest ABC store.[7] If customers had multiple views of the promotion within a day, we used the place where they viewed the promotion for the first time on that day to compute the spatial distance. We chose this approach because we believe the first promotion view has a large influence on customer's decision making on downloading the coupon and the subsequent views were mainly for checking purposes, such as checking the expiry date of the coupon or the coupon code. For each customer, we recorded a daily spatial distance. Although we did not explicitly manipulate the spatial distance in the promotional message, it was an important variable we saved for our model estimation. In addition, in the mobile app, we designed a map indicating the travelling route from a customer's current location to the nearest store. Therefore, customers could easily identify the nearest ABC store from the map. This was to ensure that customers' perceived spatial distance was the same as the objective spatial distance we recorded.

---

[7] The travel distance was calculated by using the Google Distance Matrix API. https://developers.google.com/maps/documentation/distancematrix/

#### 2.4.2.2 Social Distance

We manipulated social distance by displaying the popularity information of people who were socially distant or proximate to the customer in the promotional message. The popularity information showed the Facebook profile pictures of three randomly selected individuals who also received the promotion (see Figure 2-3).[8] These three people were randomly chosen from the customer's Facebook friends and other customers who also used this mobile app.

According to the social network studies (Gilbert et al. 2009; Kossinets et al. 2006), the social distance between two individuals can be measured by the number of mutual friends they share in the social network. The more mutual friends are shared by two customers, the less the social distance is. In this case, the most distant social distance between two customers will be the situation where they share no mutual friends. Therefore, following the book by Wassernam et al. (1994), we measured the social distance as the reciprocal of the number of mutual friends. In our study, customers saw the Facebook profile pictures of three people in the popularity information. We calculated the number of mutual friends between the customer and each of the three people. Thus, we had three numbers for the mutual friends. We took the average of the three numbers and calculated the reciprocal as our measure for social distance. Therefore, the social distance was calculated as follows[9]:

$$Social\_Distance = \frac{1}{1 + \frac{\sum_{i}^{3} Num\_Mutual\_Friends_i}{3}}$$

[8] We replaced the real profile pictures with smiley faces for privacy reasons.

[9] We add one to the denominator to avoid the situation that the denominator is zero when the customers share no mutual friends with the three people in the popularity information.

For the manipulation of the social distance, the popularity information did not reveal the friends' endorsement of the promotion. This manipulation may not have exerted a sufficiently strong influence on customers' decision making. However, the popularity information in our manipulation actually covered two aspects. First, the popularity information was not about endorsement but with the promotion exposure of other customers. Second, people in the popularity information were not necessarily the customers' friends and could be strangers. We believe our manipulation of social distance is a good indication of the current marketing practice of using popularity information. First, the website of Agoda.com, shows the number of other customers who are also looking at the same hotel. In this case, the popularity information is about other customers' promotion exposure rather than the endorsement. Second, on the website of Tripadvisor.com, the popularity information shows that the friends of the customer are also friends of the reviewer of the hotel. In this case, the popularity information is about endorsement of customers' second degree friends. In these two examples, when the websites lack information about endorsement of customers' friends, the websites chose to provide information on promotion exposure or second degree social information, i.e., information about other customers viewing the same promotion or endorsement of second degree friends. Research has shown that friends' endorsement on Facebook is effective in encouraging customers to respond to promotions (Tucker 2012). However, it is important and interesting to test the effectiveness of popularity information from friends or strangers. We believe our manipulation of social distance can help to address this question.[10]

[10] Because this research is an exploratory study, we did not have previous data on customer responses to the promotions. This led us to use the popularity information of other customers' promotion exposure.

#### 2.4.2.3 Temporal Distance

We manipulated the temporal distance by varying the expiry dates of the promotion. We randomly assigned expiry dates for each customer. The promotional message was specified as "This offer is valid for one time use till next Wednesday, 05 Mar 2012!" The underlined words indicated the expiry date of the promotion. The expiry date varied by day and was randomly chosen from the following day when customer viewed the promotion to the last day of the current round of the promotion. Each round of promotion lasted one week. Thus, when customers viewed the mobile promotion, the closest expiry date could be one day away and the furthest expiry date could be six days away.

The temporal distance was measured as the number of store opening hours left before the expiry of the promotion. In other words, the temporal distance was calculated from the first time customers viewed the promotion on each day to the time ABC stores closed on the expiry date.[11] We measured temporal distance using the remaining opening hours because the valid time left for making a purchase was essentially the same for customers who viewed the promotion after the stores' opening hours. For example, customer A viewed the promotion at 10:30 pm and customer B viewed the promotion at 11:00 pm and their promotions expired on the same day. In this case, the valid time left for them to make a purchase on the following days was essentially the same.

[11] The stores of ABC open at 10 am and close at 10 pm.

### 2.4.3 Data

Before launching the field experiment, we designed a Facebook advertisement to recruit a representative population of ABC customers.[12] Customers could see the Facebook advertisement as it was displayed on advertising space within Facebook. Table 2-1 shows the demographic settings of our Facebook advertisement.

**Table 2-1 Demographic Settings of the Facebook Advertisement**

| | |
|---|---|
| Country | Singapore |
| Age | 18-45 years old |
| Gender | Male and female |
| Broad Categories | Retail/Shopping, Movie/Film, Music, Sports |
| Connection | Fans of ABC and other competing brands |
| Precise Interest | Fashion, Shopping, Consumer Product |

The Facebook advertisement bore the name of the retailer in its title and bore the promotional message: "Join us in our birthday celebrations and download the ABC X$^{th}$ Anniversary Mobile App to enjoy our offer!"[13] Customers who clicked on the Facebook advertisement would be guided to the installation page of the mobile app.

Our field experiment lasted 18 days from March 15 2012 to April 1 2012. During the field experiment, 147 users viewed the offers (78 unique customers) and 83

[12] Because ABC customers are mostly young adults and professionals, the customers we would like recruit using Facebook ads aged from 18 to 45 years old. According to Singapore's census of population in 2010, there are 2.16 million people who aged from 18 to 45. Furthermore, there are 2.14 million Singapore users on Facebook according to data from Socialbakers (http://www.socialbakers.com/facebook-statistics/singapore) and Singapore Business Review (http://sbr.com.sg/leisure-entertainment/news/5-important-statistics-about-facebook-users-in-singapore). Thus, the Facebook penetration rate for people in Singapore is 99.1%. We believe this high penetration rate can largely mitigate the sample bias issue that customers recruited from Facebook are not mobile users.

[13] Because of the non-disclosure agreement, we cannot reveal the details of the advertisement.

users downloaded the coupons (58 unique users). We also captured customers' usage of the mobile app and their profile information from Facebook. We used these factors as control variables in our model estimation. The variables and their measures are listed in Table 2-2 .

Table 2-3 presents the descriptive statistics of the model variables associated with the 78 customers across 147 observations. Table 2-4 displays the correlation between the variables. We did not observe any high correlation between the variables. For each user, we captured the statistics from the day they viewed the promotion till the day they downloaded the coupon or the day the coupon expired. Therefore, each customer has one observation every time they viewed the promotion from the first day they viewed the promotion to the day they downloaded the coupon or the day the promotion expired.

| Table 2-2 Variables and Measures | |
|---|---|
| Variable | Measure |
| $Coupon\_Download_{it}$ | Indicator denotes whether the customer downloaded the coupon. |
| $Spatial\_Dist_{it}$ | The travel distance in kilometers from the place where the customer viewed the promotion to the nearest ABC store.[14] |
| $Social\_Dist_{it}$ | The reciprocal of the average number of mutual friends between the customer and the three people in the popularity information. |
| $Temporal\_Dist_{it}$ | The number of opening hours left before the promotion expired. |
| $Spa\_Soc\_Dist_{it}$ | Interaction term between spatial distance and social distance. |
| $Spa\_Temp\_Dist_{it}$ | Interaction term between spatial distance and temporal distance. |
| $Soc\_Temp\_Dist_{it}$ | Interaction term between social distance and temporal distance. |
| $Spa\_Soc\_Temp_{it}$ | Three-way interaction term of spatial distance, social distance, and temporal distance. |
| $Num\_Views_{it}$ | The number of times customers viewed the offer. |
| $Num\_Fnds\_app_{it}$ | The number of customers' Facebook friends used our mobile app. |
| $Fan_i$ | Indicator denotes whether the customer was a fan of ABC on Facebook. |
| $Num\_FBfnds_i$ | The total number of Facebook friends the customer has. |
| $Num\_Fanpgs_i$ | The total number of Facebook fan pages the customer liked. |
| $Female_i$ | Indicator denotes whether the customer is a female. |
| $Rnd2dmy_{it}$ | The dummy variable for the 2nd round of the promotion. |
| $Rnd3dmy_{it}$ | The dummy variable for the 3rd round of the promotion. |

* We also included day of week dummies in our model estimation.

+ $i$ denotes each individual customer and $t$ denotes each day in the campaign.

[14] If customers had multiple views of the promotion within a day, we used the place where they viewed the promotion for the first time on that day to compute the spatial distance.

| Table 2-3 Descriptive Statistics | | | | | | |
|---|---|---|---|---|---|---|
| Variables | Obs | Mean | Std.Dev | Min | Max | Skewness |
| *Coupon_ Download* | 147 | 0.558 | 0.498 | 0 | 1 | -0.233 |
| *Decision_Durantion*[15] | 147 | 6.898 | 15.311 | 0 | 62.614 | 2.452 |
| *Spatial_Dist* | 147 | 3.010 | 2.685 | 0.007 | 9.657 | 1.101 |
| *Social_Dist* | 147 | 0.540 | 0.443 | 0.005 | 1 | -0.071 |
| *Temporal_Dist* | 147 | 33.905 | 20.037 | 3.937 | 84 | 0.993 |
| *Num_Views* | 147 | 2.633 | 2.570 | 1 | 22 | 3.869 |
| *Num_Friends_app* | 147 | 2.939 | 6.991 | 0 | 52 | 4.093 |
| *Fan* | 147 | 0.361 | 0.482 | 0 | 1 | 0.581 |
| *Num_FB_friends* | 147 | 348.879 | 233.416 | 2 | 1188 | 1.119 |
| *Num_Fan_pages* | 147 | 154.414 | 256.949 | 3 | 2219 | 7.140 |
| *Female* | 147 | 0.782 | 0.414 | 0 | 1 | -1.368 |

*Std. Dev. = Standard Deviation*

[15] Decision duration captures the time in hours from first view to customers downloaded the coupon or the time coupon expired. This variable is not used in the model estimation but used for description.

| **Table 2-4 Correlation Table** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| (1) *Coupon_ Download* | - | | | | | | | | | |
| (2) *Decision_Durantion* | -0.34 | - | | | | | | | | |
| (3) *Spatial_Dist* | -0.18 | -0.06 | - | | | | | | | |
| (4) *Social_Dist* | -0.21 | 0.11 | -0.03 | - | | | | | | |
| (5) *Temporal_Dist* | 0.11 | 0.13 | -0.08 | 0.17 | - | | | | | |
| (6) *Num_Views* | 0.18 | -0.13 | -0.07 | 0.13 | -0.07 | - | | | | |
| (7) *Num_Frieds_app* | 0.05 | -0.04 | 0.08 | 0.00 | -0.07 | 0.07 | - | | | |
| (8) *Fan* | 0.06 | 0.01 | 0.00 | 0.00 | 0.01 | -0.02 | 0.21 | - | | |
| (9) *Num_FB_friends* | 0.06 | -0.12 | 0.14 | -0.27 | 0.00 | 0.08 | -0.06 | 0.05 | - | |
| (10) *Num_Fan_pages* | -0.02 | -0.05 | 0.08 | 0.11 | -0.07 | 0.03 | -0.12 | 0.13 | 0.28 | - |
| (11) *Female* | -0.10 | 0.04 | 0.11 | -0.06 | 0.09 | -0.10 | -0.07 | 0.22 | 0.05 | 0.08 |

## 2.5 Model Specification and Estimation

### 2.5.1 Model Specification

In this section, we specified three models to address our research question: a logit model, a hazard model, and a joint estimation model of these two models. The independent logit model and the hazard model aim to address the questions of whether and how fast customers respond to a mobile promotion respectively. The joint model is to estimate these two questions simultaneously. Detailed model specifications are described in the following sections.

#### 2.5.1.1 Logit Model Specification

To capture the propensity of customers' response to a mobile promotion, we used a daily-level panel logit model to estimate the probability of downloading the coupon. We specify the logit model as follows:

$$p_{it} = \Pr[Coupon\_Download_{it} = 1] = \frac{\exp(X'\beta)}{1+\exp(X'\beta)} \tag{1}$$

$$\begin{aligned} X'\beta = {} & \beta_1 * Spatial\_Dist_{it} + \beta_2 * Social\_Dist_{it} + \beta_3 * Temporal\_Dist_{it} \\ & + \beta_4 * Spa\_Soc\_Dist_{it} + \beta_5 * Spa\_Temp\_Dist_{it} \\ & + \beta_6 * Soc\_Temp\_Dist_{it} + \beta_7 * Spa\_Soc\_Temp_{it} \\ & + \beta_8 * Num\_Views_{it} + \beta_9 * Num\_Friends\_app_{it} + \beta_{10} * Fan_i \\ & + \beta_{11} * Num\_FB\_friends_i + \beta_{12} * Num\_Fan\_pages_i \\ & + Female_i + \theta_t + \alpha_i + \varepsilon_{it} \end{aligned} \tag{2}$$

where $i = 1 \ldots 78$ denotes each individual customer, $t = 1 \ldots 18$ denotes each day in the campaign which lasted 18 days. In this model, $Coupon\_Download_{it}$ indicates whether customer $i$ has downloaded the count on day $t$. The $Spatial\_Dist_{it}$,

$Social\_Dist_{it}$, $Temporal\_Dist_{it}$ and their two-way interaction terms are our focal variables of interest. The three-way interaction term $Spa\_Soc\_Temp_{it}$ is not our focal variable but we kept it for a complete model. $\beta$s are the model coefficients of interest, $\theta_t$ are the round dummies and day of week dummies[16], $\alpha_i$ captures unobserved customer heterogeneity, and $\varepsilon_{it}$ are the i.i.d. logistic distributed with mean zero and variance $\delta_\varepsilon^2 = \pi^2 / 3$, independent of $\alpha_i$.

#### 2.5.1.2 Hazard Model Specification

In order to address the question of how fast customers respond to mobile promotions, we use a hazard function specification. Specifically, we employed a Weibull distribution for the parametric form. The choice of specification was based on an extensive comparison with Exponential, and Gompertz models, using proportional hazards formulations.[17] The hazard function $h(\bullet)$, the survivor $S(\bullet)$, and the density $f(\bullet)$ for the Weibull are given by:

$$h(t) = \gamma p t^{p-1} \tag{3}$$

$$S(t) = \exp(-\gamma t^p) \tag{4}$$

$$f(t) = \lambda(t) * S(t) \tag{5}$$

where $\lambda(t)$ is the hazard function which represents the hazard of downloading the coupon. Here, $\gamma = \exp(X'\beta)$, and $X'\beta$ is the same as that shown in equation (2).

[16] Wednesday is the last day when each round of promotion expired. For customers who downloaded the coupon, they all responded before Wednesday. For customers who did not download the coupon, none of them viewed the promotion on Wednesday. Therefore, we do not have observation on Wednesday. Thus, the day of week dummies do not have Wednesday.

[17] Details of the empirical comparison of these specifications are shown in the Appendix.

The variables and $\beta$ parameters to be estimated are the same as those described in the logit model section. Furthermore, $p$ is the Weibull ancillary parameter which specifies the shape of the Weibull hazard. The parameter p determines whether the monotone hazard rate increases or decreases with time. When $p > 1$, the hazard rate decreases as time elapses. In contrast, the hazard increases if $p < 1$. If $p = 1$, it is a special case of the Weibull hazard with constant hazard rate. In this case, the hazard rate is essentially the exponential hazard.

Here, in equation (3), the $\lambda(t)$ is the hazard function which is the instantaneous probability of a customer downloading the coupon at time $t$. In equation (4), the $S(t)$ is the survival function which represents the probability that the duration before a customer downloads the coupon equals or exceeds $t$. The $f(t)$ in equation (5) is the density function which is the product of the hazard function and the survival function.

To correctly estimate the effects of distances, we had to overcome three complexities of our data. First, because customers could participate in multiple rounds of our promotion, our analysis involved multiple failures. We allowed for dependency among the recurrence times within each customer while assuming the independence of customers. Second, in our data, most of our variables were time-varying across observations. When calculating the log-likelihood, we took the integration for observations in each round to account for the time-varying variables. Third, our data had time gaps between different rounds of the promotion. We specifically indicated the starting time in the model estimation for each customer in each round of the promotion.

### 2.5.1.3 Joint Model Specification

We believe there is a functional relationship between the probability and the hazard rate for customers to download a coupon. First, decreasing one of the distances leads to a direct effect on the probability of coupon downloading. In addition, the decreased distance could potentially accelerate the response decision, which in turn affects the response probability (Chintagunta 1999). To simultaneously address the questions of whether and how fast customers respond to a mobile promotion, we used a joint estimation of the logit model and the hazard model.

We wrote the likelihood function for the joint estimation of the logit model and hazard model. Standard likelihood function methods can be employed to maximize the likelihood function. The likelihood function for customer $i$, $L_i$ is given by:

$$L_i = \prod_{t=1}^{T} p_{it}^{\ \delta_{it}} (1 - p_{it})^{1-\delta_{it}} \tag{6}$$

$$* \prod_{r=1}^{R} f_i(t)^{\eta_{ir}} S_i(t)^{1-\eta_{ir}} \tag{7}$$

where $p_{it}$ is the probability that customer $i$ downloaded coupon at time $t$, which is given in equation (1), $S_i(t)$ is the survival function which is given in equation (4), $f_i(t)$ is the density function which is the product of the hazard function and the survival function as indicated in equation (5). Furthermore, $\delta_{it}$ in equation (6) indicates whether customer $i$ downloaded the coupon at time $t$. The $\eta_{ir}$ in equation (7), indicates whether customer $i$ downloaded the coupon in round $r$ of the promotional campaign.

### 2.5.2 Model Estimation Results

In this section, we present the model estimation results of the three models previously specified. We first present the results for the two independent models. We follow this with a detailed discussion on the results of the joint model estimation.

#### 2.5.2.1 Logit Model Estimation Results

Table 2-5 presents the model estimation results of the logit model. Column (1) shows the estimation results for the logit model using the random-effects estimator. From the results of the independent logit model, we can see that all the three main effects are significant and have the correct sign. The two-way interaction effects are all significant as well. Notably, in Column (1), the additional panel-level variance component is parameterized as the log of variance $\ln(\alpha^2)$. In the same column, the component labeled as $\rho$ is the proportion of the total variance contributed by the panel-level variance component.

$$\rho = \frac{\sigma_\alpha^2}{\sigma_\alpha^2 + \sigma_\varepsilon^2} \tag{8}$$

When $\rho$ is zero, the panel-level variance component is unimportant, and the panel estimator is no different from the pooled estimator. Our likelihood-ratio test shows that the p value is greater than 0.05, which means that the model using the random-effects estimator is no better than the model using the pooled estimator. We will discuss a more detailed interpretation when we present the results of the joint model. Besides, we estimated a model using the population-averaged estimator to obtain the average response over the population. Column (2) presents the results of the model using this estimator. We further estimated the population-averaged model with robust standard errors in Column (3).

**Table 2-5 Logit Model Estimation Results**

| VARIABLES | (1) RE | (2) PA | (3) PA Robust SE |
|---|---|---|---|
| Spatial Distance | -2.272*** | -1.808*** | -1.808** |
| | (0.777) | (0.571) | (0.702) |
| Social Distance | -8.884*** | -7.118*** | -7.118*** |
| | (2.894) | (1.973) | (2.003) |
| Temporal Distance | -0.115** | -0.092** | -0.092** |
| | (0.052) | (0.040) | (0.040) |
| Spatial * Social | 2.222*** | 1.780*** | 1.780** |
| | (0.857) | (0.633) | (0.728) |
| Spatial * Temporal | 0.051** | 0.041*** | 0.041** |
| | (0.021) | (0.015) | (0.017) |
| Social * Temporal | 0.126** | 0.100** | 0.100** |
| | (0.060) | (0.045) | (0.044) |
| Spatial*Social*Temporal | -0.044* | -0.035** | -0.035* |
| | (0.023) | (0.017) | (0.018) |
| Num Promotion View | 0.351** | 0.279** | 0.279*** |
| | (0.156) | (0.112) | (0.097) |
| Num Friends use app | 0.007 | 0.004 | 0.004 |
| | (0.052) | (0.041) | (0.028) |
| Fan Status | 0.471 | 0.377 | 0.377 |
| | (0.655) | (0.532) | (0.565) |
| Num Facebook Friends | -0.000 | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| Num Fan Pages Joined | -0.000 | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| Female | -0.847 | -0.664 | -0.664 |
| | (0.772) | (0.598) | (0.578) |
| Round2 | -0.397 | -0.283 | -0.283 |
| | (0.985) | (0.771) | (0.659) |
| Round3 | -0.955 | -0.739 | -0.739 |
| | (0.990) | (0.756) | (0.712) |
| Tuesday | 1.134 | 0.373 | 0.373 |
| | (2.547) | (1.698) | (1.076) |
| Thursday | -0.044 | -0.032 | -0.032 |
| | (1.556) | (1.229) | (1.000) |
| Friday | -0.727 | -0.595 | -0.595 |
| | (1.624) | (1.284) | (1.144) |
| Saturday | -0.697 | -0.576 | -0.576 |
| | (1.590) | (1.318) | (1.345) |
| Sunday | 0.466 | 0.356 | 0.356 |
| | (1.711) | (1.388) | (1.353) |
| Constant | 7.987*** | 6.315*** | 6.315*** |
| | (2.821) | (1.948) | (2.055) |
| $\ln(\alpha^2)$ | 0.389 | | |
| | (1.185) | | |
| $\rho$ | 0.310 | | |
| | (0.253) | | |
| Observations | 147 | 147 | 147 |
| Number of customers | 78 | 78 | 78 |
| Log likelihood | -71.260 | NA | NA |
| AIC | 186.520 | NA | NA |
| AICc | 194.661 | NA | NA |
| BIC | 252.310 | NA | NA |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

### 2.5.2.2 Hazard Model Estimation Results

To control for the frailty which is the heterogeneity for survival model, we assume the distribution of the frailty for the hazard model estimation. The frailty is a random positive quantity and is assumed to have a mean value equal to 1 and a variance equal to $\theta$. For mathematical tractability, we assume the frailty to follow either the gamma distribution or the inverse-Gaussian distribution. The gamma(a, b) distribution has probability density function as (StataCorp 2009),

$$g(x) = \frac{x^{a-1}e^{-x/b}}{\Gamma(a)b^a} \tag{9}$$

and the inverse-Gaussian(a, b) distribution has the probability density function,

$$g(x) = \left(\frac{b}{2\pi x^3}\right)^{1/2} \exp\left\{-\frac{b}{2a}\left(\frac{x}{2} - 2 + \frac{a}{x}\right)\right\} \tag{10}$$

Accordingly, Table 2-6 presents the results of the hazard model estimation with Weibull survival distribution. Column (1) shows the results that assume the frailty to be a gamma distribution and Column (2) assumes the frailty to be an inverse-Gaussian distribution. The estimation results, in addition to the standard parameter estimates, present the estimate of the variance of the frailties in log form, ln($\theta$). We ran the likelihood-ratio test of the null hypothesis that this variance is zero. Our likelihood-ratio test results indicate that the variance is significantly different from zero, which indicates a statistically significant level of unobserved heterogeneity.

**Table 2-6 Hazard Model Estimation Results**

| VARIABLES | (1) gamma | (2) inverse-Gaussian |
|---|---|---|
| Spatial Distance | -1.227*** | -1.887*** |
| | (0.415) | (0.409) |
| Social Distance | -8.875*** | -9.743*** |
| | (1.857) | (1.687) |
| Temporal Distance | 0.019 | -0.081*** |
| | (0.034) | (0.030) |
| Spatial * Social | 2.131*** | 1.865*** |
| | (0.596) | (0.510) |
| Spatial * Temporal | 0.009 | 0.034*** |
| | (0.014) | (0.012) |
| Social * Temporal | 0.054 | 0.085** |
| | (0.043) | (0.038) |
| Spatial*Social*Temporal | -0.019 | -0.019 |
| | (0.017) | (0.014) |
| Num Promotion View | 0.224** | 0.247*** |
| | (0.095) | (0.094) |
| Num Friends use app | -0.005 | 0.063 |
| | (0.044) | (0.040) |
| Fan Status | 1.974* | 1.350** |
| | (1.117) | (0.610) |
| Num Facebook Friends | -0.001 | -0.001 |
| | (0.002) | (0.001) |
| Num Fan Pages Joined | -0.002** | 0.000 |
| | (0.001) | (0.001) |
| Female | -0.431 | -1.876** |
| | (1.105) | (0.734) |
| Round2 | -0.600 | 0.026 |
| | (0.855) | (0.782) |
| Round3 | -0.894 | 0.497 |
| | (0.782) | (0.716) |
| Tuesday | 0.400 | -1.095 |
| | (1.592) | (1.569) |
| Thursday | -0.284 | 2.427*** |
| | (1.144) | (0.928) |
| Friday | -2.154* | 0.631 |
| | (1.308) | (1.061) |
| Saturday | 0.580 | 0.310 |
| | (1.301) | (0.986) |
| Sunday | 1.083 | 1.034 |
| | (1.465) | (1.182) |
| Constant | 8.262*** | 9.873*** |
| | (1.853) | (3.139) |
| $\ln(\theta)$ | 1.847*** | 6.194** |
| | (0.180) | (2.733) |
| $\ln(p)$ | -0.077** | -0.330*** |
| | (0.037) | (0.049) |
| Observations | 147 | 147 |
| Number of customers | 78 | 78 |
| Log likelihood | -24.64 | -35.77 |
| AIC | 95.28 | 117.5 |
| AICc | 104.256 | 126.476 |
| BIC | 164.1 | 186.3 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Interestingly, from Table 2-6 we see quite different parameter estimates with the different assumptions of the frailty distribution. The literature on duration models shows that the frailty distribution matters for parameter estimates. Heckman et al. (1984) showed that different frailty distributions lead to different parameter estimates with the same set of data. They proposed modeling frailty non-parametrically. However, this technique was found not suitable for finite samples (Baker et al. 2000). Therefore, researchers assumed that the frailty has a probability mass function with two mass points and used a finite mixture model to estimate the parameters (Ho et al. 2009; Seiler 2013).

Furthermore, we find that the model with Exponential hazard has the best model fit when using Gamma distribution for the frailty. However, the model with Weibull hazard has the best model fit when using inverse-Gaussian distribution for the fragility. Analytically, Exponential distribution is a special case of the Weibull distribution. For Weibull distribution, when the shape parameter equals 1, the hazard is constant and it becomes the exponential distribution. From the estimated parameter $p$, we can obtain the shape of the hazard. If $p < 1$, it means that the hazard for customers to download the coupon decreases after they have viewed the mobile promotion. However, if $p > 1$, it means that the hazard for downloading the coupon increases with time. Furthermore, if the $p = 1$, it means that the hazard is actually constant. Therefore, when estimating the hazard model with finite mixture, we assume the hazard follows a Weibull distribution.

Research has shown that over 40% of customers responded on the same day after receiving a mobile promotion (Ghose et al. 2013b). Based on this finding, we believe that customers can be divided into two segments, those who are "quick response" customers and those who are "late response" customers. We also believe these two groups of customers. Analytically, we believe that "quick response" customers have a decreasing hazard of downloading the coupon and "late response" customers have an increasing hazard. Statistically, we obtained the AICc in additional to AIC and BIC to cater for the situation that sample size is

not many times larger than the square of number of parameters. Based on the AICc, we used two segments for the hazard model with finite mixture.[18] Table 2-7 shows the results of the hazard model with finite mixture.

To efficiently estimate the model, we only allowed variables related to our independent variables and the Weibull ancillary parameter *p* to vary across the two segments. We see that the Weibull ancillary parameter *p* in Segment 1 has a value of 0.48 and the *p* in Segment 2 has a value of 1.07. The results suggest a decreasing hazard for customers in Segment 1 and an increasing hazard for customers in Segment 2. This actually supports our analytical prediction. We will discuss a detailed interpretation when we present the results of the joint model.

[18] Statistically, we found that the model with two segments have a better model fit with AICc and BIC than the model with one segment only. We further tried model with three segments but the model estimation cannot converge due limited number of observations.

**Table 2-7 Hazard Model with Finite Mixture Estimation Results**

| VARIABLES | (1) Segment 1 | | (2) Segment 2 |
|---|---|---|---|
| Spatial Distance | -2.398*** | | 0.125 |
| | (0.358) | | (0.275) |
| Social Distance | -6.912*** | | -0.208 |
| | (1.148) | | (1.235) |
| Temporal Distance | -0.098*** | | -0.010 |
| | (0.018) | | (0.024) |
| Spatial * Social | 1.844*** | | -0.377 |
| | (0.421) | | (0.439) |
| Spatial * Temporal | 0.047*** | | -0.007 |
| | (0.009) | | (0.008) |
| Social * Temporal | 0.057** | | 0.011 |
| | (0.029) | | (0.031) |
| Spatial*Social*Temporal | -0.022* | | 0.012 |
| | (0.011) | | (0.011) |
| Num Promotion View | | 0.059 | |
| | | (0.052) | |
| Num Friends use app | | -0.015 | |
| | | (0.018) | |
| Fan Status | | 0.386 | |
| | | (0.251) | |
| Num Facebook Friends | | 0.001* | |
| | | (0.001) | |
| Num Fan Pages Joined | | 0.001*** | |
| | | (0.000) | |
| Female | | -0.849*** | |
| | | (0.324) | |
| Round2 | | -0.356 | |
| | | (0.411) | |
| Round3 | | -0.239 | |
| | | (0.491) | |
| Tuesday | | 0.863 | |
| | | (0.809) | |
| Thursday | | 1.101* | |
| | | (0.604) | |
| Friday | | 0.037 | |
| | | (0.703) | |
| Saturday | | 0.233 | |
| | | (0.596) | |
| Sunday | | 1.106 | |
| | | (0.807) | |
| Constant | | 4.705*** | |
| | | (0.946) | |
| Weibull ancillary parameter | 0.477*** | | 1.070*** |
| | (0.052) | | (0.041) |
| Segment parameter | 0.500*** | | |
| | (0.217) | | |
| Segment 1 Probability | 0.622*** | | |
| | (0.050) | | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | 64.312 | |
| AIC | | -66.623 | |
| AICc | | -49.371 | |
| BIC | | 26.079 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

#### 2.5.2.3 Joint Model Estimation Results

In this section, we discuss the results of the logit model and then discuss the results of the hazard model. For the logit model, the likelihood-ratio test for the panel-level variance component was not significant ($p > 0.05$) as we indicated in the discussion of the logit model results. We used a pooled estimator for the logit model in the joint model estimation. Because the results of the independent hazard model show two different shapes of hazard, we continued to use two segments for the hazard model in the joint model estimation. We present the results of the joint model estimation in Table 2-8.

Column (1) shows the results of the logit model. For the main effects of spatial distance, social distance, and temporal distance on the probability of customers downloading the coupon, all the three coefficients are significant ($p < 0.01$) and show the expected sign. Importantly, all the two-way interaction effects are significant ($p < 0.01$).

As we have hypothesized, decreasing any one of the three distances (i.e., spatial distance, social distance, and temporal distance) leads to a higher probability of coupon downloading. Therefore, H1a, H2a, and H3a are all supported. Because we have significant two-way interaction effects between our independent variables, we will only qualitatively interpret the main effects of the three distances and focus on the quantitative interpretation of their interaction effects. This is because the coefficient for the main effect of a variable is not meaningful when the variable interacts with another variable (Brambor et al. 2006).

**Table 2-8 Joint Model Estimation Results**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -2.001*** | -2.549*** | -0.009 |
| | (0.580) | (0.349) | (0.307) |
| Social Distance | -7.450*** | -6.373*** | 0.408 |
| | (1.897) | (1.109) | (1.392) |
| Temporal Distance | -0.105*** | -0.104*** | -0.038 |
| | (0.039) | (0.018) | (0.027) |
| Spatial * Social | 1.954*** | 1.884*** | -0.133 |
| | (0.637) | (0.435) | (0.461) |
| Spatial * Temporal | 0.046*** | 0.058*** | -0.003 |
| | (0.016) | (0.010) | (0.009) |
| Social * Temporal | 0.108*** | 0.052* | 0.032 |
| | (0.044) | (0.031) | (0.034) |
| Spatial*Social*Temporal | -0.040** | -0.031*** | 0.007 |
| | (0.017) | (0.013) | (0.011) |
| Num Promotion View | 0.289*** | 0.141*** | |
| | (0.101) | (0.054) | |
| Num Friends use app | 0.004 | 0.152*** | |
| | (0.036) | (0.021) | |
| Fan Status | 0.413 | 0.369 | |
| | (0.431) | (0.267) | |
| Num Facebook Friends | 0.000 | 0.167*** | |
| | (0.001) | (0.065) | |
| Num Fan Pages Joined | 0.000 | 0.102** | |
| | (0.001) | (0.048) | |
| Female | -0.729 | -1.281*** | |
| | (0.514) | (0.321) | |
| Round2 | -0.358 | -0.394 | |
| | (0.749) | (0.406) | |
| Round3 | -0.720 | -0.323 | |
| | (0.738) | (0.573) | |
| Tuesday | 0.984 | -0.298 | |
| | (1.681) | (0.909) | |
| Thursday | 0.406 | 0.663 | |
| | (1.142) | (0.614) | |
| Friday | -0.319 | 0.174 | |
| | (1.194) | (0.68) | |
| Saturday | -0.505 | -0.784 | |
| | (1.262) | (0.671) | |
| Sunday | 0.391 | 0.398 | |
| | (1.340) | (0.810) | |
| Constant | 6.531*** | 5.034*** | |
| | (1.823) | (0.957) | |
| Weibull ancillary parameter | | 0.458*** | 1.117*** |
| | | (0.047) | (0.051) |
| Segment parameter | | -0.599*** | |
| | | (0.237) | |
| Segment1 probability | | 0.645*** | |
| | | (0.053) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -11.081 | |
| AIC | | 126.162 | |
| AICc | | 184.800 | |
| BIC | | 281.664 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

First, we interpret the interaction effect between spatial distance and social distance. To interpret the interaction effect correctly, we need to include all the coefficients of these two variables and their interaction terms. Because the spatial distance and social distance are continuous variables, we illustrate the interpretation using scenarios. In the first scenario, we assume customers to be 0.5 kilometers away from the nearest store when they view the mobile promotion,[19] and they share no mutual friends with the people in the popularity information (spatial distance equals 0.5 kilometers and social distance equals 1). In addition, the promotions they view will expire in two days (temporal distance equals 24 hours).[20] If we decrease the social distance by changing the shared number of mutual friends to one (social distance equals 0.5),[21] the odds of customers downloading the coupon are 8.85 times higher. In the second scenario, we assume customers are six kilometers away from the nearest store when they view the mobile promotion,[22] and they share on average one mutual friend with the people in the popularity information. The promotion they view will also expire in two days. If we increase the social distance by changing the shared number of mutual friends to zero, the odds for customers to download the coupon are 1.74 times higher. Therefore, H4a is supported. We plot this interaction effect between spatial distance and social distance in Figure 2-4 using the above scenarios.

[19] The spatial distance of 0.5 kilometers to the store is a relatively low spatial distance according to the distribution of the spatial distance (bottom 25%).

[20] The temporal distance equal to 24 hours is close to the median value of the temporal distance.

[21] When customers share one mutual friend with the people in the popularity information, the social distance is at its median value and equals to 0.5.

[22] The six-kilometer spatial distance is a relatively high spatial distance (top 25%).

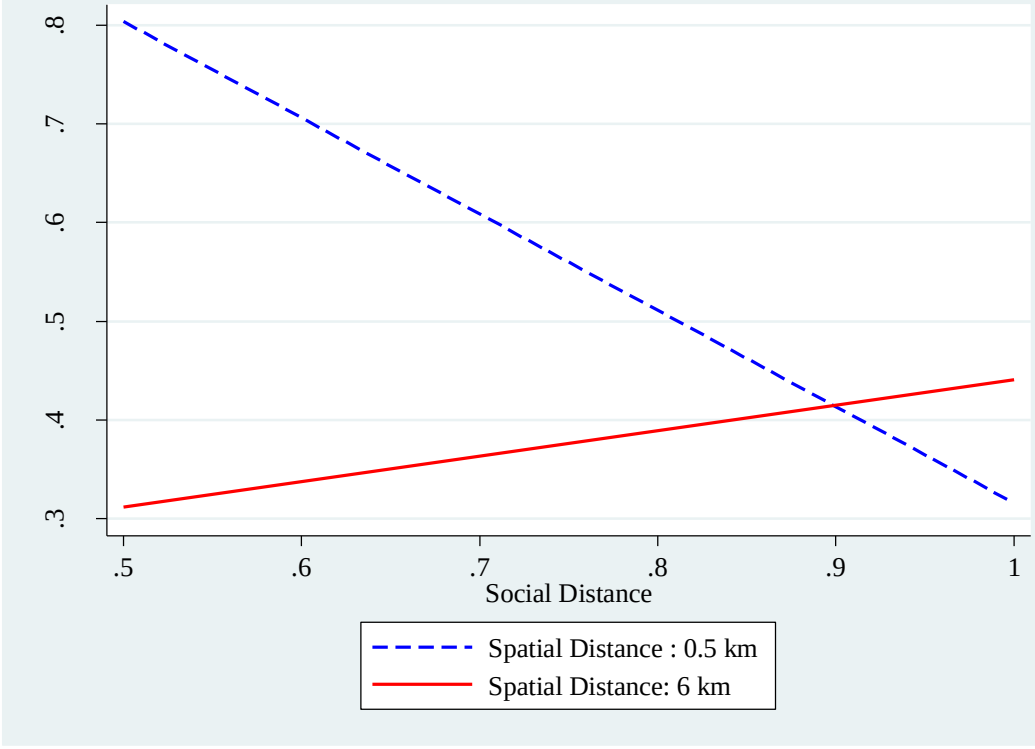



**Figure 2-4 Interaction between Spatial Distance and Social Distance on Download Probability**

Second, we illustrate the interaction effect between spatial distance and temporal distance. We describe the scenario where both the spatial distance and the temporal distance are short. We assume customers are 0.5 kilometers away from the nearest store when they view the mobile promotion, and they share on average one mutual friend with the people in the popularity information. Additionally, the promotion they view will expire in three days (temporal distance equals 36 hours). If we decrease the temporal distance so that the promotion expires in two days, the odds of customers downloading the coupon are 1.58 times higher. Thus, H5a is supported. Surprisingly, we observe interesting findings which we did not hypothesized. The finding is described in a scenario where both the spatial distance and the temporal distance are high. In this scenario, we assume customers are six kilometers away from the nearest store when they view the

mobile promotion, and they share on average one mutual friend with the people in the popularity information. In addition, the promotion they view will expire in two days. If we increase the temporal distance so that the promotion will expire in three days, the odds of customers downloading the coupon are 3.53 times higher. Therefore, the odds of downloading the coupon are higher when both the spatial distance and the temporal distance are at high levels. Figure 2-5 shows the plot of the interaction effect between spatial distance and temporal distance using these two scenarios.

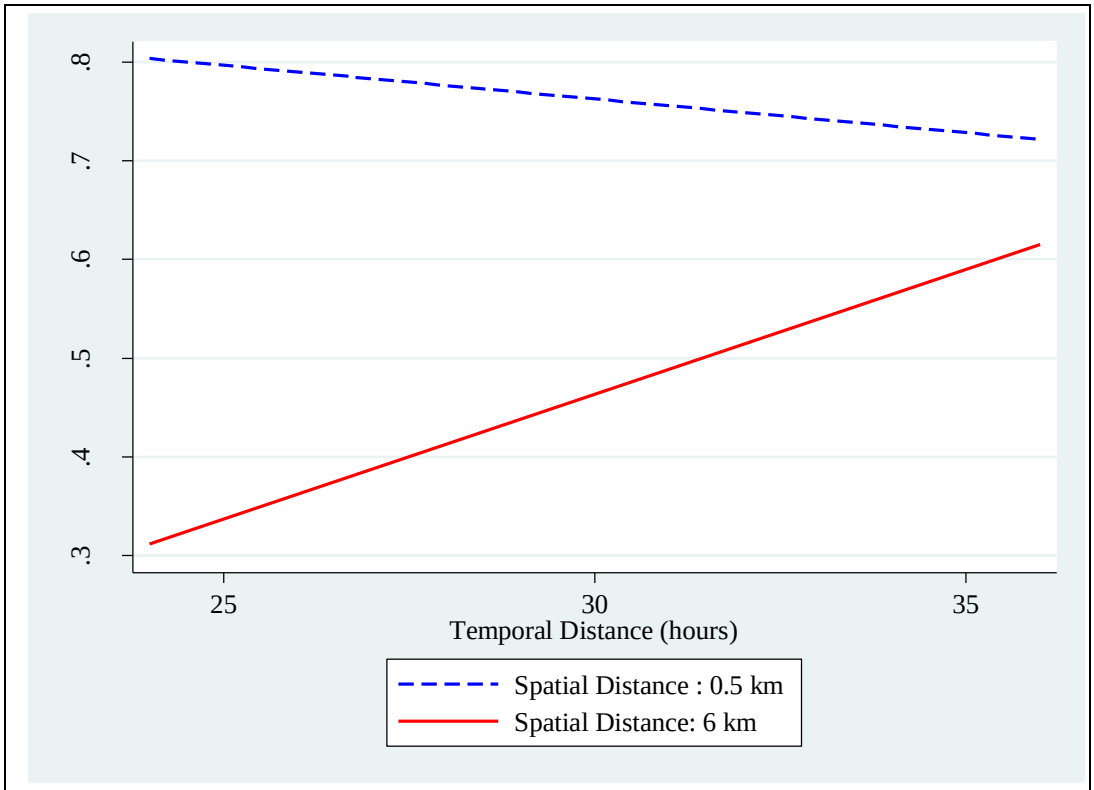



**Figure 2-5 Interaction between Spatial Distance and Temporal Distance on the Probability of Downloading Coupon**

Third, we describe the interaction effect between social distance and temporal distance. In the first scenario, we assume customers are 1.35 kilometers away

from the nearest store when they view the mobile promotion, [23] and they share on average 50 mutual friends with people in the popularity information (spatial distance equals 1.35 kilometers and social distance equals 0.02).[24] Furthermore, the promotion they viewed expires in three days. If we decrease the temporal distance so that the promotion expires in two days, the odds for customers to download the coupon are 1.65 times higher. In the second scenario, we assume customers are 1.35 kilometers away from the nearest store when they view the mobile promotion, and they share no mutual friends with people in the popularity information (spatial distance equals 1.35 kilometers and social distance equals 0.02). In addition, the promotion they view will expire in two days. If we increase the temporal distance so that the promotion will expire in three days, the odds for customers to download the coupon become 1.14 times higher. Therefore, H6a is supported. We present the plot of the interaction effect between social distance and temporal distance in Figure 2-6.

[23] The spatial distance of 1.35 kilometers is the median value of the spatial distance.

[24] When customers share 50 mutual friends with the people in the popularity information, the social distance equals to 0.02. A social distance equal to 0.02 is considered as a low social distance because it is below the bottom 25% of the social distance.

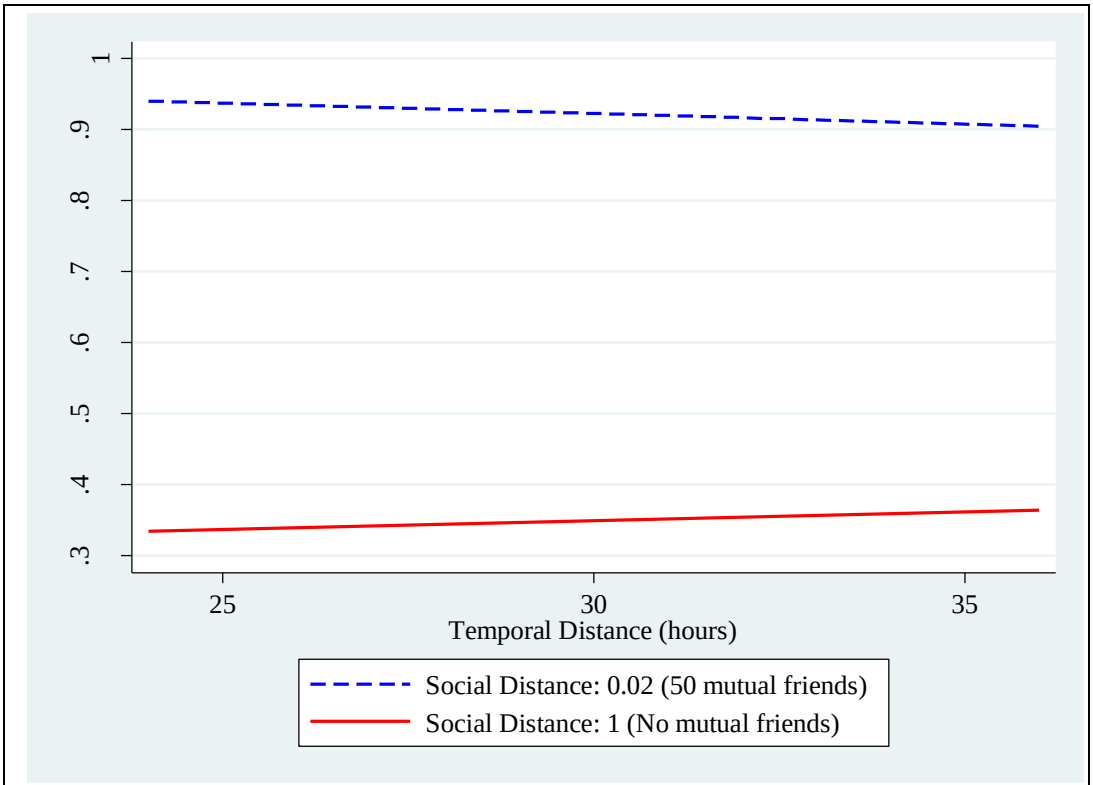



**Figure 2-6 Interaction between Social Distance and Temporal Distance on the Probability of Downloading Coupon**

We next refer to the results of the hazard model in Table 2-8. Columns (2) and (3) show the results for customers from Segment 1 and Segment 2 respectively. For customers from Segment 1, the three main effects on the hazard rate of customers downloading the coupon are all significant with expected sign ($p < 0.01$). Furthermore, we find that both the interaction effect between spatial distance and social distance and the interaction effect between spatial distance and temporal distance are significant ($p < 0.01$). However, the interaction effect between social distance and temporal distance is not significant ($p > 0.05$). Surprisingly, we find that none of the main effects or interaction effects is significant for customers from Segment 2.

Importantly, the Weibull ancillary parameter $p$ for Segment 1 is equals 0.46 and the $p$ in Segment 2 is equals 1.12. This suggests a decreasing hazard of

downloading coupon for customers from Segment 1 whereas an increasing hazard of downloading coupon for customers from Segment 2. We consider customers from Segment 1 as "quick response" customers because their hazard of downloading coupon was highest when they first viewed the mobile promotion. Furthermore, from the segment probability we see that over 64% of customers are estimated to be from Segment 1 which account for the majority of our sample. This result is also consistent with the findings of the past study which showed that over 40% of customers responded on the same day after receiving a mobile promotion (Ghose et al. 2013b). Therefore, we focus on Segment 1 to interpret the results of our hypotheses testing.

Column (2) in Table 2-8 shows that all the three main effects on the hazard rate of customers downloading the coupon are significant with expected sign. Thus, the hazard rate for customers to download coupon will be higher when any of the three distances (i.e., spatial distance, social distance, and temporal distance) decreases. Therefore, H1b, H2b, and H3b are all supported.

We also use scenarios to illustrate the two significant interaction effects. First, we interpret the interaction effect between spatial distance and social distance. In the first scenario, we assume customers are 0.5 kilometers from the nearest store when they view the mobile promotion, and they share no mutual friends with the people in the popularity information. In addition, the promotion they view will expire in two days. If we decrease the social distance by changing the shared number of mutual friends to one, the hazard for customers to download the coupon is 9.75 times higher. In the second scenario, we assume customers to be six kilometers away from the nearest store when they view the mobile promotion, and they share on average one mutual friend with the people in the popularity information. Also, the promotion they view will expire in two days. If we increase the social distance by changing the shared number of mutual friends to zero, the hazard for customers to download the coupon is 2.35 times higher. Thus, H4b is supported. Figure 2-7 shows the plot of the interaction effect between spatial distance and social distance.

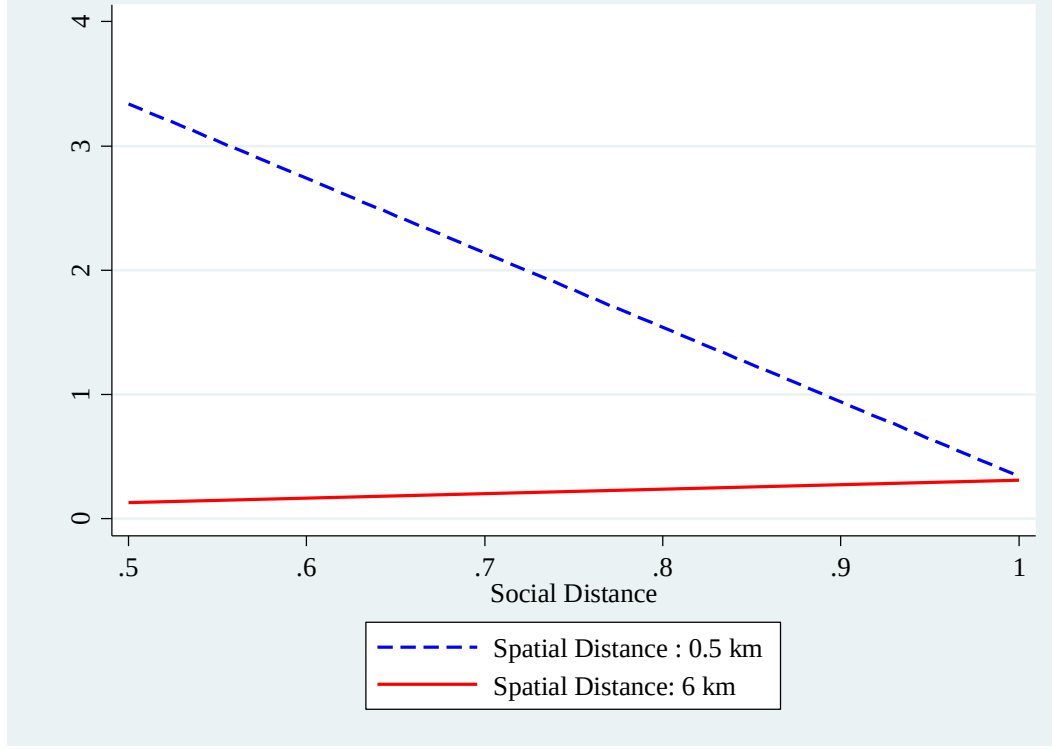



**Figure 2-7 Interaction between Spatial Distance and Social Distance on the Hazard Rate of Downloading Coupon**

Second, we discuss the interaction effect between spatial distance and temporal distance. In the first scenario, we assume that customers are 0.5 kilometers from the nearest store when they view the mobile promotion, and they share on average one mutual friend with the people in the popularity information. Furthermore, the promotion they viewed expires in three days. If we decrease the temporal distance so that the promotion expires in two days, the hazard for customers to download the coupon is 1.98 times higher. In the second scenario, we assume that customers to be six kilometers away from the nearest store when they view the mobile promotion, and they share on average one mutual friend with the people in the popularity information. In addition, the promotion they view expires in two days. If we increase the temporal distance so that the promotion expires in three days, the hazard for customers to download the coupon is 8.36 times higher. Thus, H5b

is supported. We plot the interaction effect between spatial distance and temporal distance in Figure 2-8.

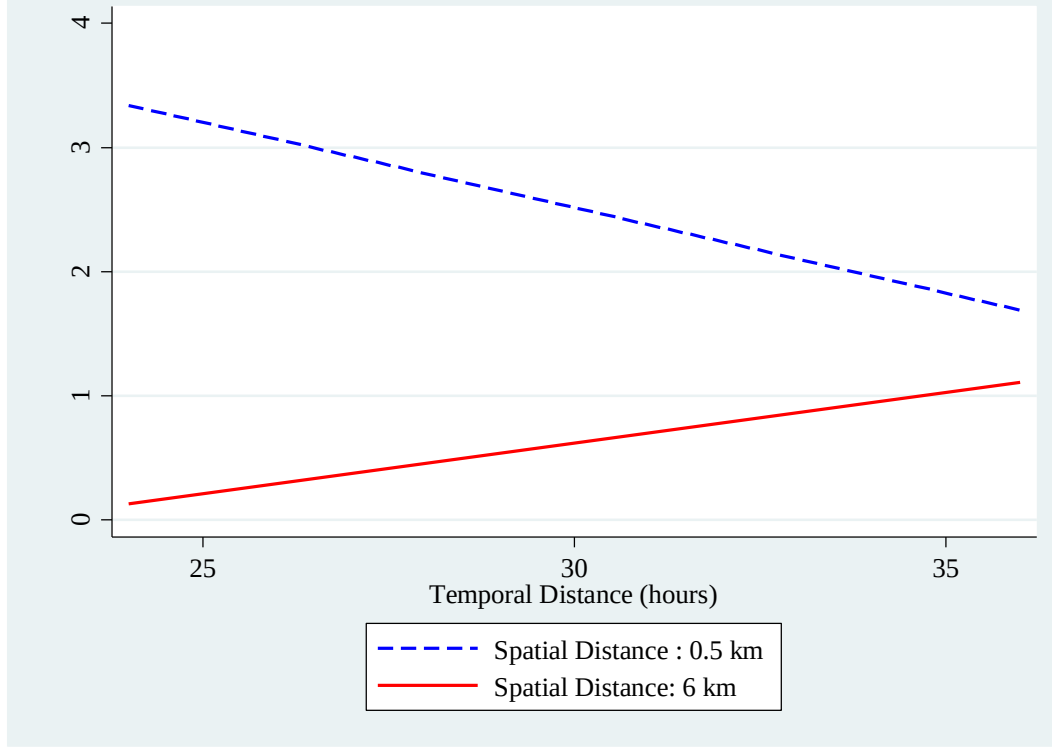



**Figure 2-8 Interaction between Spatial Distance and Temporal Distance on Download Hazard**

Third, it can be seen that the coefficient for the interaction effect between social distance and temporal distance is not significant ($p > 0.05$). Thus, H6b is not supported. We explain this finding with the following reasons. First, spatial distance plays a dominant role in influencing the hazard rate of downloading coupon. A low spatial distance encourages customers to think of the feasibility of getting to the store and buying the product. Thus, the low spatial distance stimulates customers into responding to the promotion quickly. On the other hand, a high spatial distance prompts customers to consider the desirability of buying the product. Once the desirability is enhanced by a high social distance or a high temporal distance, customers would respond to the mobile promotion quickly.

However, when the influence of the spatial distance is absent, the combined influence from the social distance and temporal distance would not drive customers to respond to the promotion quickly. Our finding on the critical role of spatial distance in mobile marketing is consistent with the study by Ghose et al.'s study (2013c) which examined customers' tradeoff between physical distance to the store and coupon value when responding to mobile promotions.

To compare the relative impact of the three distance factors, we report the marginal effects and elasticities for the significant distance factors based on the joint model. Table 2-9 shows the average marginal effects and marginal effects at means. Table 2-10 shows the average elasticities and elasticities at means.

**Table 2-9 Marginal Effects**

| | Logit Model | | Hazard Model | |
|---|---|---|---|---|
| | Average Marginal Effect | Marginal Effect at Means | Average Marginal Effect | Marginal Effect at Means |
| Spatial Distance | -0.326 | -0.489 | -0.179 | -0.113 |
| Social Distance | -1.215 | -1.820 | -1.974 | -2.101 |
| Temporal Distance | -0.017 | -0.026 | 0.049 | 0.024 |

**Table 2-10 Elasticities**

| | Logit Model | | Hazard Model | |
|---|---|---|---|---|
| | Average Elasticity | Elasticity at Means | Average Elasticity | Elasticity at Means |
| Spatial Distance | -3.097 | -2.551 | -0.004 | -0.006 |
| Social Distance | -2.098 | -1.705 | -0.001 | -0.016 |
| Temporal Distance | -1.427 | -1.503 | 0.034 | 0.023 |

Except for the number of promotion views, which has a positive impact on the probability of downloading coupon, none of the other control variables has a significant effect on the probability of downloading coupon. Nevertheless, we

observe a few control variables to have a significant impact on the hazard rate of downloading coupon. For variables on mobile app usage, we find that customers who viewed a promotion more frequently within a day responded to the promotion more swiftly. Importantly, customers with more Facebook friends who were also using the mobile app show a quicker response to the promotion. Surprisingly, customers who are fans of ABC retailer did not show a higher probability of download coupon. Nor did they respond to the promotion more quickly. From customers' Facebook profile information we find that customers with more Facebook friends and who "liked" more Facebook fan pages had downloaded the coupon more quickly. Finally, female customers responded to the mobile promotion more slowly than male customers. We further summarize our hypotheses testing results in Table 2-11.

| Table 2-11 Hypotheses Testing Results (Study One) | | |
|---|---|---|
| Hypotheses | | Supported |
| *H1a* | Decreasing spatial distance → Higher propensity of downloading coupon | Yes |
| *H1b* | Decreasing spatial distance → Higher hazard rate of downloading coupon | Yes |
| *H2a* | Decreasing social distance → Higher probability of downloading coupon | Yes |
| *H2b* | Decreasing social distance → Higher hazard rate of downloading coupon | Yes |
| *H3a* | Decreasing temporal distance → Higher probability of downloading coupon | Yes |
| *H3b* | Decreasing temporal distance → Higher hazard rate of downloading coupon | Yes |
| *H4a* | When the spatial distance is low:<br>decreasing social distance → Higher probability of downloading coupon<br>When the spatial distance is high:<br>increasing social distance → Higher probability of downloading coupon | Yes |
| *H4b* | When the spatial distance is low:<br>decreasing social distance → Higher hazard rate of downloading coupon<br>When the spatial distance is high:<br>increasing social distance → Higher hazard rate of downloading coupon | Yes |
| *H5a* | When the spatial distance is low:<br>decreasing temporal distance → Higher probability of downloading coupon<br>When the spatial distance is high:<br>increasing temporal distance → Higher probability of downloading coupon | Yes |
| *H5b* | When the spatial distance is low:<br>decreasing temporal distance → Higher hazard rate of downloading coupon<br>When the spatial distance is high:<br>increasing temporal distance → Higher hazard rate of downloading coupon | Yes |
| *H6a* | When the social distance is low:<br>decreasing temporal distance → Higher probability of downloading coupon<br>When the social distance is high:<br>increasing temporal distance → Higher probability of downloading coupon | Yes |
| *H6b* | When the social distance is low:<br>decreasing temporal distance → Higher hazard rate of downloading coupon<br>When the social distance is high:<br>increasing temporal distance → Higher hazard rate of downloading coupon | No |

### 2.5.3 Sensitivity Checks

We further corroborate our findings by checking the sensitivity in multiple ways. First, when computing the social distance, we took the average of the three numbers of mutual friends that the customer shared with the people in the popularity information. Instead of using the average, we compute the median, maximum and minimum of the three numbers of shared mutual friends. We chose the median because we believe that customers can also be mainly influenced by the person who has a moderate number of mutual friends among the three people in the popularity information. We choose the maximum because we also expect customers to be potentially influenced by the closest friend among the three people in the popularity information. We choose the minimum because we do not want to exclude the possibility that customers are actually influenced by the least close person in the popularity information. The results of the joint model estimation using median, maximum and minimum computation are shown in Table 2-12, Table 2-13, and Table 2-14 respectively.

**Table 2-12 Sensitivity Check - Travel Distance - Social Distance (Median)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -1.884*** | -2.257*** | 0.150 |
| | (0.542) | (0.353) | (0.265) |
| Social Distance | -7.096*** | -6.698*** | -0.146 |
| | (1.776) | (1.118) | (1.202) |
| Temporal Distance | -0.098*** | -0.096*** | -0.008 |
| | (0.037) | (0.018) | (0.024) |
| Spatial * Social | 1.793*** | 1.675*** | -0.380 |
| | (0.598) | (0.42) | (0.418) |
| Spatial * Temporal | 0.044*** | 0.045*** | -0.007 |
| | (0.015) | (0.009) | (0.008) |
| Social * Temporal | 0.102*** | 0.055** | 0.009 |
| | (0.042) | (0.029) | (0.031) |
| Spatial*Social*Temporal | -0.038** | -0.019* | 0.012 |
| | (0.017) | (0.012) | (0.010) |
| Num Promotion View | 0.271*** | 0.057 | |
| | (0.104) | (0.052) | |
| Num Friends use app | 0.007 | -0.014 | |
| | (0.035) | (0.017) | |
| Fan Status | 0.318 | 0.356 | |
| | (0.421) | (0.243) | |
| Num Facebook Friends | 0.000 | 0.122* | |
| | (0.001) | (0.068) | |
| Num Fan Pages Joined | 0.000 | 0.132*** | |
| | (0.001) | (0.047) | |
| Female | -0.719 | -0.824*** | |
| | (0.492) | (0.317) | |
| Round2 | -0.456 | -0.331 | |
| | (0.666) | (0.405) | |
| Round3 | -0.683 | -0.183 | |
| | (0.679) | (0.478) | |
| Tuesday | 0.359 | 0.671 | |
| | (1.466) | (0.733) | |
| Thursday | -0.279 | 0.880* | |
| | (1.083) | (0.474) | |
| Friday | -0.913 | -0.172 | |
| | (1.136) | (0.545) | |
| Saturday | -1.125 | 0.053 | |
| | (1.217) | (0.493) | |
| Sunday | -0.235 | 0.805 | |
| | (1.295) | (0.691) | |
| Constant | 6.960*** | 4.744*** | |
| | (1.816) | (0.890) | |
| Weibull ancillary parameter | | 0.465*** | 1.067*** |
| | | (0.051) | (0.039) |
| Segment parameter | | -0.502** | |
| | | (0.238) | |
| Segment1 probability | | 0.623*** | |
| | | (0.055) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -9.082 | |
| AIC | | 122.164 | |
| AICc | | 180.802 | |
| BIC | | 277.666 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 2-13 Sensitivity Check - Travel Distance - Social Distance (Maximum)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -1.926*** | -2.430*** | 0.668 |
| | (0.545) | (0.369) | (0.406) |
| Social Distance | -7.249*** | -7.405*** | 0.595 |
| | (1.808) | (1.265) | (1.490) |
| Temporal Distance | -0.102*** | -0.099*** | -0.049 |
| | (0.037) | (0.021) | (0.041) |
| Spatial * Social | 1.883*** | 1.723*** | -0.985 |
| | (0.600) | (0.433) | (0.622) |
| Spatial * Temporal | 0.044*** | 0.044*** | -0.021 |
| | (0.015) | (0.009) | (0.016) |
| Social * Temporal | 0.105*** | 0.050* | 0.026 |
| | (0.042) | (0.030) | (0.051) |
| Spatial*Social*Temporal | -0.039*** | -0.014 | 0.024 |
| | (0.016) | (0.011) | (0.023) |
| Num Promotion View | 0.290*** | 0.312*** | |
| | (0.110) | (0.049) | |
| Num Friends use app | 0.005 | 0.140*** | |
| | (0.037) | (0.018) | |
| Fan Status | 0.433 | 0.602** | |
| | (0.428) | (0.277) | |
| Num Facebook Friends | 0.000 | -0.077 | |
| | (0.001) | (0.065) | |
| Num Fan Pages Joined | 0.000 | 0.130*** | |
| | (0.001) | (0.046) | |
| Female | -0.736 | -1.587*** | |
| | (0.498) | (0.349) | |
| Round2 | -0.335 | -0.805* | |
| | (0.710) | (0.415) | |
| Round3 | -0.746 | -0.120 | |
| | (0.705) | (0.527) | |
| Tuesday | 0.821 | -1.729* | |
| | (1.639) | (0.945) | |
| Thursday | 0.389 | 1.023 | |
| | (1.100) | (0.629) | |
| Friday | -0.365 | 0.110 | |
| | (1.159) | (0.717) | |
| Saturday | -0.525 | -0.325 | |
| | (1.193) | (0.661) | |
| Sunday | 0.336 | 0.478 | |
| | (1.299) | (0.826) | |
| Constant | 6.346*** | 5.817*** | |
| | (1.761) | (1.073) | |
| Weibull ancillary parameter | | 0.494*** | 0.989*** |
| | | (0.047) | (0.048) |
| Segment parameter | | -0.742*** | |
| | | (0.229) | |
| Segment1 probability | | 0.677*** | |
| | | (0.049) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -17.252 | |
| AIC | | 138.505 | |
| AICc | | 197.143 | |
| BIC | | 294.006 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 2-14 Sensitivity Check - Travel Distance - Social Distance (Minimum)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -2.774*** | -2.330*** | 0.062 |
| | (0.718) | (0.371) | (0.348) |
| Social Distance | -8.949*** | -6.528*** | -0.247 |
| | (2.134) | (1.150) | (1.190) |
| Temporal Distance | -0.133*** | -0.093*** | -0.012 |
| | (0.045) | (0.019) | (0.025) |
| Spatial * Social | 2.748*** | 1.731*** | -0.229 |
| | (0.766) | (0.438) | (0.458) |
| Spatial * Temporal | 0.062*** | 0.045*** | -0.005 |
| | (0.019) | (0.010) | (0.009) |
| Social * Temporal | 0.136*** | 0.050* | 0.014 |
| | (0.050) | (0.029) | (0.032) |
| Spatial*Social*Temporal | -0.056*** | -0.019 | 0.009 |
| | (0.020) | (0.012) | (0.011) |
| Num Promotion View | 0.295*** | 0.050 | |
| | (0.117) | (0.052) | |
| Num Friends use app | 0.000 | -0.014 | |
| | (0.038) | (0.017) | |
| Fan Status | 0.502 | 0.324 | |
| | (0.448) | (0.269) | |
| Num Facebook Friends | 0.000 | 0.119* | |
| | (0.001) | (0.067) | |
| Num Fan Pages Joined | 0.000 | 0.123*** | |
| | (0.001) | (0.045) | |
| Female | -0.738 | -0.790*** | |
| | (0.499) | (0.299) | |
| Round2 | -0.336 | -0.275 | |
| | (0.709) | (0.399) | |
| Round3 | -0.486 | 0.000 | |
| | (0.687) | (0.462) | |
| Tuesday | 0.998 | 0.619 | |
| | (1.564) | (0.751) | |
| Thursday | -0.256 | 0.736 | |
| | (1.134) | (0.491) | |
| Friday | -0.997 | -0.372 | |
| | (1.193) | (0.563) | |
| Saturday | -1.043 | -0.152 | |
| | (1.248) | (0.508) | |
| Sunday | 0.113 | 0.564 | |
| | (1.332) | (0.699) | |
| Constant | 8.562*** | 4.910*** | |
| | (2.119) | (0.922) | |
| Weibull ancillary parameter | | 0.459*** | 1.062*** |
| | | (0.048) | (0.041) |
| Segment parameter | | -0.508** | |
| | | (0.219) | |
| Segment1 probability | | 0.624*** | |
| | | (0.050) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -8.308 | |
| AIC | | 120.615 | |
| AICc | | 179.253 | |
| BIC | | 276.118 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Second, when computing the spatial distance, we used the travel distance from the location where customers viewed the mobile promotion to the nearest ABC store. However, as customers might perceive the spatial distance to be the direct distance to the nearest store, we therefore, re-compute the spatial distance using the direct physical distance between customers' location and the nearest ABC store.[25] The formulas for computation are shown below:

$$x = (lon2 - lon1) \ * \ \cos\left(\frac{lat1 + lat2}{2}\right) \tag{11}$$

$$y = (lat2 - lat1) \tag{12}$$

$$Spatial\ Distance \ = \ \text{sqrt}(x \ * \ x \ + \ y \ * \ y) \ * \ R \tag{13}$$

where (*lon1, lat1*) and (*lon2, lat2*) are two pairs of coordinates for the customer's location and the store location. *R* is the mean radius of the earth, which equals to 6371 kilometers. With spatial distance computed as the direct physical distance, we further checked the sensitivity of our findings using this method and combined the social distance computation method using mean, median, maximum, and minimum measurements respectively. We present the estimation results in Table 2-15, Table 2-16, Table 2-17, and Table 2-18 accordingly.

[25] Direct distance is relevant if customers are close to store. However, we acknowledge that direct distance is an inferior measure for sensitivity check.

**Table 2-15 Sensitivity Check – Direct Distance - Social Distance (Mean)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -3.280*** | -3.375*** | 1.376*** |
| | (0.933) | (0.760) | (0.547) |
| Social Distance | -8.217*** | -7.600*** | -0.598 |
| | (2.094) | (1.305) | (1.386) |
| Temporal Distance | -0.122*** | -0.110*** | -0.032 |
| | (0.042) | (0.026) | (0.034) |
| Spatial * Social | 3.035*** | 2.713*** | -1.619* |
| | (1.022) | (0.813) | (0.884) |
| Spatial * Temporal | 0.072*** | 0.069*** | -0.044*** |
| | (0.024) | (0.021) | (0.017) |
| Social * Temporal | 0.116*** | 0.072** | 0.026 |
| | (0.046) | (0.033) | (0.043) |
| Spatial*Social*Temporal | -0.059** | -0.034 | 0.047* |
| | (0.027) | (0.023) | (0.025) |
| Num Promotion View | 0.233*** | 0.076 | |
| | (0.095) | (0.059) | |
| Num Friends use app | 0.000 | -0.017 | |
| | (0.037) | (0.019) | |
| Fan Status | 0.611 | 0.620** | |
| | (0.469) | (0.302) | |
| Num Facebook Friends | 0.000 | -0.117* | |
| | (0.001) | (0.066) | |
| Num Fan Pages Joined | 0.000 | 0.157*** | |
| | (0.001) | (0.056) | |
| Female | -0.972* | -1.566*** | |
| | (0.537) | (0.313) | |
| Round2 | -0.494 | -0.878** | |
| | (0.759) | (0.438) | |
| Round3 | -0.816 | -0.447 | |
| | (0.753) | (0.540) | |
| Tuesday | 0.958 | -0.196 | |
| | (1.704) | (0.903) | |
| Thursday | 0.422 | 1.370** | |
| | (1.15) | (0.656) | |
| Friday | 0.000 | 0.383 | |
| | (1.198) | (0.740) | |
| Saturday | -0.088 | 0.180 | |
| | (1.304) | (0.654) | |
| Sunday | 0.327 | -2.005** | |
| | (1.461) | (0.910) | |
| Constant | 7.870*** | 6.386*** | |
| | (2.060) | (1.113) | |
| Weibull ancillary parameter | | 0.468*** | 1.003*** |
| | | (0.053) | (0.040) |
| Segment parameter | | -0.498** | |
| | | (0.227) | |
| Segment1 probability | | 0.622*** | |
| | | (0.052) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -16.602 | |
| AIC | | 137.205 | |
| AICc | | 195.843 | |
| BIC | | 292.706 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 2-16 Sensitivity Check – Direct Distance - Social Distance (Median)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -3.262*** | -2.917*** | 1.055** |
| | (0.923) | (0.648) | (0.506) |
| Social Distance | -8.503*** | -6.018*** | -2.369** |
| | (2.117) | (1.392) | (1.109) |
| Temporal Distance | -0.124*** | -0.114*** | -0.006 |
| | (0.042) | (0.025) | (0.032) |
| Spatial * Social | 2.984*** | 1.111 | 0.015 |
| | (1.010) | (0.978) | (0.699) |
| Spatial * Temporal | 0.072*** | 0.061*** | -0.046*** |
| | (0.024) | (0.020) | (0.015) |
| Social * Temporal | 0.121*** | 0.026 | 0.018 |
| | (0.047) | (0.042) | (0.037) |
| Spatial*Social*Temporal | -0.058** | 0.005 | 0.031* |
| | (0.027) | (0.029) | (0.019) |
| Num Promotion View | 0.224*** | -0.064 | |
| | (0.096) | (0.051) | |
| Num Friends use app | 0.002 | -0.024 | |
| | (0.038) | (0.018) | |
| Fan Status | 0.528 | 0.365 | |
| | (0.459) | (0.318) | |
| Num Facebook Friends | 0.000 | -0.078 | |
| | (0.001) | (0.070) | |
| Num Fan Pages Joined | 0.000 | -0.276*** | |
| | (0.001) | (0.045) | |
| Female | -1.026* | -1.632*** | |
| | (0.547) | (0.321) | |
| Round2 | -0.586 | -1.039*** | |
| | (0.780) | (0.421) | |
| Round3 | -0.771 | -0.273 | |
| | (0.772) | (0.519) | |
| Tuesday | 0.319 | 1.376 | |
| | (1.806) | (0.903) | |
| Thursday | -0.257 | 2.363*** | |
| | (1.194) | (0.629) | |
| Friday | -0.599 | 1.959*** | |
| | (1.227) | (0.677) | |
| Saturday | -0.683 | 0.919 | |
| | (1.338) | (0.614) | |
| Sunday | -0.095 | -0.570 | |
| | (1.436) | (0.828) | |
| Constant | 8.797*** | 6.483*** | |
| | (2.245) | (1.060) | |
| Weibull ancillary parameter | | 0.514*** | 0.906*** |
| | | (0.060) | (0.043) |
| Segment parameter | | -0.561*** | |
| | | (0.226) | |
| Segment1 probability | | 0.637*** | |
| | | (0.052) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -18.737 | |
| AIC | | 141.475 | |
| AICc | | 200.113 | |
| BIC | | 296.976 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 2-17 Sensitivity Check – Direct Distance - Social Distance (Maximum)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -3.172*** | -3.548*** | 0.505 |
| | (0.916) | (0.735) | (0.501) |
| Social Distance | -7.948*** | -7.305*** | -3.295*** |
| | (2.043) | (1.358) | (1.184) |
| Temporal Distance | -0.118*** | -0.139*** | -0.034 |
| | (0.042) | (0.026) | (0.035) |
| Spatial * Social | 2.929*** | 1.775* | 0.682 |
| | (1.010) | (0.974) | (0.679) |
| Spatial * Temporal | 0.070*** | 0.078*** | -0.028* |
| | (0.024) | (0.022) | (0.016) |
| Social * Temporal | 0.112*** | 0.057 | 0.046 |
| | (0.046) | (0.040) | (0.041) |
| Spatial*Social*Temporal | -0.056** | -0.012 | 0.012 |
| | (0.026) | (0.029) | (0.019) |
| Num Promotion View | 0.234*** | -0.050 | |
| | (0.093) | (0.051) | |
| Num Friends use app | 0.001 | -0.018 | |
| | (0.037) | (0.019) | |
| Fan Status | 0.629 | 0.447 | |
| | (0.461) | (0.312) | |
| Num Facebook Friends | 0.000 | -0.199*** | |
| | (0.001) | (0.065) | |
| Num Fan Pages Joined | 0.000 | -0.257*** | |
| | (0.001) | (0.047) | |
| Female | -0.971* | -1.690*** | |
| | (0.532) | (0.329) | |
| Round2 | -0.471 | -1.018*** | |
| | (0.772) | (0.410) | |
| Round3 | -0.832 | -0.657 | |
| | (0.781) | (0.538) | |
| Tuesday | 0.758 | 1.718* | |
| | (1.767) | (0.895) | |
| Thursday | 0.395 | 2.727*** | |
| | (1.179) | (0.647) | |
| Friday | -0.061 | 1.887*** | |
| | (1.227) | (0.710) | |
| Saturday | -0.124 | 1.050* | |
| | (1.334) | (0.628) | |
| Sunday | 0.260 | -0.287 | |
| | (1.434) | (0.833) | |
| Constant | 7.639*** | 7.467*** | |
| | (1.982) | (1.153) | |
| Weibull ancillary parameter | | 0.534*** | 0.945*** |
| | | (0.061) | (0.041) |
| Segment parameter | | -0.476** | |
| | | (0.217) | |
| Segment1 probability | | 0.617*** | |
| | | (0.050) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -18.926 | |
| AIC | | 141.852 | |
| AICc | | 200.490 | |
| BIC | | 297.354 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 2-18 Sensitivity Check – Direct Distance - Social Distance (Minimum)**

| | Logit Model | Hazard Model | |
|---|---|---|---|
| | (1) | (2) | (3) |
| VARIABLES | | Segment 1 | Segment 2 |
| Spatial Distance | -3.215*** | -3.162*** | 0.097 |
| | (0.916) | (0.517) | (0.510) |
| Social Distance | -7.888*** | -6.226*** | -1.236 |
| | (2.095) | (1.179) | (1.104) |
| Temporal Distance | -0.118*** | -0.115*** | -0.005 |
| | (0.043) | (0.023) | (0.030) |
| Spatial * Social | 2.917*** | 1.675*** | 1.356* |
| | (1.011) | (0.676) | (0.722) |
| Spatial * Temporal | 0.070*** | 0.070*** | -0.030** |
| | (0.025) | (0.016) | (0.015) |
| Social * Temporal | 0.110** | 0.039 | 0.000 |
| | (0.048) | (0.034) | (0.036) |
| Spatial*Social*Temporal | -0.055** | -0.012 | 0.011 |
| | (0.027) | (0.021) | (0.019) |
| Num Promotion View | 0.215*** | 0.242*** | |
| | (0.089) | (0.056) | |
| Num Friends use app | -0.001 | 0.139*** | |
| | (0.036) | (0.019) | |
| Fan Status | 0.471 | 0.431 | |
| | (0.444) | (0.305) | |
| Num Facebook Friends | 0.000 | -0.116* | |
| | (0.001) | (0.064) | |
| Num Fan Pages Joined | 0.000 | -0.365*** | |
| | (0.001) | (0.041) | |
| Female | -0.892* | -1.522*** | |
| | (0.529) | (0.299) | |
| Round2 | -0.553 | -0.582 | |
| | (0.780) | (0.405) | |
| Round3 | -0.599 | -0.055 | |
| | (0.768) | (0.540) | |
| Tuesday | 0.920 | 0.392 | |
| | (1.646) | (0.896) | |
| Thursday | -0.168 | 1.651*** | |
| | (1.167) | (0.582) | |
| Friday | -0.687 | 0.982 | |
| | (1.207) | (0.644) | |
| Saturday | -0.690 | 0.314 | |
| | (1.287) | (0.618) | |
| Sunday | -0.283 | -2.281*** | |
| | (1.402) | (0.858) | |
| Constant | 8.346*** | 5.996*** | |
| | (2.143) | (1.012) | |
| Weibull ancillary parameter | | 0.492*** | 0.951*** |
| | | (0.045) | (0.041) |
| Segment parameter | | -0.649*** | |
| | | (0.227) | |
| Segment1 probability | | 0.657*** | |
| | | (0.051) | |
| Observations | | 147 | |
| Number of customers | | 78 | |
| Log likelihood | | -19.541 | |
| AIC | | 143.082 | |
| AICc | | 201.720 | |
| BIC | | 298.584 | |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

As indicated in Table 2-12, Table 2-13, and Table 2-14, the models estimation using different computation methods for social distance generate consistent results as our main model in Table 2-8. This implies our findings from our main model are generally not sensitive to different social distance computation methods. Furthermore, the estimation results from Table 2-15, Table 2-16, Table 2-17, and Table 2-18 show that models with spatial distance computed using direct distance are also consistent with findings from our main model. This further implies that both travel distance and direct distance are good indicators for spatial distance computation. In summary, we are confident of our findings given that all the various checks indicated consistency.

## 2.6 Discussion and Contributions

### 2.6.1 Discussion of Findings

We investigated the impacts of distances on customer response to mobile promotions, specifically, the probability of downloading the mobile coupon and the hazard rate of downloading the mobile coupon. Using a field experiment, we provided several notable findings. First, we empirically showed that decreasing any one of the three distances (i.e., spatial distance, social distance, and temporal distance) significantly increases the probability and hazard rate for customers to respond to a mobile promotion. Different from past studies which mainly conduct descriptive analyses (Ghose et al. 2013a; Molitor et al. 2012), we make causal statements about the underlying effects of focal variables on response to mobile promotions.

Second, we examined the interplay between spatial, social, and temporal distance. Our in-depth examination of the two-way interaction effects between the three distances suggests an interesting phenomenon in mobile marketing. Specifically, when the spatial distance is low, either decreasing the social distance or decreasing the temporal distance leads to a higher probability and a higher hazard

rate of response to the mobile promotion by downloading the coupon. On the other hand, when the spatial distance is high, either increasing the social distance or increasing the temporal distance leads to a higher probability and a higher hazard rate of response to the mobile promotion. It is surprising to find that a higher temporal distance increases the probability and hazard rate of response when the spatial distance is high. We believe this is because the travel cost to the store will be more if customers are at a distant place form the store. In this case, a longer valid period of the promotion gives customers more time and helps them to plan their trip to the stores. Otherwise, customers may not choose to respond to the promotion because of the time constraint. Therefore, customers are more responsive to the promotion when both the levels of the distances match. Interestingly, when the social distance is low, decreasing the temporal distance results in a higher probability, but not a higher hazard rate of response to the mobile promotion. In addition, when the social distance is high, increasing the temporal distance leads to a higher probability but not a higher hazard rate of response to the mobile promotion. Our findings are consistent with the construal level theory that the influence of one factor can be stronger when both distances are at the same construal level (Trope et al. 2010). More importantly, our results imply the dominant role of spatial distance in mobile marketing. The influences of social distance and temporal distance largely depend on the levels of spatial distance. The importance of spatial distance is consistent with past research which focused on travel cost in the shopping context (Bell et al. 1998; Forman et al. 2009).

Third, we can draw important insights from the empirical results. According to the scenarios we created to interpret the interaction effects, we identified the turning points on the spatial distance and social distance which change the direction of the effects of other distances. In other words, when the spatial distance is less than 4.5 kilometers, decreasing the social distance leads to a higher probability and a higher hazard rate of response. However, the direction of the effects is reversed if the spatial distance is above 4.5 kilometers. More

importantly, the direction of the impact from temporal distance changes at the point where spatial distance is at two kilometers rather than at 4.5 kilometers.

The two different turning points on the spatial distance dimension actually suggest that customers have a dynamic perception of the spatial distance when influenced by other distances. In other words, in the face of the influence of the social distance, customers consider a spatial distance lower than 4.5 kilometers as a low spatial distance. Thus, we believe that when the spatial distance is lower than 4.5 kilometers, customers are more likely to perceive the persuasive aspect of the popularity information. However, the case is different when customers face the influence from the temporal distance. The spatial distance has to be lower than two kilometers for them to treat it as a low spatial distance. In other words, when customers are less than two kilometers from the nearest ABC store, they are more likely to consider the urgency of responding to the mobile promotion.

Regarding the interaction effect between social distance and temporal distance, the situation is much simpler. When faced with the influence of the temporal distance, customers consider the social distance to be a low social distance as long as they share one mutual friend with the people in the popularity information. Thus, customers only consider the social distance to be a high social distance when they share no mutual friends with the people in the popularity information. This shows that whether people in the popularity information are strangers or not influences customers' perception of low or high social distance.

Fourth, with different hazard shapes for the two segment groups, we found that customers from different segments actually behaved fundamentally different in terms of how fast they responded to a mobile promotion. Particularly, for one segment group of the customers, none of the main effects or the interaction effects has a significant effect on the hazard rate of response. Nevertheless, the other segment group of customers, estimated to be over 65% of our sample, responded to the mobile promotion more quickly when they were positively influenced by changes in the three distances. Furthermore, hazard rate of downloading the

coupon is highest for this segment of customers when they viewed the mobile promotion for the first time. The hazard rate subsequently kept dropping as the time elapsed.

### 2.6.2 Theoretical Contributions

Our study contributes to the mobile marketing literature in the following ways. First, by identifying the fundamental difference between mobile marketing and online marketing, we highlighted the important roles of spatial distance, social distance, and temporal distance in mobile marketing. In this way, we articulated the unique characteristics which influence the effectiveness of mobile marketing. Specifically, our findings suggest a dominant role of spatial distance in mobile marketing, which is consistent with the Ghose et al.'s (2013c) study which studied customers' trade-off between spatial distance and coupon value in mobile marketing.

Second, based on the construal level theory, we empirically illustrated how customers respond to a mobile promotion when their psychological distances change spatially, socially, and temporally. By accentuating the role of distances and their impacts in mobile marketing, we have provided theoretical guidance for researchers to study the unique phenomenon of mobile marketing based on the construal level theory. Compared to past studies which also leveraged construal level theory (Kim et al. 2008; Zhao et al. 2011), we have demonstrated a more comprehensive picture by incorporating the spatial distance in addition to the social and temporal distance.

Third, with the validation of the main effects of distances, we further tested the two-way interaction effects between the three distances. Different from Ghose et al.'s (2013c) paper which assesses the impact of spatial distance only, we explored the interplays between distances in mobile marketing. Through our in-depth investigation of the interplays between these distances, our study provides a

clear understanding of the detailed mechanism through which multiple distances interact with each other to influence the probability and the hazard rate of customer response to mobile marketing.

Fourth, prior research on mobile marketing mainly focused on the acceptance of mobile marketing (Haghirian et al. 2005; Leppaniemi et al. 2005) or the effectiveness of mobile marketing using SMS (Goh et al. 2009; Merisavo et al. 2006; Scharl et al. 2005). The advent of smartphones has propelled mobile marketing into another level with various advanced technologies. Our study is among the first to empirically quantify the effectiveness of new mobile marketing features. This approach enables us to understand the impacts of varying distance settings on customer response to mobile promotions.

Fifth, by conducting a randomized field experiment to test the effects of distances on customer response to mobile promotions, our study is one of the pioneer efforts in identifying the causal relationships in mobile marketing. With a rigorous experiment design, we were able to obtain the relatively unbiased causal estimates of the impacts of distances (Duflo et al. 2007). Furthermore, different from laboratory experiment studies, our field experiment provided all customers with a purely realistic mobile marketing environment. Therefore, we believe our findings are more generalizable.

Finally, we used a single framework to investigate both the probability and the hazard rate of response to mobile promotions. By exploiting customers' decision on whether and how fast to respond to a mobile promotion, our joint model provides a more comprehensive analysis of customer behavior in mobile marketing.

### 2.6.3 Practical Implications

As mobile marketing goes mainstream, marketers are eager to know how to improve the effectiveness of their mobile marketing campaigns. Our study also delivers important practical implications for marketers which serve as guidance for improving the design of their mobile marketing strategies. First, decreasing the spatial distance is found to increase the probability and hazard rate for customers to respond to a mobile promotion. With knowledge of customers' locations, marketers can send mobile promotions to their customers when they are close to the stores. By providing certain incentives, marketers are able to not only enhance their store traffic by attracting customers near them, but also reduce the marketing costs by sending promotions to a target group of customers with high potential to respond to the mobile promotion. For example, Subway has already taken the initiative to attract spatially close customers through mobile promotions (Murphy 2011).

Second, showing socially proximate people in the popularity information is found to be effective in stimulating customer response to mobile promotions. With access to customers' online profiles, marketers can identify the people who share the same friends or the same interests with their customers and put these people in the popularity information to encourage customers to respond to promotions. Popularity information with socially proximate people enhances the persuasiveness of a promotion. Based on the ideas of sponsored story advertisements on Facebook (Constine 2012), marketers can optimize the use of popularity information from customers' friends to increase the persuasiveness of the promotion. For example, besides showing friends' endorsement of a product, the popularity information can also display the list of friends who are planning to buy the product. In addition, marketers can also apply the popularity information to product reviews. For example, a social distance measure can be attached to each of the reviews to indicate whether the reviewer is socially proximate to or distance from the customer.

Third, our results show that decreasing the temporal distance stimulates the urgency of responding to the promotion and thus results in a higher probability and hazard rate of response. This implies that the limited validity of the promotional period spurs customers to make immediate response because they do not wish to lose the opportunity to enjoy the promotional discount. Notably, the positive effect of decreasing the temporal distance is even stronger when customers are spatially proximate to the store. Marketers can well leverage this finding and provide mobile promotions with a minimum valid period (e.g., two hours) to customers who are near the store or in the shopping mall where the store is located. Essentially, the temporal distance can be reduced to such a level that the mobile promotion will expire in hours so that the customer has to respond to the mobile promotion on the current shopping trip.

Fourth, the interesting findings of the interaction effects imply that a good combination of distance settings in mobile promotions is of utmost importance for achieving greater effectiveness of a promotion. According to the findings of this study, marketers need to first understand whether customers are currently spatially proximate to or distant to the store. By pinpointing customers' current locations, marketers can design the social distance and temporal distance settings for a mobile promotion accordingly. We suggest marketers should design the social distance and temporal distance at the same level as customers' spatial distance to the store, that is to set both the spatial distance and the social distance to be low, or for both to be high. For example, when customers are close to the store (less than 4.5 kilometers as found in this study), marketers can show them information of their close friends also received the promotion. This increases the persuasiveness of the promotion. On the other hand, if customers are far away from the store, marketers should send them the promotion in which showing how the promotion is well-accepted by the general public. This makes the promotion message more informative and increases customers' desirability of responding to the promotion.

The findings also show that marketers should carefully set the expiry date depending on customers' distance to the nearest store. For example, with knowledge that customers are close to the store, marketers should set an approaching expiry date such that customers will quickly respond to the promotion in order to enjoy the promotional discount on their current shopping trip. On the other hand, if customers are far from the store, marketers should set expiry dates far enough so that customers have enough time to react to the promotion.

Lastly, marketers should always make the level of social distance consistent with the temporal distance. For example, if marketers set the promotion to expire soon, they should embed popularity information from customers' close friends to increase the persuasiveness of the promotion. On the other hand, marketers should use popularity information from the general public if they design the promotion to expire in the distant future.

## 2.7 Limitations and Future Research

While this research has surfaced several notable findings, we acknowledge some limitations. First, we used the number of mutual friends shared on Facebook to compute the social distance. However, this is not the only method of measuring social distance. Future studies can compare the homophily of two individuals, such as, the same interests, the same graduate school, or the same Facebook fan pages liked. Researchers can develop an algorithm to compute the social distance based on all the 'same' attributes of two individuals. Second, due to privacy issues, some consumers did not permit our mobile app to access their location and Facebook information. This led to some missing values in our data set which also limited our sample size for estimation. This suggests a future opportunity to study the privacy perspective in mobile marketing (Xu et al. 2012). The resolution of the privacy issue will be more meaningful in mobile marketing because the

private information is not only disclosed to the marketers but also can be disclosed to customers' friends on social networks. Third, our sample size is relatively small which restrict us from conducting further analysis on the coupon redemption. Future research with large-scale field experiment can investigate customers' coupon redemption when more customers are involved. Fourth, when computing the spatial distance, we only computed the spatial distance in the two-dimensional space. However, stores might actually locate at a high floor or at a low level such as the basement of a shopping mall. With improved indoor positioning technology (Groves 2008), future studies may consider measuring spatial distance in a three-dimensional space. Thus, the computation of spatial distance will be more precise. Accordingly, the effect of spatial distance can be further investigated for customers within a shopping mall.

Moving ahead, there are other potential directions for future search. A potential research direction is to study the viral effects of social distance. As mobile devices are highly personal, it is important to investigate customers' sharing behavior in different social distance settings. Besides, to extend on the current study, researchers can include hypothetical distance as the fourth distance to examine its influence in the mobile context. For example, Mini Coupe conducted an overwhelming mobile marketing campaign, asking customers to use the Mini Coupe mobile app to capture a virtual Mini Coupe vehicle located in the city (Mini Coupe 2012). The customers competed to capture the virtual car using LBS and the final owner of the virtual car was awarded a real Mini Coupe. It is interesting and yet meaningful to study how a hypothetical product will influence customer response to a mobile promotion and how the hypothetical distance interact with the other three distances.

## 2.8 Conclusion

In conclusion, this study examines the influences of spatial distance, social distance, and temporal distance on the effectiveness of customer response to mobile promotions. Based on the construal level theory, we developed a comprehensive and integrated model with three distance dimensions for the mobile marketing context. Using a field experiment to collect customer responses, we applied a joint-estimation to test our hypotheses. The findings suggest that decreasing any of the distances leads to a higher probability and a higher hazard rate of response to the mobile promotion. In addition, the robust two-way interaction effects of the three distances validate our proposed hypotheses. That is, when the spatial distance is low, decreasing either the social distance or the temporal distance results in a higher probability and a higher hazard rate of customer response to a mobile promotion. On the other hand, when the spatial distance is high, increasing either the social distance or the temporal distance leads to a higher probability and a higher hazard rate of response to a mobile promotion. One interesting finding is that when the social distance is low, decreasing the temporal distance results in a higher probability but not a higher hazard rate of response to a mobile promotion. In addition, when the social distance is high, increasing the temporal distance leads to a higher probability but not a higher hazard rate of response to a mobile promotion. In summary, our study contributes important insights for researchers who want to investigate the effectiveness of mobile marketing and for marketers who wish to build optimal mobile marketing strategies.

# Chapter 3

# Engaging Consumers with Advergames: An Experimental Evaluation of Interactivity, Fit and Expectancy

## 3.1 Introduction

Advertisers have been deploying various conventional and digital media to convey advertising messages, from printed material, television, to website banners. Recently, advergame, a new digital advertising format, is experiencing a boom in popularity. In the U.S. alone, the market for advergaming is projected to reach $68 billion by 2012 (Kanth 2010). An advergame refers to an integration of advertising messages in a custom-built game (typically online) aimed at promoting a product or brand to potential consumers who are engaged in playing the game (Buckner et al. 2002; Mallinckrodt et al. 2007). Increasingly, in a world of fragmented media proliferation, print ads are losing their prominence as newspaper subscription rates plunge. The appeal of TV commercials is also fading due to high cost and low interactivity, while the click-through rates web banner ads continue to drop as consumers are inundated by irrelevant ads. In such a context, the advergame provides a potential solution to such problems of existing advertising formats by providing the consumer with an interactive engaging experience while being exposed to ad messages which may bring about positive advertising responses.

The advergame is typically custom designed for the sponsoring brand and aims to provide consumers with an interactive and engaging brand experience (Wise et al. 2008). Compared to traditional advertisements, in the advergame, the role of a

consumer changes from a passive observer to an active player since he can interact with brand components in the game (Buckner et al. 2002). The value of the advergame lies in the integrated delivery of a captivating advertising message within a game such that consumers are more likely to form a favorable attitude toward the advertised brand (Dahl et al. 2009). A typical advergame costs from $10,000 to $100,000 but can garner up to 100,000 interactive minutes of engagement with a brand (Marketinomics 2011; Obringer 2011). With such an appeal of prolonged interactive brand experience to consumers at a fraction of conventional mass media advertising costs, marketers are actively adopting advergames and diverting their advertising dollars to the advergame. Indeed, the emerging trend of using advergames clearly demonstrates the importance of a detailed investigation on the effectiveness of advergames.

To date however, few empirical research have focused on the effectiveness of advergames for digital marketing purposes. It thus remains unclear what renders an advergame effective from both the theoretical and practical perspectives. To study this issue, we focus on the design elements of the advergame and examine how different manipulations of the design elements can influence the effectiveness of advergames.

We pose two important research questions in this study: a) *What are the fundamental design elements that influence the effectiveness of advergames?* b) *How and to what extent do these elements influence the effectiveness of advergames?* To answer these research questions, we identify three major design elements that influence the effectiveness of advergames, namely *interactivity*, *fit* and *expectancy*. To provide insights into the effectiveness of advergames, this study investigates two major outcome metrics, attitude toward advergame and attitude toward brand. These two measures interest advertisers most and are direct measures of the effectiveness of advergames (Gardner 1985; Homer 1990; Homer 2006; MacKenzie et al. 1986; Mittal 1990). In addition, we investigate whether

playing advergames indeed affects consumers' intention to purchase the advertised brand in the advergame.

We conducted a 2*2*2 factorial design experiment in an online 3D virtual world environment to test our hypotheses. The results indicate that in the condition of high fit, consumers have a more favorable attitude toward advergame in both high interactivity and low expectancy situations. Contrary to our hypothesis, we found that, in the low interactivity condition, low expectancy generates a more positive attitude toward advergame. Interestingly, interactivity is the only variable that has a significant positive effect on attitude toward brand. Importantly, the causal effect from attitude toward advergame to attitude toward brand, and the effect from attitude toward brand to purchase intention are both significantly positive.

Overall, our study makes four important contributions. First, we apply and extend the concept of interactivity from the Human-Computer Interaction (HCI) literature, and the concept of fit from the cognitive fit and task-technology fit literatures into the advertising context. Second, we extend the concept of expectancy from the advertising literature, and use the engagement theory and transportation theory to elaborate how a consumer's emotion, mental imagery and attention can be influenced by the interactivity, fit and expectancy of an advergame to ultimately affect advertising effectiveness. Third, this is a pioneering effort that provides new theoretical underpinnings to understand the interaction effects amongst three pivotal design factors of advergames, and elaborates how such insights can be applied to the practice of advergame designs. Finally, our study is the first one that documents, based on the transportation theory, the positive attitude toward advergame can be transported to the advertised brand in the advergame. In relation to this result, we also validate the positive effect of attitude toward brand on consumers' purchase intention in the advergame context.

## 3.2 Theoretical Foundation

In this study, we use the engagement theory (Kearsley et al. 1998) and the transportation theory (Green et al. 2000; Green et al. 2004) for our main theoretical foundation. Given that these two theories share a focus on engagement, they can be combined to provide an integrative view that yields a deeper understanding of the underlying mechanisms that can enhance the effectiveness of advergames. The engagement theory sheds light on the effectiveness of advergames by explaining how individuals are engaged in an advergame. For example, this theory can account for the reasons why individuals are engaged in the advergame. Complementing the engagement theory, the transportation theory explains that when individuals are engaged in a narrative world such as one portrayed in an advergame, the personal enjoyment derived from the advergame can affect their attitudes and beliefs (Green et al. 2004). This theory thus explains how the feelings and reactions generated in the advergame are transported to the real world and the advertised brand or product.

### 3.2.1 Engagement Theory

The fundamental idea underlying the engagement theory is that individuals must be meaningfully engaged in activities through interactions, while technology can enhance engagement in ways which may not be otherwise easily achieved (Kearsley et al. 1998). When individuals are engaged, the experience consequently generated is associated with perceptions of intrinsic interest, attention focus, and curiosity (Chapman et al. 1999). In other words, the individual is meaningfully occupied, engrossed with and captivated by a specific activity. A high level of engagement allows individuals to focus on an activity such that his or her attention is largely absorbed or captured by it for a significant period (Higgins 2006). When individuals are engaged with a particular activity or a product, they intend to prolong the activity (Sandelands 1988) or use the product

repeatedly (Jordan 1998). Moreover, in the HCI literature, higher engagement can result in a more positive view of the interactions with computer interfaces and in higher motivation for such future interactions (Kim et al. 1998; Webster et al. 1993).

When advertising their brands, marketers are particularly interested in engaging consumers with their brands (Wang et al. 2006) so that consumers can form positive feelings about these brands (Mayes 1992). In line with the engagement theory, *interactivity* with brand components is considered an important factor that can increase individuals' engagement levels. Moreover, the relevance of the advertisement context is found in the advertising literature to be a primary antecedent of consumers' engagement (Wang 2006). Similarly, extending from the IS literature in e-commerce and website design (Cyr et al. 2009; Lombard et al. 1997; Palmer 2002; Van der Heijden 2003), the *fit* between the type of advergame and the brand image of a product being advertised is posited as an important antecedent to engagement levels and thus consumer attitudes toward advergames and brands. Furthermore, a novel, creative yet unconventional element or idea in the advertisement can enhance consumers' engagement with the ad or brand. Hence, *expectancy* of the advertisement is identified as an important element to engage consumers (Wells et al. 1992).

### 3.2.2 Transportation Theory

The concept of transportation is theoretically defined as "a convergent process, where all mental systems and capacities become focused on events occurring in the narrative" (Green et al. 2000). In other words, transportation into a narrative world is to become fully engaged in an activity, resulting in an "integrative melding of attention, imagery and feelings" (Green et al. 2002; Green et al. 2004). This theory suggests that the enjoyment gained from the experience of being engaged can affect individuals' attitudes and beliefs in the real world (Green et al.

2004). Specifically, the underlying mechanisms of transportation affect individuals in the following ways. First, transportation reduces negative cognitive responses in individuals. Transported individuals are less likely to disbelieve or counter-argue narrative claims, and thus their beliefs may be positively influenced. Next, transportation leads to narrative experiences which seem more like real experiences through the use of mimicry. Finally, transportation can create strong feelings toward characters in narratives; the experiences or beliefs of those characters may then have an enhanced effect on individuals' beliefs and attitudes.

Originally proposed in the realm of the reading of written materials or narratives, the transportation theory is however construed to encompass the listening, viewing, receiving and participating in the action of narrative information from a variety of media channels or content such as video games and virtual reality simulations (Green et al. 2004). The transformative potentials of transportation might be especially prominent with digital interactive media or content such as advergames in online or virtual world platforms. This is because individuals in such platforms are provided with the capacity to place themselves into an interactive narrative context that allows them to go beyond their usual role as a passive audience or consumer, and to shape and control the flow of events in the online virtual world (Nah et al. 2011; Suh et al. 2005). Indeed, achieving a transportation experience in an online virtual world is akin to the "telepresence" notion in the IS literature (Nah et al. 2011; Suh et al. 2005) where individuals with a sense of telepresence are "focused on the virtual or mediated environment to the extent that their stimulus field is limited to just that environment, while the physical environment is disregarded" (Nah et al. 2011).

A transportation experience requires a high level of engagement from the individual involved (Wang 2006). Specifically, media content consumption such as game playing usually involves a high level of engagement in the entertainment process such that this process is deemed pleasurable and enjoyable by consumers or game players (Brock et al. 2004; Escalas 2004). Accordingly, consumers playing advergames are put in a position where they are more likely to be

transported into the narrative world portrayed. As a result, positive feelings and enjoyment evoked by mental simulation in the transportation experience can be transferred to the advertised brand in the advergame (Glass 2007; Homer 2006). Thus, the advertised brand can benefit from consumers' pleasurable transportation experience, such that consumers with more immersive positive transportation experiences can experience more favorable attitudes toward the advertised brand (Wang 2006). In the IS literature, it has been similarly reported that enjoyment has a positive influence on attitude toward an online vendor or website (Lee et al. 2005; Van der Heijden et al. 2003) and on shoppers' propensity to return to a site (Koufaris 2002). Therefore to sum up, the transportation theory implies that the advertising effectiveness of the advergame depends on how the advergame can engage consumers with a pleasurable and enjoyable transportation experience during the game play. In particular, we posit in this paper that the three design factors of *interactivity*, *fit* and *expectancy* of advergames can have influences on the extent of engagement and enjoyment by consumers playing advergames, which can then be transferred to consumers' attitudes.

### 3.2.3 Interactivity

Computer or video games have an important defining feature of interactivity (Berman et al. 1995; Bezjian-Avery et al. 1998; Nicovich 2005). Interactivity has received much attention in the HCI literature (Palmer 2002; Shneiderman et al. 1998). Many researchers from different disciplines define interactivity from distinct angles (Blattberg et al. 1991; Deighton 1996; Hoffman et al. 1996; Rafaeli 1988; Rafaeli et al. 1997; Steuer 1992; Steuer et al. 1995). These definitions can be classified into three categories, namely user-machine interaction, user-user interaction, and user-message interaction (Cho et al. 1997). In the context of advergame, advertisers aim to persuade consumers with advertising messages. Thus, the interaction occurs between consumers and advertising messages. By reviewing the interactivity literature, Liu & Shum (2002) further specified three

dimensions of interactivity: active control, two-way communication, and synchronicity. For synchronicity, in the context of advergame, all the actions are synchronized since consumers' input and the game responses occur in the same time frame. Thus, we omit synchronicity in our conceptualization of interactivity. In accordance with the nature of game play, control and feedback are two dominant features for game designs (Kafai 1995; Salen et al. 2004; Sweetser et al. 2005). For active control, consumers are able to customize their actions in advergames, such as deciding whether to interact with the in-game brand components. For two-way communication, consumers receive consequent feedback according to their actions with the game components. For example, advertising messages are conveyed to consumers when they are interacting with the brand components.

In the context of advergame, we combine the dimensions of active control and two-way communication for the conceptualization of interactivity. Therefore, we define interactivity as the *extent to which consumers can interact with brand components and get feedback of advertising messages accordingly*. In this study, high interactivity refers to the situation that consumers can extensively interact with brand components and get sufficient feedback of advertising messages in the advergame. Low interactivity refers to the scenario where only limited interactions with brand components occur and consumers receive little feedback from advertising messages.

### 3.2.4 Fit

In the IS literature, the theory of cognitive fit posits that the performance on a task will be enhanced when there is a match between the information conveyed in the problem representation and the problem-solving task (Vessey 1991; Vessey et al. 1991). When there is such a match, individuals can use the same mental representation and decision processes for both the representation and the task,

thus producing enhanced task outcomes. A similar notion of task-technology fit is defined as "the degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue et al. 1995). Many prior researches have emphasized that technologies should have a good fit with the work tasks that are supported by them. Beyond the context of tasks in work places, related research in this area has evolved to include tasks in group support systems (Dennis et al. 2001), group communication (Sarker et al. 2010) and e-commerce (Liu et al. 2012; Suh et al. 2005). Further, in this paper, we extend the concept of task-technology fit to the context of online advertising, where the advergame is the "technology" in focus while the "task" involves, from a brand marketer perspective (rather than from an end-user perspective), communicating the theme or image of the advertised brand. Indeed, the proposed fit construct here for advergame is also similar to the "made-for-the-medium" construct used in the HCI literature of website usability (Agarwal et al. 2002), where the "made-for-the-medium" construct relates to the extent of tailoring a website to fit a specific user's needs.

Advertising research suggests that contextual relevancy is a critical factor that influences the effectiveness of advertisements (Heckler et al. 1992; Lee et al. 1999). Relevancy reflects "how information contained in the stimulus contributes to or detracts from the clear identification of the theme or primary message being communicated" (Heckler et al. 1992). Fit, when applied in the context of advergame, refers to the *extent to which the advergame fits with the theme or image of the advertised brand*. In conventional advertisements, relevant components in the ad contain informative or persuasive elements that support or fit with the theme of the advertised brand (Muehling et al. 1993). For advergames, a fitting relevant design requires the context of the game to match the theme or image of the advertised brand. For example, sports games are more appropriate for a sports brand compared to puzzle games. High fit refers to the scenario in which the context of the advergame can clearly fit or match the theme of an advertised brand, while a low fit situation is such that the advergame context can hardly reflect the primary brand message or theme.

### 3.2.5 Expectancy

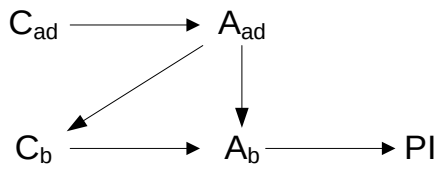
Typically, individuals will be aroused when they are presented with a novel object (Berlyne 1960). As such, expectancy is critical to novelty since unexpected information is delivered and received in a unique or unusual mode (Lee et al. 1999). In past literature, expectancy is defined as the "degree to which an item or piece of information falls into some predetermined pattern or structure" evoked by the marketing message or communication (Heckler et al. 1992). In this paper, we define expectancy of the advergame as the *extent to which the design of an advergame is within the expectation of consumers compared to the existing knowledge or preconceptions in similar conventional games*. Advergames with high expectancy refer to those games that are more similar to existing conventional games while advergames with low expectancy have certain elements (e.g., game characters, components, plots or rules) which are novel or distinct from traditional games.

In summary, we try to investigate different combinations of the three factors: interactivity, fit and expectancy of advergames. We believe that with optimal design combinations of these factors, the advergame can fully engage consumers and facilitate a pleasurable transportation experience when they are playing the advergame. Thus, a positive experience of transportation will be associated with the advergame and the advertised brand (Green et al. 2004). Ideally, the positive attitude toward the brand can also influence consumer behavioral intention in purchasing the brand.

## 3.3 Hypotheses Development

We use a dual mediation hypothesis (Homer 1990; MacKenzie et al. 1986) (see Figure 3-1) to portray the relationship between our two dependent variables, attitude toward advergame ($A_{ad}$) and attitude toward brand ($A_b$). The dual mediation model proposes that attitude toward advergame ($A_{ad}$) influences

attitude toward brand ($A_b$) both directly and indirectly through its effect of brand cognitions on consumers. We note that both the brand cognition ($C_b$) and ad cognition ($C_{ad}$) are not the focal constructs of interest in our research model or hypotheses. Nevertheless, we do measure and control for both in our data analysis (see Table 3-3). We also postulate a direct one-way causal influence from $A_b$ to purchase intention (PI) in the dual mediation model. In this study, we propose two-way interaction effects between interactivity, fit and expectancy of the advergame on $A_{ad}$ and the main effects of these three variables on $A_b$. Further, we explore the two causal effects from $A_{ad}$ to $A_b$ and from $A_b$ to PI to examine the consequent effects. Figure 3-2 shows our research model.




$C_{ad}$ – ad cognition
$C_b$ – brand cognition
$A_{ad}$ – attitude toward advergame
$A_b$ – attitude toward brand
PI – purchase intention

**Figure 3-1 Dual Mediation Hypothesis**

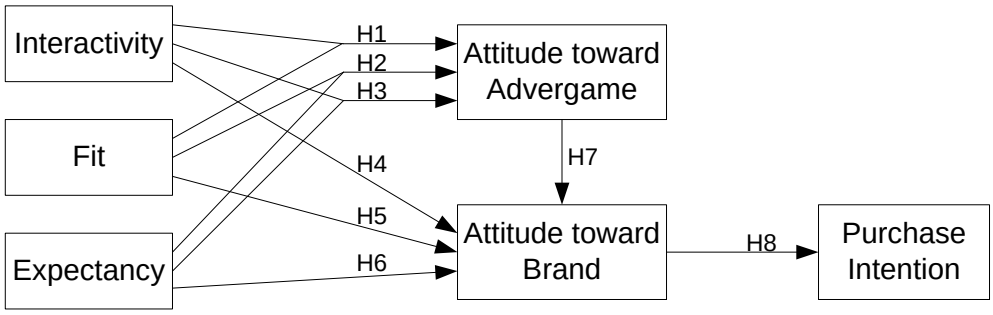



**Figure 3-2 Research Model on Advergame Marketing**

### 3.3.1 Interactivity and Fit

In advergames, different from traditional passive media, brand identifiers are inserted as active game components and become brand components in the game environment (Nelson 2002; Wu 1999). In our study, brand identifiers refer to those logos and stylized texts which contain embedded advertising messages. The essential characteristic of advergame is that consumers, in assuming the game character or role, can play with the brand components and get feedback from advertising messages according to their actions. These brand components usually serve as tools or equipment which can assist consumers to win the game or gain extra winning advantages (Lee et al. 2009). A high level of interactivity enables consumers to have extensive control in playing with the brand components and obtain sufficient feedback from the advertising messages. Since interacting with the brand components can assist consumers to gain winning advantages in a typical advergame, consumers have the intrinsic interest to engage themselves with these brand components. Hence, a highly interactive game play makes it natural for consumers to generate positive affective responses and vivid mental imageries of the brand advertised, and thus be transported into the narratives of the advergame (Nicovich 2005). In addition, research in online shopping also reveals that consumers' enjoyment, as an intrinsic motivation for adopting technologies (Davis et al. 1992), is an influential factor that affects consumer attitudes (Jarvenpaa et al. 1996; Van der Heijden 2003). Thus, it is likely that the enjoyment from playing a highly interactive advergame will be associated with a favorable attitude toward advergame (Holbrook et al. 1984; Sweetser et al. 2005).

Regarding the fit of an advergame, when an advertisement matches the theme of the advertised brand, consumers need little effort to process the advertising information (Hastie 1980; Hastie 1981; Scrull 1981; Srull et al. 1985). In an advergame with a high level of fit, the game play, context and plot match the theme of the advertised brand, and thus the advertised brand will not appear out of context in the advergame. Consumers who play the advergame can easily understand the connection between the game context and the advertised brand.

Compared to an advergame of low fit which requires considerable cognitive resources to decode the irrelevant advertising information, consumers perceive less intrusiveness when the advertised brand appears to be congruent with the game context (Hernandez et al. 2004). Thus, consumers can focus their attention on the game play and are more likely to be engaged in the advergame. When consumers engage themselves in the advergame, we expect a more positive attitude toward the advergame when the advergame context highly matches the theme of the advertised band (Green et al. 2004; Russell 2002; Shamdasani et al. 2001).

Given a relevant and fitting advertising context, the positive transportation experience triggered by the interactivity can further enhance the attitude toward advergame. In the high fit and high interactivity condition, consumers can be totally engaged in an immersive context because the relevant advertising exposure does not disrupt the transportation experience. In particular, transported individuals have a greater affinity for the main characters of a narrative and thus are more likely to be influenced by the positive emotions or affective responses associated with these characters (Green et al. 2000). The presence of rich, realistic details in a high fit and high interactivity scenario of advergames can also allow consumers to form more vivid and convincing mental images of brands (Green et al. 2004). However when fit is low, the inappropriate or poorly matched ad elements are likely to interrupt the consumers' gaming experience regardless of the extent of interactivity, such that consumers cannot fully engage in the advergame. Thus, with a lack of positive emotional reaction to the game and incomplete formation of a relevant mental imagery of the advertised brand, an optimal transportation experience is hampered. Accordingly, the low fit impedes the development of a favorable attitude toward the advergame. Therefore, we propose:

**H1:** *There is an interaction effect between an advergame's interactivity and fit on the attitude toward advergame. Under a high fit condition, high interactivity results in a better attitude toward advergame than that in a low interactivity*

*condition. However, under a low fit condition, both high and low interactivity conditions result in the same level of attitude toward advergame.*

### 3.3.2 Fit and Expectancy

A low level of expectancy of an advergame refers to the situation when certain game elements in the advergame are not within consumers' expectations. In this situation, the game elements (e.g., game components, game plot, or game rules) in the advergame appear out of sync with conventional expectations of gaming experiences and are unique compared to conventional game designs. Compared to advergames which are more similar to conventional games, novel advergames with unique or unanticipated design or creative elements are expected to elicit greater cognitive elaboration (Lee et al. 1999). When consumers encounter unforeseen or surprising game elements in the advergame, they will be curious about these game elements and be eager to explore how the novel or unconventional game elements work. Further, the increased elaboration of curiosity is primarily favorable so that consumers are likely to evaluate the advergame positively when exploring game elements of low expectancy (Lee et al. 1999). Consequently, we believe the enjoyment gained from the exploration of a low expectancy advergame can lead to a positive effect on attitude toward advergame.

An assumption underlying the positive effects of an unexpected stimulus is that the consumer must successfully understand the advertising message (Lee et al. 1999). In other words, for unexpected information to generate favorable attitudes, the advergame must be able to provide consumers with a relevant or appropriate context. If the advergame context does not match the theme of the advertised brand, consumers are more likely to recognize the persuasive attempts of the advertising messages (Raney et al. 2003). In such a case, consumers can become suspicious of overt selling of brand messages and thus be skeptical of the ads in

the advergames. Further, the resistance to ad messages in advergames can impede consumers' transportation experiences. In addition, prior research on the transportation theory has also documented that consumers of fictional programs are less concerned with its objective truth status, but are more concerned with whether the content meets some plausibility criterion (e.g., realistic characters, settings or the plot of an advergame) (Busselle et al. 2000). In cases where advergames are of low fit, these tend to be less plausible to consumers, and thus result in a much smaller extent of transportation or enjoyable experience for consumers. Therefore in sum, the positive attitude generated from low expectancy of an advergame can be negated by low fit in that advergame.

However, in a high fit condition of advergames, consumers are provided with a seamless, plausible game context. Consumers do not feel the advertising messages to be too prominent or incongruent, and are able to engage themselves in the advergame. Thus, coupled with high fit, the low expectancy of an advergame can engender consumer pleasure and emotional resonance with the advertised brand, and thus generate a more positive attitude toward the advergame when consumers are transported seamlessly to the narrative world of the advergame. We expect that when an advergame has a high fit with the theme of the advertised brand, a low level of expectancy helps in engaging consumers in the advergame to generate a better attitude toward the advergame, as compared to the high expectancy case. Therefore, we hypothesize that:

**H2:** *There is an interaction effect between an advergame's fit and expectancy on the attitude toward advergame. Under a high fit condition, low expectancy results in a better attitude toward advergame than that in a high expectancy condition. However, under a low fit condition, both high and low expectancy conditions result in the same level of attitude toward advergame.*

### 3.3.3 Interactivity and Expectancy

When the interactivity level in an advergame is high, consumers have extensive control over playing with the brand components and getting sufficient feedback from advertising messages. In a highly interactive game context, consumers are likely to be engaged with full focus and attention on the game play and be transported into the narrative world of the advergame (Nicovich 2005). Further, when the advergame is designed with low expectancy, consumers perceive the novel and unconventional game elements as pleasurable, surprising and unanticipated (Berlyne 1971). Consumers are likely to be enthused by a gratifying and entertaining engagement when they are exploring the novel and unanticipated elements in the advergame. Thus, the enjoyable experience of exploring the low expectancy elements in the advergame is further enhanced when consumers are engaged in an immersive manner in a highly interactive advergame that accentuates the active mental imagery of the advertised brand. Consequently, with the components of a transportation experience being activated, i.e., positive emotional reaction, mental imagery and attention, an individual's transportation can be facilitated. Consequently, we expect a more favorable attitude toward advergame in both a high interactivity and a low expectancy condition (Lee 2000).

In contrast, when the level of interactivity in the advergame is low, consumers do not have much interaction with the brand components. Consumers can hardly be engaged thoroughly in a low interactivity advergame when they have fewer interactions with the brand components in the game. Even when an advergame is of low expectancy, consumers may not have an adequately engaging and pleasurable experience with the brand components in the state of a low interactivity advergame. Therefore without the phenomena of transportation being heightened, in the low interactivity condition, we do not expect that the low expectancy of the advergame can positively impact the attitude toward advergame, relative to the high expectancy baseline.

**H3:** *There is an interaction effect between an advergame's interactivity and expectancy on the attitude toward advergame. Under a high interactivity condition, low expectancy results in a better attitude toward advergame than that in a high expectancy condition. However, under a low interactivity condition, both high and low expectancy conditions result in the same level of attitude toward advergame.*

### 3.3.4 Main Effects on Attitude toward Brand

When an advergame is designed with a high level of interactivity, consumers have stronger motivation to interact with the brand components in order to perform better in the game play. During the game play, advertising messages are typically shown to consumers in the advergame as feedback of their interaction with the brand components. These advertising messages are found to be more persuasive when consumers are fully engaged in the advergame (Raney et al. 2003). Further, if the mental simulation while playing the advergame evokes positive feelings, these feelings can be transferred to the advertised brand through a transportation experience (Glass 2007; Green et al. 2004; Homer 2006). Thus, we hypothesize:

**H4:** *The interactivity of an advergame is positively related to the attitude toward the brand advertised in the advergame.*

When an advergame is of high fit, the game play, context and plot match the theme of the advertised brand in a coherent and seamless manner. Consumers can therefore easily understand the implied connections between the game context and the advertised brand. Past research shows that in electronic video games, consumers have a positive evaluation of the advertised product when the advertised product appears in the game context in a coherent or intelligible manner (Hernandez et al. 2004). Compared to the low fit condition, the advertised brand in the high fit condition is thus able to garner a better consumer appreciation of the fit between the advertised brand and the game context,

enhancing the affective response, mental imagery and engaged focus with the brand. We argue that this translates to a superior attitude toward the advertised brand through the activation of a transportation experience by a consumer (Green et al. 2000; Green et al. 2004). Therefore, we posit that:

**H5:** *The fit of an advergame is positively related to the attitude toward the brand advertised in the advergame.*

When an advergame is designed with a low level of expectancy, the game components are uniquely different from the conventional games consumers have played previously. Such novel and unanticipated game components will increase consumers' processing effort to encode this information (Srull et al. 1985; Srull et al. 1989). When consumers encounter such game components, they will be aroused and will try to explore the source of low expectancy in the gaming context. The exploration and stimulation of surprising, unconventional game elements in low expectancy, hedonic entertainment platforms of advergames can thus generate positive affective responses in consumers, as was demonstrated in the designs of web navigation systems (Webster et al. 2006). Consequently, consumers' positive affect and pleasurable feelings in the game play can be transported to the advertised brand when they are engaged in the advergame (Green et al. 2004). We therefore expect that in advergames with a low expectancy, a more positive attitude toward the advertised brand would emerge. Thus, we hypothesize that:

**H6:** *The expectancy of an advergame is negatively related to the attitude toward the brand advertised in the advergame.*

### 3.3.5 Impacts of Attitude toward Advergame and Attitude toward Brand

The ultimate goal of an advergame is to advertise the brand and convince consumers to purchase the advertised brand. Thus, it is important to investigate whether the attitude toward advergame has an impact on the attitude toward the advertised brand. Further, it is crucial to understand whether the attitude toward brand can eventually influence consumers' purchase intention.

Our research model proposes that attitude toward advergame positively influences attitude toward brand. When consumers have a positive attitude toward the advergame, their favorable attitudes are expected to be transported to the advertised brand in the advergame (Green et al. 2004). It is also postulated in the model that attitude toward brand will eventually affect consumers' purchase intention (Homer 1990). We expect consumers' brand evaluation from the advergame to have a positive impact on their purchase intention. Therefore, we believe these two causal relationships both hold in the advergame context. Thus, we posit that:

**H7:** *Attitude toward advergame positively influences attitude toward a brand advertised in the advergame.*

**H8:** *Attitude toward a brand resulting from playing the advergame positively influences consumers' purchase intention.*

## 3.4 Research Methodology

### 3.4.1 Experimental Design

We designed a car racing game for this study in an online 3D virtual world platform. In the advergame, four large billboards were set up around the racing track. These billboards show the advertising messages of the advertised brand.

The four large-sized billboards were large in size and were set up strategically around the track so that at least one billboard can be seen anywhere on the track. The consumer who finishes the required number of laps within the minimum time was considered the winner of the advergame.

We tested the proposed hypotheses in the present study in a laboratory experiment using the prior-described advergame with a 2×2×2 between-subject design (i.e., 2 levels of interactivity × 2 levels of fit × 2 levels of expectancy). Thus, the experiment comprises eight treatments groups. Table 3-1 shows the breakdown of the eight experiment treatments. We elaborate below the operationalization of experiment treatments for the three independent variables related to the advergame's design factors.

**Table 3-1 Breakdown of Experiment Treatments**

| | | Expectancy (High) | Expectancy (Low) |
|---|---|---|---|
| Interactivity (High) | Fit (High) | Red Bull Cans + Red Bull Billboards + Racing Car | Red Bull Cans + Red Bull Billboards + Crab Vehicle |
| | Fit (Low) | Marigold Milk Packs + Marigold Billboards + Racing Car | Marigold Milk Packs + Marigold Billboards + Crab Vehicle |
| Interactivity (Low) | Fit (High) | Red Bull Billboards + Racing Car | Red Bull Billboards + Crab Vehicle |
| | Fit (Low) | Marigold Billboards + Racing Car | Marigold Billboards + Crab Vehicle |

### 3.4.1.1 Interactivity

In the advergame, we manipulated interactivity by the extent to which consumers can interact with brand components by controlling the car and get the feedback from the advertising messages. In the low interactivity condition, consumers can only drive the vehicle around the race track to view the billboards and be exposed

to the advertising messages. Figure 3-3 shows an example of the advertising billboards.

In the high interactivity condition, besides the four billboards, there are four enlarged samples of the advertised product brand scattered around the race track. In addition to getting advertising messages from the billboards, when traversing around the race track, consumers can control the vehicle to come into contact with the advertised products and get a speed boost. The acceleration due to the speed boost is designed to be large so that consumers can easily discern the acceleration. Along with the boost, the logo of the advertised brand will flash above the consumer's avatar. The boost and the flash will last for five seconds. Figure 3-4 shows an example of the product placement on the track and the displayed interactive ad message. In addition to the advertising messages from the billboards, we consider the acceleration as additional feedback from the advertising messages when consumers interact with the brand components. Since the speed boost can help consumers to drive faster, consumers have the intrinsic motivation to "hit" the advertised products so as to win the game. Therefore, consumers are likely to engage themselves in an immersive manner with the brand components in the advergame.

#### 3.4.1.2 Fit

For the fit treatment of the advergame, we used two brands, Red Bull (energy drink) and Marigold HL (milk) to represent two levels of fit. We associate Red Bull with the high fit treatment since Red Bull is an energy drink brand. The context of the racing game matches with the advertising theme of Red Bull because it gives the consumer an additional boost of energy after drinking it. In contrast, Marigold HL is a milk brand whose brand promise is about drinking milk as a healthy beverage. The gaming context in our experiment thus does not

fit the brand image. Thus, Marigold HL is deemed appropriate for the low fit treatment.

In the high fit situation (Red Bull), all the in-game advertising will be about Red Bull and the four billboards display Red Bull advertising messages (see Figure 3-3). The products placed on the track in the high interactivity condition are enlarged depictions of cans of the Red Bull drink, while in the low interactivity condition, no products are placed on the track. When consumers drive their cars to strike the Red Bull cans on the track, they will get a speed boost and see the real-life commercial advertising message of "Red Bull gives you wings" flashed above their avatar during the acceleration.

In the low fit condition, all the billboards display the advertising messages of Marigold HL milk (see Figure 3-5). In the high interactivity condition, the advertised products placed on the tracks are Marigold HL rectangular milk packs with a triangular top. Upon getting a speed boost when the maneuvered car strikes the advertised milk packs, the advertising message shown is "The perfect balance of highs and lows", which is the same one used in mass media marketing campaigns of the brand. In the low interactivity condition, no packages of milk are placed on the track.

#### 3.4.1.3 Expectancy

The expectancy was manipulated through controlling the design of the vehicle in the racing game. When consumers enter the advergame settings, they only see the racing track without the vehicle in sight. Consumers can only see the vehicle (either a car or a crab) after choosing the color of the vehicle. The car or crab selected will be then used for the entire duration of the racing game without a possibility of switching the vehicle.

For the high expectancy condition, we designed the vehicle to resemble a Formula One racing car as in those of racing games of a similar game genre (see Figure 3-3 and Figure 3-6). For the low expectancy condition, we designed the vehicle to resemble a crab-like creature (see Figure 3-3 and Figure 3-5). Our premise is that such a crab-like creature is seldom used as a vehicle in conventional racing games, and thus consumers and game players would have the least expectation to see such a unique, non-standard vehicle design in an advergame, thus befitting the low expectancy treatment. For both the Formula One racing car and the crab-like vehicle, the same controls of four arrow keys on the keyboard were used to maneuver them throughout the duration of the racing game. Similarly, the speeds of the racing vehicles were identical across both conditions of expectancy in the advergame.

Finally, Figure 3-3 to Figure 3-6 illustrate the screen shots of four representative experiment treatments in our advergame that was designed using the criteria described above.

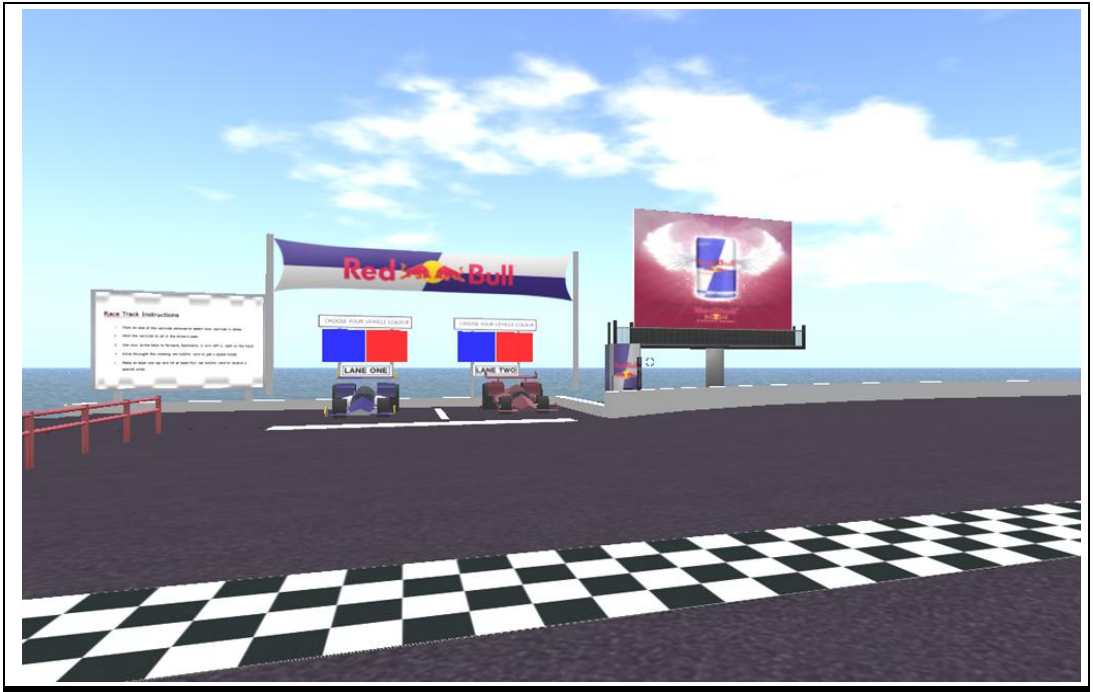



**Figure 3-3 Treatment: Low Interactivity * High Fit * High Expectancy**


**Figure 3-4 Treatment: High Interactivity * High Fit * Low Expectancy**

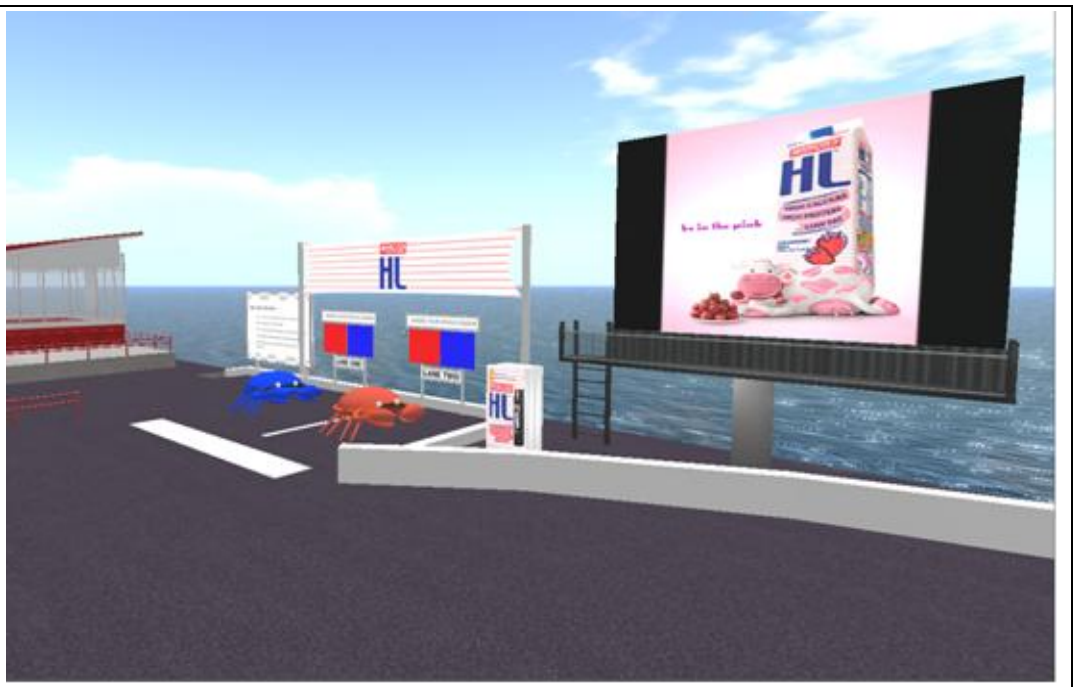



**Figure 3-5 Treatment: Low Interactivity * Low Fit * Low Expectancy**


**Figure 3-6 Treatment: High Interactivity * Low Fit * High Expectancy**

## 3.4.2 Experimental Procedures

### 3.4.2.1 Participants

We recruited a total of 126 undergraduate students from a large publicly-funded university.[26] Subjects were only told that they were participating in a consumer decision making experiment; the experimental task of playing an advergame was not revealed beforehand during the recruitment. Each subject received the equivalent of USD$8 as an incentive for participation. For the data analysis, we used the responses of 121 subjects (see Table 3-2) whose perceptions of the experiment treatments passed the manipulation checks, i.e., having correctly recalled the brands and vehicle types used in the experiment, as well as scoring correctly in at least 2 out of 3 manipulation check measurement scales for interactivity, fit and expectancy conditions corresponding to the treatment

[26] A pilot test on 40 subjects was conducted and the advergame design and the questionnaire were accordingly revised for the main test.

assigned. Among the 121 subjects used for data analysis, 72 were males (59.5%) and 49 (40.5%) were females. The average age of the participants was 22.4 years old. There was no significant difference in gender and age distributions across the treatments.

**Table 3-2 Treatment Assignment**

| Independent Variable | Expectancy Low | | Expectancy High | |
|---|---|---|---|---|
| | Fit Low | Fit High | Fit Low | Fit High |
| Interactivity Low | 16 | 15 | 16 | 14 |
| Interactivity High | 14 | 14 | 16 | 16 |

### 3.4.2.2 Experiment Procedure

We randomly assigned all the subjects to a treatment group. For each session of the experiment, we paired two subjects from the same treatment group to race against each other in the advergame. Before the start of play, subjects were asked to fill in a pre-experiment questionnaire. Then, we gave them instructions on how to play the advergame. Before the actual race, subjects were asked to experience a test drive in the assigned treatment condition for three rounds around the race track to get accustomed to the advergame's race vehicle responses and interactions with the brand components (if applicable in a treatment). They were told to drive as fast as they can as an internal timer recorded the track lap time. After completing the racing game, the subjects then completed the final questionnaire which captured various measurements of advertising effectiveness and other covariates such as brand familiarity (where the measured attributes (e.g., brand) is specific to the assigned treatment).

#### 3.4.2.3 Measures

We list the measures for the manipulation check in Table 3-3. Because subjects have different levels of brand knowledge before the experiment, the prior knowledge of a brand can affect their perception of the advergame and the brand advertised in the advergame (Kent et al. 1994; Lutz 1985; Monroe 1976). To control for the effect of subjects' prior brand knowledge, we measured attitude toward brand before the experiment, brand familiarity, and attitude towards ads in general. Prior studies have shown that experience in previous similar games may influence the perception of a game played (Castel et al. 2005; Green et al. 2007). To control for the potential effect of prior game experience on attitude toward the advergame, we also captured subjects' experience in racing games. Table 3-4 lists the measurement items for the three outcome dependent variables of advertising effectiveness and other covariates. All the measures in Table 3-4 were captured in the post-game questionnaire, except for the four measures for attitude toward brand (before experiment), attitude toward ads in general, brand familiarity, and experience in racing games which were captured in the pre-game questionnaire.

| Table 3-3 Measures for Manipulation Check | |
|---|---|
| 1-7 Likert scales are used. 1 = Strongly disagree, 7 = Strongly agree | |
| Interactivity | 1. I think I had interacted with the brand information in this advergame.<br>2. I think I had interactive exposure to the brand information in this advergame.<br>3. I think I had interactive experience with the brand information in this advergame. |
| Fit | 1. I think the theme of racing game is relevant to the Red Bull / Marigold brand.<br>2. I think the brand image of Red Bull / Marigold is relevant to the racing game.<br>3. I think the use of a racing game is appropriate for the Red Bull / Marigold brand. |
| Expectancy | 1. I think the racing / crab car I drove is within my expectation before playing this advergame.<br>2. I think the design of the racing / crab car I drove is within my expectation before playing this advergame.<br>3. I think the design of the racing / crab car I drove is the same as conventional designs available in other racing games. |

| Table 3-4 Measurement Items for Constructs | |
|---|---|
| 1-7 Likert scales are used, 1 = left hand expression, 7 = right hand expression | |
| Attitude toward Advergame (attAd)<br><br>(Gardner 1985; MacKenzie et al. 1989; MacKenzie et al. 1986) | What is your opinion of this advergame?<br>Extremely unfavorable / extremely favorable<br>Extremely boring / extremely interesting<br>Extremely bad / extremely good<br>Extremely unpleasant / extremely pleasant<br>Extremely dislike / extremely like<br>Extremely uninteresting / extremely interesting |
| Attitude toward Brand (After Experiment) (attBD_af)<br><br>(MacKenzie et al. 1989; MacKenzie et al. 1986; Miniard et al. 1990; Mittal 1990) | After playing this advergame, what is your overall feeling about Red Bull / Marigold?<br>Extremely unfavorable / extremely favorable<br>Extremely bad / extremely good<br>Extremely unpleasant / extremely pleasant<br>Extremely undesirable / extremely desirable<br>Extremely negative / extremely positive<br>Extremely dislike / extremely like |
| Purchase Intention (pur_int)<br><br>(MacKenzie et al. 1986) | What is the probability that you will try Red Bull / Marigold after playing this advergame?<br>Extremely unlikely / extremely likely<br>Extremely improbable / extremely probable<br>Extremely impossible / extremely possible |
| Attitude toward Ads in General (attAdG)<br><br>(MacKenzie et al. 1989) | What is your general opinion of advertisements by companies?<br>Extremely bad / extremely good<br>Extremely unpleasant / extremely pleasant<br>Extremely unfavorable / extremely favorable |
| Attitude toward Brand (Before Experiment) (attBd_bf)<br><br>(MacKenzie et al. 1989; MacKenzie et al. 1986; Miniard et al. 1990; Mittal 1990) | What is your overall feeling about Red Bull / Marigold?<br>Extremely unfavorable / extremely favorable<br>Extremely bad / extremely good<br>Extremely unpleasant / extremely pleasant<br>Extremely undesirable / extremely desirable<br>Extremely negative / extremely positive<br>Extremely dislike / extremely like |

| | |
|---|---|
| Brand Familiarity<br>(fam)<br><br>(Kent et al. 1994) | With regard to my familiarity with Red Bull / Marigold, I am<br>Extremely unfamiliar / extremely familiar<br>With regard to my experience with Red Bull / Marigold, I am<br>Extremely inexperienced / extremely experienced<br>With regard to my knowledge with Red Bull / Marigold, I am<br>Extremely not knowledgeable / extremely knowledgeable |
| Experience in Racing Games<br>(expRG) | How much experience do you think you have in car track racing games? (1-7 Likert scale, 1 = None, 7 = Extensive) |

## 3.5 Data Analysis

### 3.5.1 Manipulation Checks

Using questionnaire item responses collected from the subjects, we checked the validity of the manipulation of the three independent variables. Simple T-tests on the different levels for each independent variable show significant differences between the means for different levels of the treatments (see Table 3-5). Therefore, the manipulations for interactivity, fit and expectancy were all successful.

**Table 3-5 Manipulation Checks**

| Independent Variable | Levels | N | Mean | Std. Dev. | T-statistics |
|---|---|---|---|---|---|
| Interactivity | High | 60 | 5.00 | 1.25 | t = -6.738 |
| | Low | 61 | 3.42 | 1.34 | p < 0.001 |
| Fit | High | 59 | 5.29 | 1.30 | t = -10.809 |
| | Low | 62 | 2.88 | 1.16 | p < 0.001 |
| Expectancy | High | 62 | 4.08 | 1.11 | t = -10.740 |
| | Low | 59 | 2.19 | 0.78 | p < 0.001 |

### 3.5.2 Measurement Validation

We carried out all statistical tests at a 5% level of significance. In particular, we conducted both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to assess the survey instrument's convergent and discriminant validity for perceptual constructs. Table 3-6 reports the EFA results with principal component analysis and varimax rotation. We found a six-factor structure with eigenvalues greater than 1.0. All constructs explained 75.32% of the total variance. All measure items loaded on the target factors respectively and scored above 0.718, indicating excellent construct validity (Cook et al. 1979).

Table 3-7 reports the results of testing reliability and validity in the CFA. Using Cronbach's Alpha (Cronbach 1951), we assessed the constructs for reliability. A value of at least 0.70 indicates adequate reliability (Nunnally et al. 1994). The Cronbach's Alphas for all constructs were well above 0.7, indicating that all the measurement items in this study had achieved high reliability, as was the case from the results of the Composite Reliability metrics. All the metrics of Composite Reliability were greater than those of the Average Variance Extracted (AVE) in Table 3-7. In addition, as is generally recommended (Fornell et al. 1981), all our AVE statistics were greater than 0.5. Thus, from the factor loadings, Cronbach's Alphas and AVE, there is strong evidence of convergent validity in our measurement items. In assessing the discriminant validity, we looked at the factor loadings and the AVE recommendation that the square root of the AVE for each construct should be greater than the construct's correlations with the other constructs (Chin et al. 2003). This was indeed the case in Table 3-7, where the smallest square root of AVE is 0.822, which is larger than any of the inter-construct correlations in Table 3-8. After the measurement validation, we took the average values across the items for each construct as a measure of the target construct.

| Table 3-6 Results of Exploratory Factor Analysis | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variables | Items | Factor1 | Factor2 | Factor3 | Factor4 | Factor5 | Factor6 |
| Attitude toward Advergame (attAd) | attAd1 | -0.004 | 0.094 | 0.760 | 0.238 | 0.053 | -0.084 |
| | attAd2 | -0.018 | 0.138 | 0.817 | -0.083 | -0.120 | 0.161 |
| | attAd3 | -0.015 | 0.218 | 0.804 | 0.145 | 0.000 | -0.027 |
| | attAd4 | 0.115 | 0.045 | 0.809 | 0.096 | 0.125 | -0.037 |
| | attAd5 | -0.002 | 0.181 | 0.871 | 0.063 | -0.023 | -0.129 |
| | attAd6 | -0.048 | 0.250 | 0.761 | -0.095 | 0.013 | 0.036 |
| Attitude toward Brand (After Experiment) (attBD_af) | attBd_af1 | 0.109 | 0.790 | 0.242 | 0.129 | 0.156 | 0.203 |
| | attBd_af2 | 0.230 | 0.850 | 0.170 | 0.183 | 0.075 | 0.076 |
| | attBd_af3 | 0.238 | 0.820 | 0.166 | 0.221 | 0.148 | 0.090 |
| | attBd_af4 | 0.154 | 0.718 | 0.121 | 0.244 | -0.107 | 0.237 |
| | attBd_af5 | 0.173 | 0.816 | 0.240 | 0.218 | 0.105 | -0.074 |
| | attBd_af6 | 0.230 | 0.818 | 0.212 | 0.254 | 0.026 | 0.059 |
| Purchase Intention (pur_int) | pur_int1 | 0.111 | 0.387 | 0.135 | 0.860 | -0.053 | 0.015 |
| | pur_int2 | 0.119 | 0.378 | 0.075 | 0.875 | -0.047 | 0.001 |
| | pur_int3 | 0.157 | 0.301 | 0.106 | 0.870 | -0.038 | -0.026 |
| Attitude toward Ads in General (attAdG) | attAdG1 | -0.044 | 0.042 | 0.100 | 0.044 | 0.836 | 0.051 |
| | attAdG2 | 0.136 | 0.066 | 0.019 | -0.034 | 0.867 | 0.121 |
| | attAdG3 | 0.152 | 0.128 | -0.089 | -0.120 | 0.829 | 0.000 |
| Attitude toward Brand (Before Experiment) (attBd_bf) | attBd_bf1 | 0.846 | 0.216 | -0.011 | -0.037 | 0.050 | 0.166 |
| | attBd_bf2 | 0.844 | 0.228 | -0.036 | 0.014 | 0.096 | 0.184 |
| | attBd_bf3 | 0.849 | 0.141 | 0.121 | -0.003 | 0.159 | 0.169 |
| | attBd_bf4 | 0.762 | 0.063 | 0.093 | 0.194 | -0.036 | 0.115 |
| | attBd_bf5 | 0.874 | 0.203 | -0.047 | 0.147 | 0.067 | 0.111 |
| | attBd_bf6 | 0.805 | 0.133 | -0.073 | 0.122 | 0.013 | 0.139 |
| Brand Familiarity (fam) | fam1 | 0.268 | 0.174 | 0.013 | -0.090 | 0.070 | 0.795 |
| | fam2 | 0.452 | 0.053 | -0.042 | 0.097 | 0.044 | 0.765 |
| | fam3 | 0.175 | 0.136 | -0.064 | 0.005 | 0.088 | 0.837 |

| Table 3-7 Results of Confirmatory Factor Analysis | | | |
|---|---|---|---|
| Constructs | Cronbach's Alpha | Composite Reliability | AVE |
| attAd | 0.904 | 0.926 | 0.676 |
| attBd_af | 0.942 | 0.955 | 0.778 |
| pur_int | 0.959 | 0.973 | 0.924 |
| attAdG | 0.821 | 0.893 | 0.737 |
| attBd_bf | 0.933 | 0.947 | 0.750 |
| fam | 0.840 | 0.904 | 0.758 |

| Table 3-8 Correlation of Variables | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Interactivity (1) | - | | | | | | | | | | |
| Relevancy (2) | 0.02 | - | | | | | | | | | |
| Expectancy (3) | 0.04 | -0.01 | - | | | | | | | | |
| Attad (4) | 0.12 | 0.02 | -0.07 | - | | | | | | | |
| Attbd_Af (5) | 0.20 | 0.00 | -0.04 | 0.40 | - | | | | | | |
| Pur (6) | 0.13 | -0.18 | -0.01 | 0.26 | 0.66 | - | | | | | |
| Gattad (7) | -0.07 | 0.03 | -0.05 | 0.03 | 0.17 | -0.01 | - | | | | |
| Attbd_Bf (8) | 0.03 | -0.21 | 0.16 | 0.05 | 0.42 | 0.38 | 0.18 | - | | | |
| Brand_Familiarity (9) | 0.16 | -0.06 | 0.00 | -0.01 | 0.30 | 0.20 | 0.17 | 0.52 | - | | |
| Exprg (10) | -0.13 | -0.09 | -0.11 | 0.00 | 0.07 | 0.04 | 0.01 | 0.18 | 0.22 | - | |
| Age (11) | 0.06 | -0.05 | -0.01 | -0.05 | -0.09 | -0.06 | -0.24 | 0.10 | 0.20 | 0.09 | - |
| Male (12) | -0.16 | 0.06 | 0.07 | -0.08 | 0.04 | -0.04 | -0.11 | 0.07 | 0.14 | 0.20 | 0.21 |

### 3.5.3 Results of ANCOVA on Attitude toward Advergame

We conducted MANCOVA on both attitude toward advergame and attitude toward brand (measured after playing the advergame). Results show that the treatment effects are significant ($p < 0.05$). Thus, we further conducted ANCOVAs on the two dependent variables separately. Table 3-9 presents the descriptive statistics of the experiment treatment results on attitude toward advergame. The results of an ANCOVA test on attitude toward advergame show that all the two-way interaction effects between the three independent variables are significant (see Table 3-10). None of the covariates have a significant effect. To study the interaction effects, we used a simple main effect analysis.

**Table 3-9 Descriptive Statistics of Attitude toward Advergame**

| Mean (N, SD) | | Expectancy (High) | Expectancy (Low) |
|---|---|---|---|
| Interactivity (High) | Fit (High) | 5.27 (16, 0.88) | 5.39 (14, 0.69) |
| | Fit (Low) | 5.02 (16, 0.91) | 4.44 (14, 0.98) |
| Interactivity (Low) | Fit (High) | 3.96 (14, 0.86) | 5.11 (15, 0.48) |
| | Fit (Low) | 5.10 (16, 0.94) | 5.02 (16, 0.99) |

| Table 3-10 Results of ANCOVA on Attitude toward Advergame | | | | | | | |
|---|---|---|---|---|---|---|---|
| Source | $R^2$ = 21.9% | B | SE# | df | Mean Sq. | F | Sig. |
| Covariates | Brand Familiarity | 0.014 | 0.077 | 1 | 0.027 | 0.035 | 0.853 |
| | Attitude toward Ads in General | 0.004 | 0.109 | 1 | 0.001 | 0.001 | 0.973 |
| | Attitude toward Brand (Bef Expt) | 0.078 | 0.122 | 1 | 0.315 | 0.408 | 0.525 |
| | Experience in Racing Games | -0.015 | 0.056 | 1 | 0.052 | 0.068 | 0.795 |
| | Male | -0.035 | 0.178 | 1 | 0.030 | 0.039 | 0.844 |
| | Age | -0.010 | 0.047 | 1 | 0.035 | 0.045 | 0.832 |
| Main Effect | Interactivity (Int) | -0.582 | 0.330 | 1 | 1.241 | 1.608 | 0.208 |
| | Fit (Fit) | 0.141 | 0.323 | 1 | 0.112 | 0.146 | 0.703 |
| | Expectancy (Exp) | 0.084 | 0.315 | 1 | 0.841 | 1.090 | 0.299 |
| Interaction Effect | Int * Fit | 0.833 | 0.466 | 1 | 8.810 | 11.415 | 0.001** |
| | Int * Exp | 0.474 | 0.458 | 1 | 4.172 | 5.406 | 0.022* |
| | Fit * Exp | -1.272 | 0.458 | 1 | 6.954 | 9.011 | 0.003** |
| | Int * Fit * Exp | 0.565 | 0.650 | 1 | 0.583 | 0.755 | 0.387 |

Notes: *p < 0.05, **p < 0.01 ; # SE: Standard error

In support of H1, the interaction effect between fit and interactivity is significant ($F = 11.415$, $p < 0.01$). In the condition of high fit, attitude toward advergame is significantly higher ($F = 1.685$, $p < 0.05$) in the high interactivity condition ($N = 30$, Mean = 5.33, SD = 0.784) than in the low interactivity condition ($N = 29$, Mean = 4.56, SD = 0.892). In the condition of low fit, no significant main effect for interactivity is detected ($F = 0.017$, $p > 0.05$). Therefore, H1 is supported (see Figure 3-7).

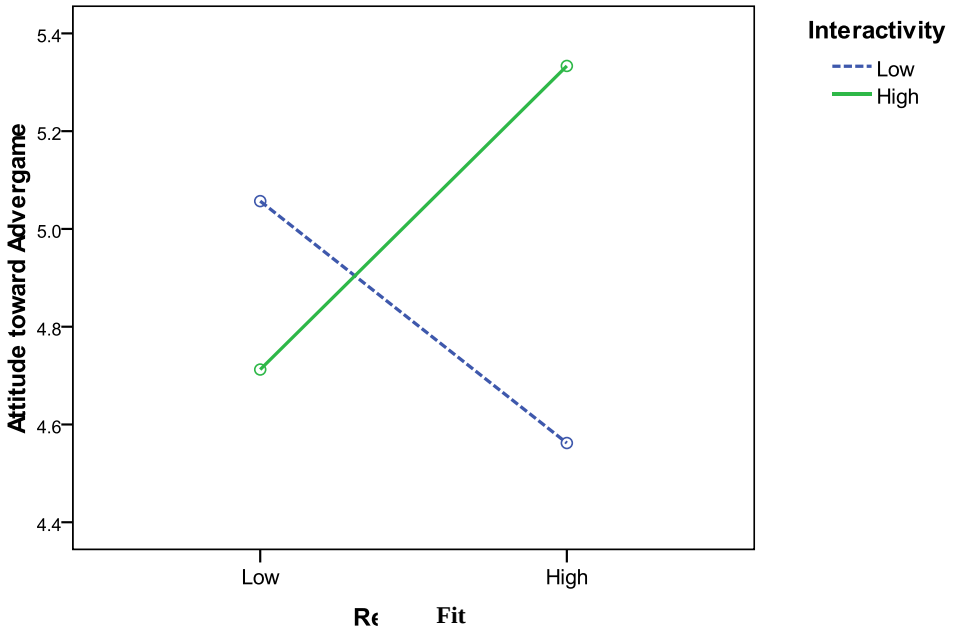



**Figure 3-7 Plot of the Interaction Effect (Fit * Interactivity)**

In support of H2, the interaction effect between fit and expectancy is significant ($F = 9.011$, $p < 0.01$). In the condition of high fit, attitude toward advergame is significantly higher ($F = 14.893$, $p < 0.05$) in the low expectancy condition ($N = 29$, Mean = 5.25, SD = 0.595) than in the high expectancy condition ($N = 30$, Mean = 4.66, SD = 1.081). In the condition of low fit, no significant main effect for interactivity is detected ($F = 0.166$, $p > 0.05$). Therefore, H2 is supported (see Figure 3-8).

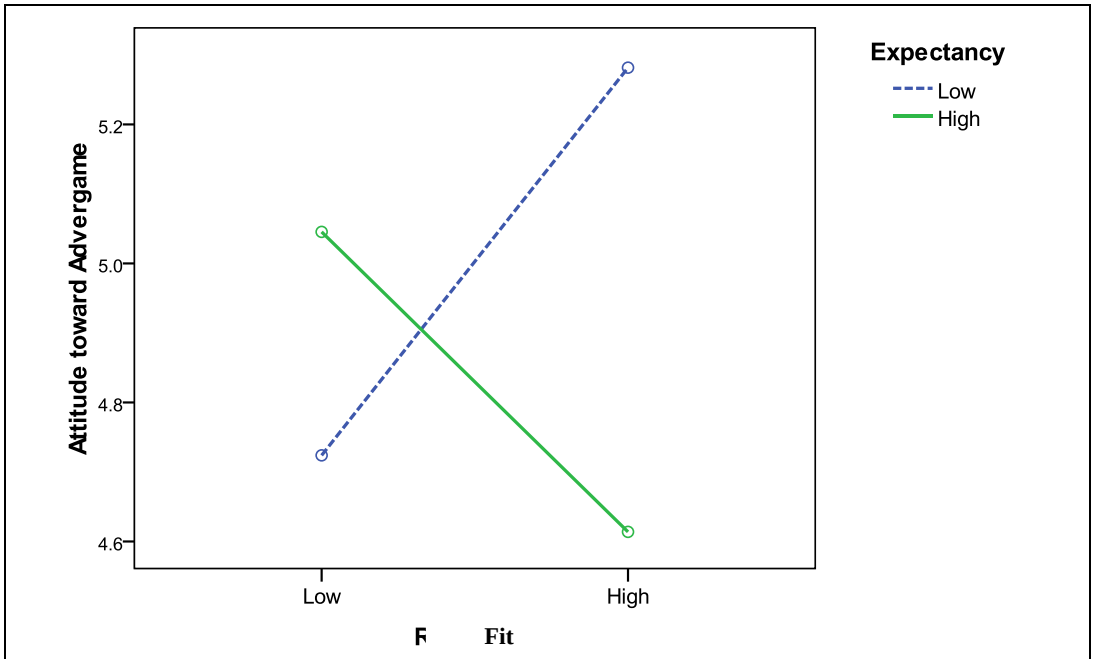



**Figure 3-8 Plot of the Interaction Effect (Fit * Expectancy)**

As for H3, the interaction effect between interactivity and expectancy is significant ($F = 4.172$, $p < 0.05$). However, contrary to our hypothesis, in the condition of high interactivity, no significant main effect for expectancy is detected ($F = 0.019$, $p > 0.05$). However, in the condition of low interactivity, attitude toward advergame is significantly higher ($F = 8.362$, $p < 0.05$) in the low expectancy condition ($N = 31$, Mean = 5.07, SD = 0.775) than in the high expectancy condition ($N = 30$, Mean = 4.57, SD = 1.058). Therefore, our H3 is not supported (see Figure 3-9).

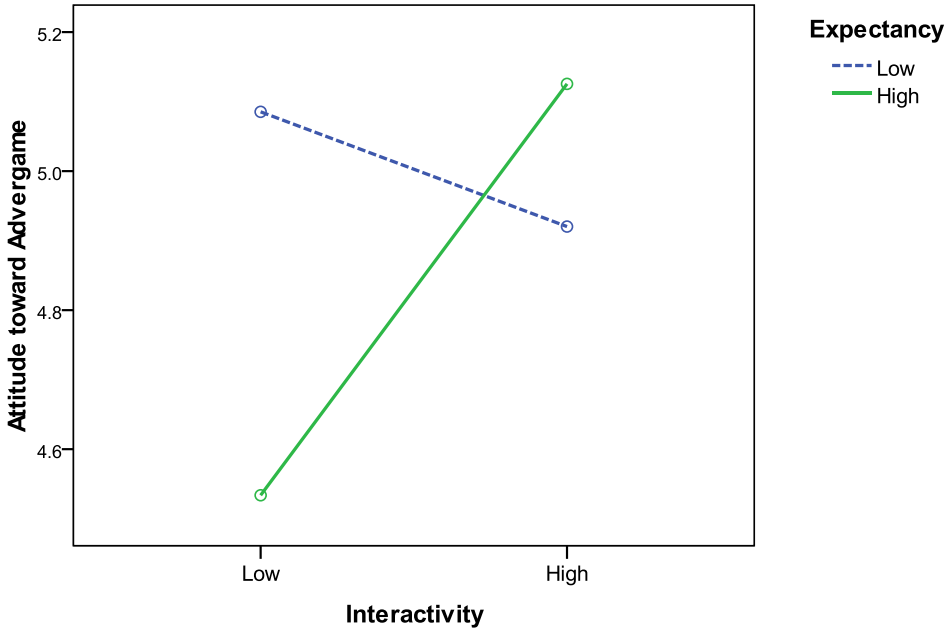



**Figure 3-9 Plot of the Interaction Effect (Interactivity * Expectancy)**

### 3.5.4 Results of ANCOVA on Attitude toward Brand

Table 3-11 presents the descriptive statistics of the experiment treatment results on attitude toward brand (after the advergame experiment). The results of an ANCOVA test on the dependent variable attitude toward brand showed that only the main effect of interactivity is significant (see Table 3-12). One of the covariates, attitude toward brand before the experiment is significant ($F = 15.217$, $p < 0.05$).

**Table 3-11 Descriptive Statistics of Attitude toward Brand**

| Mean (N, SD) | | Expectancy (High) | Expectancy (Low) |
|---|---|---|---|
| Interactivity (High) | Fit (High) | 4.98 (16, 0.72) | 5.30 (14, 0.69) |
| | Fit (Low) | 4.98 (16, 1.00) | 4.88 (14, 0.84) |
| Interactivity (Low) | Fit (High) | 4.69 (14, 0.90) | 4.50 (15, 0.88) |
| | Fit (Low) | 4.69 (16, 0.81) | 4.94 (16, 0.64) |

In support of H4, the main effect of interactivity is significant ($F = 5.652$, $p < 0.05$). However, the main effect for fit is not significant ($F = 0.612$, $p > 0.05$). Thus, H5 is not supported. As for H6, the main effect for expectancy is not significant ($F = 1.823$, $p > 0.05$). Thus, H6 is not supported.

**Table 3-12 Results of ANCOVA on Attitude toward Brand**

| Source | $R^2$ = 29.4% | B | SE# | df | Mean Sq. | F | Sig. |
|---|---|---|---|---|---|---|---|
| Covariates | Brand Familiarity | 0.058 | 0.065 | 1 | 0.435 | 0.810 | 0.370 |
| | Attitude toward Ads in General | 0.064 | 0.091 | 1 | 0.265 | 0.493 | 0.484 |
| | Attitude toward Brand (Bef Expt) | 0.399 | 0.102 | 1 | 8.175 | 15.217 | 0.001** |
| | Experience in Racing Games | -0.015 | 0.047 | 1 | 0.053 | 0.098 | 0.755 |
| | Male | 0.176 | 0.149 | 1 | 0.749 | 1.395 | 0.240 |
| | Age | -0.067 | 0.040 | 1 | 1.529 | 2.847 | 0.094 |
| Main Effect | Interactivity (Int) | 0.007 | 0.276 | 1 | 3.036 | 5.652 | 0.019* |
| | Fit (Fit) | -0.182 | 0.270 | 1 | 0.329 | 0.612 | 0.436 |
| | Expectancy (Exp) | -0.257 | 0.263 | 1 | 0.979 | 1.823 | 0.180 |
| Interaction Effect | Int * Fit | 0.739 | 0.389 | 1 | 0.889 | 1.656 | 0.201 |
| | Int * Exp | 0.299 | 0.382 | 1 | 0.053 | 0.098 | 0.755 |
| | Fit * Exp | 0.225 | 0.382 | 1 | 0.180 | 0.336 | 0.563 |
| | Int * Fit * Exp | -0.769 | 0.543 | 1 | 1.078 | 2.006 | 0.160 |

Notes: *p < 0.05, **p < 0.01 ; # SE: Standard error

### 3.5.5 Results of PLS Analysis on Overall Model

In addition to the ANCOVA analysis, we also used the partial least squares (PLS) analysis to evaluate the structural model proposed in Figure 3-2. We conducted bootstrap resampling on the structural model to examine path significance. Overall, as shown in Figure 3-10, the PLS analysis reveals very good model fit statistics for the models of attitude toward advergame ($R^2$ = 22.0%), attitude toward brand ($R^2$ = 39.7%) and purchase intention ($R^2$ = 36.5%).

Results of the PLS analysis on attitude toward advergame as shown in Table 3-13 essentially confirm the ANCOVA results of significant interaction effects between interactivity, fit and expectancy of advergame ($p < 0.01$). As such, the PLS analysis confirms the support of H1 and H2 but does not find support for H3. None of the other covariates included in the PLS model is significant.

| Table 3-13 Results of PLS on Attitude toward Advergame | | | | |
|---|---|---|---|---|
| Source | $R^2$ = 22.0% | Path Coefficient | t-Statistics | Hypothesis Testing |
| Main Effect | Interactivity (Int) | 0.120 | 1.270 | |
| | Fit (Fit) | 0.025 | 0.270 | |
| | Expectancy (Exp) | -0.081 | 0.930 | |
| Interaction Effect | Int * Fit | 0.305** | 4.274 | H1 supported |
| | Fit * Exp | -0.270** | 2.825 | H2 supported |
| | Int * Exp | 0.203* | 2.516 | H3 not supported |
| Covariates | Brand Familiarity | 0.006 | 0.055 | |
| | Attitude toward Ads in General | 0.014 | 0.134 | |
| | Attitude toward Brand (Bef Expt) | 0.070 | 0.572 | |
| | Experience in Racing Games | -0.027 | 0.252 | |
| | Male | -0.002 | 0.020 | |
| | Age | -0.013 | 0.151 | |

Notes: *p < 0.05, **p < 0.01. Two-tailed tests.

Results in Table 3-14 for attitude toward brand also reaffirm the ANCOVA results. Specifically, a significant positive relationship between the interactivity of advergame and attitude toward brand is uncovered ($p < 0.01$), but not for the fit and expectancy attributes of advergame. Thus, only H4 is supported but not for H5 and H6. In support of H7, we also find that attitude toward advergame has a significant positive effect on attitude toward brand ($p < 0.01$). One of the included covariates, attitude toward brand (before experiment) is statistically significant and has a path coefficient (0.373, $p < 0.01$) which is comparable to that of attitude toward advergame (0.360, $p < 0.01$). Lastly, results in Table 3-15 show that the causal effect from attitude toward brand to purchase intention is also significant ($p < 0.01$). Thus, H8 is supported.

| Table 3-14 Results of PLS on Attitude toward Brand | | | | |
|---|---|---|---|---|
| Source | $R^2$ = 39.7% | Path Coefficient | t-Statistics | Hypothesis Testing |
| Main Effect | Interactivity (Int) | 0.158** | 2.618 | H4 supported |
| | Fit (Fit) | 0.046 | 0.647 | H5 not supported |
| | Expectancy (Exp) | -0.082 | 1.283 | H6 not supported |
| | Attitude toward Advergame | 0.360** | 4.431 | H7 supported |
| Covariates | Brand Familiarity | 0.097 | 0.978 | |
| | Attitude toward Ads in General | 0.061 | 0.868 | |
| | Attitude toward Brand (Bef Expt) | 0.373** | 3.406 | |
| | Male | 0.101 | 1.332 | |
| | Age | -0.150 | 1.677 | |

Notes: *p < 0.05, **p < 0.01. Two-tailed tests.

| Table 3-15 Results of PLS on Purchase Intention | | | | |
|---|---|---|---|---|
| Source | $R^2$ = 36.5% | Path Coefficient | t-Statistics | Hypothesis Testing |
| Main Effect | Attitude toward Brand | 0.597** | 7.993 | H8 supported |
| Covariates | Male | -0.018 | 0.641 | |
| | Age | -0.109 | 1.254 | |

Notes: *p < 0.05, **p < 0.01. Two-tailed tests.

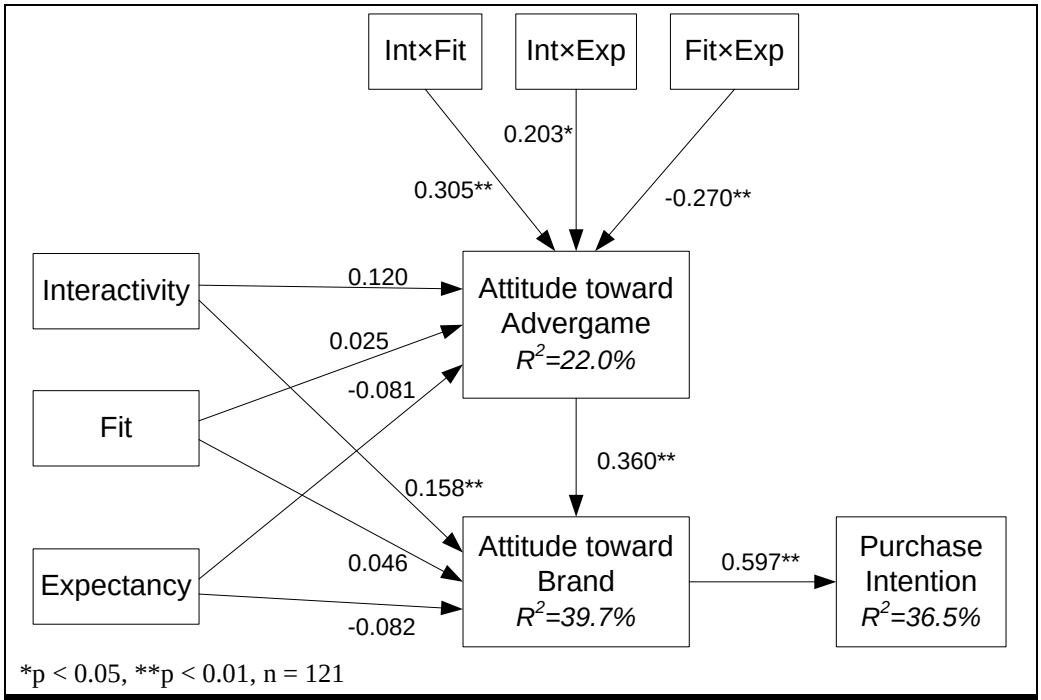



**Figure 3-10 Partial Least Squares (PLS) Analysis Results**

## 3.6 Discussion and Implications

### 3.6.1 Discussion

This study investigates the impacts of three advergame design factors, in terms of interactivity, fit and expectancy, on advertising effectiveness outcomes of attitudes toward advergame and brand. Overall, we find that all the two-way interactions between these three factors on attitude toward advergame are significant. Our findings also suggest that interactivity has a significant positive main effect on attitude toward brand. Interestingly, we find that attitude toward advergame is positively related to attitude toward brand, which in turn influences consumers' purchase intention. Table 3-16 summarizes the results of the research hypotheses testing.

| Table 3-16 Hypotheses Testing Results (Study Two) | |
|---|---|
| Hypotheses | Supported? |
| **H1:** Interaction effect of interactivity & fit on attitude toward advergame | Yes |
| **H2:** Interaction effect of fit & expectancy on attitude toward advergame | Yes |
| **H3:** Interaction effect of interactivity & expectancy on attitude toward advergame | No, but significant. |
| **H4:** Positive effect of interactivity on attitude toward brand | Yes |
| **H5:** Positive effect of fit on attitude toward brand | No |
| **H6:** Negative effect of expectancy on attitude toward brand | No |
| **H7:** Positive effect of attitude toward advergame on attitude toward brand | Yes |
| **H8:** Positive effect of attitude toward brand on purchase intention | Yes |

First, the impact of interactivity in an advergame is contingent on the level of fit. In the high fit condition, high (low) interactivity leads to a more (less) favorable attitude toward advergame. In contrast, in the low fit condition, interactivity seems immaterial in changing the attitude toward advergame. Our findings are consistent with past literature that showed fit is an important premise in forming a favorable ad evaluation (Lee et al. 1999). Similar to previous studies (Jiang et al. 2007; Suh et al. 2005), our results affirm that an increase in interactivity can also lead consumers to be more engaged in a task (i.e., the game play in our advergame context) and consequently form a more favorable attitude toward the advergame.

Second, the impact of expectancy of an advergame is contingent on the level of fit. In the high fit condition, low (high) expectancy leads to a more (less) favorable attitude toward advergame. However, in the low fit condition, consumers' expectancy of the advergame does not influence the attitude toward advergame. This result confirms the finding from prior research that unanticipated information from ad exposures aid in consumers' attitude formation only when it is relevant to

the main advertising messages (i.e., the advertising message is perceived to be coherent or intelligible in the ad) (Lee et al. 1999).

Third, the interaction effect between interactivity and expectancy in an advergame is significant. Contrary to our hypothesis, in the low interactivity condition, rather than the high interactivity condition, low (high) expectancy draws a more (less) favorable attitude toward advergame. However, in the high interactivity condition, low expectancy does not arouse a significantly better attitude toward advergame compared to high expectancy condition. Post-hoc interviews were conducted with several subjects to generate some insights for this result. The outcome of these interviews suggests that in the high interactivity condition, subjects were highly immersed in the game play such that a majority of their attention was focused on the interactive aspects of the advergame. Thus, a negligible amount of the subjects' cognitive evaluation was dedicated to the expectancy feature (Grigorovici et al. 2004; Lee et al. 2007). However, in the low interactivity condition, subjects did not need to constantly interact with the brand components in the advergame (i.e., maneuvering the race vehicle to strike the advertised product in order to get a speed boost). Thus, subjects were able to afford a higher level of cognitive and affective evaluations on the low expectancy element (i.e., novel and creative game design) of the advergame, leading to a better attitude toward advergame.

Fourth, interactivity in an advergame has a significant impact on consumers' attitude toward brand. As put forward by the engagement theory, when individuals are involved in a highly interactive task, they are more likely to be engaged in the task (Kearsley et al. 1998). Our finding is consistent with the transportation theory which posits that if the engaging experience generates a positive attitude toward the advergame, this favorable attitude can then be transferred to the advertised brand (Green et al. 2004).

Fifth, fit of ad message in an advergame shows no significant effect on attitude toward brand. A possible explanation is that, in the high fit condition, even though consumers can easily relate to the connection between the game context and the

advertised brand, they may still be skeptical of the credibility of the ad messages in relation to the gameplay in the advergame (Scott 1994). Besides, we measured the attitude toward brand immediately after subjects had completed their experiment. With the skepticism about the advertised brand fresh in mind, it is hard for the subjects to form a favorable attitude toward the advertised brand.

Sixth, the effect of expectancy of an advergame on attitude toward brand is not significant. Attitude toward brand is regarded as a long-term memory of consumers (Mitchell 1986). The attitude toward brand in consumers' long term memory is typically affected after an exposure to a marketing communication. In addition, only limited information in consumers' short term memory (i.e., attitude toward advergame) can be transferred to a long term memory (i.e., attitude toward brand) (Anderson 1996). Thus, the positive effect of low expectancy on the attitude toward brand may only be observable or measured after a prolonged period.

Lastly, although two of the main effects on attitude toward brand are not significant, our results show that attitude toward advergame has a positive effect on attitude toward brand. This finding indicates that the positive relationship between attitude toward ads and attitude toward brand in the previous research is valid in the advergame context as well (Homer 1990; MacKenzie et al. 1986). Further, our results show that the attitude toward brand has a positive influence on consumers' purchase intention. This evidence affirms the value proposition and effectiveness of advergames in increasing consumer purchase intentions of the advertised brand.

### 3.6.2 Implications for Theory

This study examines the effects of three important design factors for the advergame: interactivity, fit, and expectancy. Based on the engagement theory and transportation theory, we explain the underlying mechanisms of how these three factors influence the advertising effectiveness of advergames. We propose that with proper design combinations of these three factors, increased levels of advertising effectiveness can be achieved.

This study identifies interactivity as the unique characteristic of advergames compared to conventional advertisements. In the advergame context, we conceptualize interactivity as the extent to which consumers can interact with brand components and get feedback of advertising messages accordingly. Through interaction with brand components in the advergame, the role of consumers' getting advertising messages has been changed from a passive viewer to an active player. Our findings extend the theoretical boundary in the HCI literature (Jiang et al. 2007; Jiang et al. 2010) by incorporating interactivity into the advergame marketing context. Studying the effects of interactivity in the advergame context is important because consumers' interaction with brand components is a dominant feature of advergames.

In addition, we also extend the concept of task-technology fit in the IS literature (Goodhue et al. 1995; Liu et al. 2012; Vessey et al. 1991) to the context of advergame marketing from the brand marketers' perspective. Beyond the cognitive fit and task-technology fit theories which only focus on the mental representation or imagery of tasks involved, our application of the transportation theory in this paper highlights the pivotal roles of emotion and attention afforded by an IT artifact. Importantly, we clarify how the fit of an advergame in terms of its game elements or components with the theme or image of the advertised brand can alter the affective responses, attention and mental imagery created by the advergame, and how these can affect the extent of a consumer's transportation experience. Examining the effects of fit of an advergame is instrumental since this

design factor is crucial in determining the plausibility of the brand engagement and the persuasive capability of the advertising message embodied in the advergame.

This study also incorporates another crucial factor in the advertising literature, i.e., expectancy in advergames (Heckler et al. 1992). We extend previous research in the advertising literature and demonstrate the combined effects of expectancy together with interactivity and fit of advergames on consumers' attitudes toward the advergame and the brand. By bringing together the engagement theory and transportation theory, Study Two sheds light on the underlying mechanism of how interactivity, fit and expectancy of advergames can influence the components of emotion, mental imagery and attention in a transportation experience. This study provides theoretical underpinnings to understand the interaction effects amongst the three design factors of advergames. This is an important contribution to the extant literature of both HCI and advertising (Jiang et al. 2007; Jiang et al. 2010; Lee et al. 1999).

Based on the dual mediation hypothesis (Homer 1990), the causal effect from attitude toward advergame to attitude toward brand is validated in the advergame context. In accordance with the transportation theory, the positive attitude toward advergame is transferred to the advertised brand. This study goes one step further by investigating whether the beneficial effects of the advergame influence consumers' purchase intention. The result confirms our hypothesis and contributes more evidence for the dual mediation hypothesis. In sum, this study uncovers the underlying mechanisms of how the proposed design factors of interactivity, fit and expectancy influence the advertising effectiveness of the advergame in terms of consumer attitudes and purchase intention.

### 3.6.3 Implications for Practice

We provide practical implications for advertisers and game developers to improve the design of advergames in order to promote their brand or product in an effective manner. With proper design combinations of the three proposed factors of advergames (e.g., high fit with high interactivity, high fit with low expectancy, or low interactivity with low expectancy), advertisers can optimally design an advergame which best fits their advertised brand or product according to the objectives of an advertising campaign.

First, our results show that the design combination of *high fit* coupled with *high interactivity* of an advergame can enhance the attitude toward advergame, relative to a low interactivity baseline. This implies that advergame designers and advertisers should strive to achieve a good fit between the image or theme of the advertised brand and the advergame's game elements. A particular manner of achieving such high fit is to identify carefully the target segment of consumers which are likely to have a strong affinity to the brand or product category, and then select appropriate advertising messages that appeal to the target segment and have a strong fit to the gaming context. In addition, advergame designers should also put in place message strategies, in relation to the game play, that clearly identify the consumer benefits of a brand and that can capture and hold the target market's attention. In terms of the level of interactivity in an advergame, marketers and advergame designers can customize appropriate genres of games in relation to the brand advertised or the ad message communicated. For example, action arcade-style games with high interactivity requirements of players to control a central game character using quick reflexes, accuracy, and timing to overcome obstacles in various platforms (e.g., Donkey Kong and Super Mario) can be appropriate for brands with well-known mascots such as the Michelin tire man.

Second, our findings reveal that the design combination of *high fit* coupled with *low expectancy* of an advergame can increase the attitude toward advergame,

relative to a high expectancy condition. This result implies that besides aiming for high fit in advergame elements, advergame designers should also strive to achieve consumer delight and gratification in novel game play elements, i.e., low expectancy. This can be accomplished by: 1) designing unique, creative or even wacky game elements (e.g., refreshing game plots, character designs, game plays, interaction modes, etc.), 2) combining different game genres into a single game such that the best and most unique aspects of the genres are fused into a unconventional game play in the advergame, and 3) optimizing the creative concept in the advergame to capitalize on an alternative avant-garde idea that can bring the ad message strategy to life and resonance in the consumers' minds.

Third, our results demonstrate that, contrary to our hypothesis, the design combination of *low interactivity* coupled with *low expectancy* of an advergame can increase the attitude toward advergame, relative to a high expectancy condition. This result points to the value proposition of casual games (i.e., those with simple rules, easy play techniques and a low degree of strategy needs) designed with a low to moderate amount of user interactions with the game or brand components. Such casual games that also incorporate novel creative game elements not within players' familiar expectations would suffice to enhance consumers' attitudes toward advergames. In particular, this genre of low interactivity casual games is already riding high on the popularity of mobile phones and games developed for mobile platforms such as the iPhone and iPhone apps based on the iOS of Apple Inc.. As such, marketers and advergame designers can capitalize on the popularity of mobile casual games to engage and enthuse customers with advergames that include unique game play elements. A good example of such an approach is *Rovio*'s development of the Angry Birds Season game with a unique Mid-Autumn Moon Cake Festival theme for the Chinese market, coupled with an ad campaign of Angry Birds Moon Cake pastries (Takahashi 2011).

Fourth, we find that *high interactivity* of the advergame can achieve a positive attitude toward the advertised brand. As such, instead of locating the brand

components such as logos, trademarks or mascots in the background of the game, advergame designers can embed brand components explicitly into the forefront of interactive game components so that consumers can interact frequently with the brand components in an intuitive manner during game play. These brand components should also be designed in a manner that can help players to achieve winning advantages in the game, in order to highlight the brand usage or consumption benefits. Consumers would have more intrinsic motivation to interact with the brand components, and thus enhancing brand attitudes as a result.

Fifth, our study documents an important finding that there is both a positive effect of attitude toward advergame on attitude toward brand, and that of attitude toward brand on consumer's purchase intention. These results suggest that consumers may have a good likelihood of purchasing the advertised product or brand after playing advergames. Advertisers and advergame designers can thus incorporate appropriate call-to-action elements in the advergame in order to convert the game player to a brand customer. For example, at the conclusion of game play, consumers can be shown a prominent featured link to the e-commerce website of the advertised brand, or a toll-free phone number for orders-taking on the mobile phone. Such time-critical exposures to stimuli for consumer calls-to-actions can drive consumers with high purchase intention or probability to complete a purchase transaction on a website or a mobile phone.

## 3.7 Limitations and Future Research

There are limitations to this study and we propose avenues for future studies. First, for the brands we used in our experiment, they are real commercial brands and are familiar to most of the experiment subjects. The attitude toward the brand may thus be influenced by the prior knowledge of the brand. In our data analysis however, we controlled both the attitude toward the brand before the experiment and brand familiarity as covariates. Nevertheless, we can use hypothetical

unknown brands in future studies. By using hypothetical unknown brands, consumers' attitude toward a brand and brand familiarity are equalized and controlled for prior to the start of the experiment.

Second, the fit of the advergame in our experiment was manipulated across the high and low fit conditions by using the Red Bull energy drink and Marigold milk respectively. Consequently, any differences in the attitude toward brand detected across the high and low fit conditions may have been due to the different choice of brands (i.e., Red Bull or Marigold) or beverage types (i.e., energy drink or milk), rather than the difference in fit of the advergame in our experiment. Nevertheless, it is instructive to note that the choice of the energy drink (and thus the Red Bull brand) to correspond to the high fit condition is crucial since it has direct relevance in a car racing game (e.g., due to the Red Bull drink providing energy or speed boosts in sporting activities). Similarly, the choice of the milk drink (and thus the Marigold brand) is appropriate in the low fit condition since milk as a beverage is generally not known as an energy-providing drink and milk brands are very seldom seen as sponsoring brands in sporting events compared to other beverage or drink brands such as Gatorade, Coke, Minute Maid, etc. To the extent that the fit of the advergame reported in this study does not have an impact on attitude toward brand, this possible confounding of the advergame fit factor with the brand or beverage type used in the experiment may be less of a concern here in our reported results.

Third, to keep the manipulation on expectancy robust, we manipulated the low expectancy condition in terms of driving a crab-like creature in the advergame. However, in relating the low expectancy treatment condition to the actual Red Bull energy drink brand, a bull riding game may be a more ideal advergame gaming context since the bull is used as a part of the Red Bull brand logo and trademark. A bull riding game may render the game context more relevant to the brand image of Red Bull. However, we did not use a bull riding game scenario in the experiment because the graphical depiction of two bulls in the Red Bull brand logo may confound the effect of the fit treatment in our experiment.

Fourth, a car racing game requires much of the consumer's attention toward the game itself and less attention may be paid to the advertising messages communicated in the advergame. Consequently, consumers may not have enough time or cognitive resources to evaluate the advertising messages. Thus, a more leisurely casual game with more focus on entertainment and less demand for cognitive resources can be customized into an advergame for further investigations.

## 3.8 Conclusion

In conclusion, this study examines the roles of interactivity, fit, and expectancy on the advertising effectiveness of advergames. Based on the engagement theory and the transportation theory, this study focuses on three design factors of advergames and develops a comprehensive and integrated model for the advergame environment. The findings suggest that the interactivity element is an important factor which can trigger the transportation experience and shows positive effects on both attitude toward advergame and attitude toward brand. In addition, the robust interaction effects of the three factors are validated as proposed by our hypotheses, i.e., high interactivity and low expectancy both lead to a higher attitude toward advergame under a high level of fit. One interesting finding that is opposite to our hypothesis is that low expectancy leads to a more favorable attitude toward advergame under a low level of interactivity. We also confirm the causal effects from attitude toward advergame to attitude toward brand. The positive influence of attitude toward brand on purchase intention is also validated for an advergame environment. In sum, our study provides important insights on the kind of digital advertising that consumers want to participate in or be engaged by, rather than those they find intrusive or loathsome.

# Chapter 4 Conclusion

Motivated by the importance of investigation on digital marketing, this thesis aims to address the following general research questions:

*What are the features which affect the effectiveness of mobile marketing and advergame marketing?*

*What are the impacts of these features on customer response to mobile marketing and advergame marketing?*

Study One explores the impacts of distances on customer response to mobile marketing. Study Two focuses on the influences of design elements on customers' attitudes toward the advergame and the advertised brand in the advergame.

Study One identifies the three distances deemed important factors in mobile marketing. Based on the construal level theory, we hypothesized the impacts of distances on customer response to mobile promotions. Particularly, we focused on the investigation of the interactions between the distances. The findings reveal important and interesting interaction effects and suggest insightful explanation on customer behavior in the mobile marketing context.

Study Two examines the roles of three design elements for advergames, interactivity, fit, and expectancy. It investigates how these design elements affect customers' attitude toward the advergame and the advertised brand. Based on the engagement theory and the transportation theory, we developed a comprehensive and integrated model for the advergame environment. The findings demonstrate the interesting interplay among the three design elements. When the advergame is of high interactivity, low expectancy may not necessarily bring about a more positive attitude toward the advergame.

The two studies in this thesis are believed to contribute to both the academia and the practitioner arenas. Particularly, Study One reveals the dominant role of

spatial distance in mobile marketing. We provided theoretical guidance for researchers by empirically demonstrating how customers respond to the mobile promotion when their psychological distances change spatially, socially, and temporally. Our in-depth investigation of the interplays between these distances provides a clear understanding of the detailed mechanism of how multiple distances interact with each other to influence customer response to mobile marketing. With the rigorous designed field experiment, our identified causal estimates of the impacts of distances are more generalizable. Practically, Study One provides guidance on how to leverage the distance factors to build optimal mobile promotions. For example, based on customers' real-time spatial distance, marketers can customize the mobile promotion in terms of the social distance and temporal distance. Overall, our research suggests the importance of designing the mobile promotions with a fit between the distance levels.

As another emerging digital marketing channel, advergame marketing is increasingly gaining popularity in stimulating customer engagement. Study Two identifies interactivity as the unique characteristic of advergames and extends the concept of task-technology fit to the advergame context. In addition, expectancy was incorporated as another crucial factor for advergame marketing. Based on the engagement theory and transportation theory, Study Two presents a comprehensive model which explains the underlying mechanism of how interactivity, fit and expectancy of advergames can affect customers' attitudes toward the advergame and the advertised brand and subsequently influence their purchase intention. Further, our study also provides theoretical underpinnings to understand the interaction effects amongst the three design factors. Practically, this study offers important insights into how to smartly design the advergame to achieve a better marketing performance. Marketers are suggested to identify the brand or product category and select the gaming context which best fits. Further, based on the interactivity level of the game, marketers are advised to optimize the expectancy level by customizing the game plots or game characters.

This thesis also presents the potential avenues for future research. When measuring the social distance, Study One uses the number of mutual friends to compute it. In future study, the homophily of two individuals can be used for computing social distance. For example, the same interests, the same graduate school, or the same Facebook fan pages liked. Another potential direction for future research is to study the viral effects of social distance. Researchers can study the impacts of social distance on customers sharing behaviors. The research questions can focus on whether customers share the mobile promotions they receive, and to whom the promotions are shared.

More importantly, as the gamification perspective of mobile marketing is booming, the line between mobile marketing and advergame marketing is blurring. Marketers are building their marketing campaigns as social games but in the mobile context. Future research can study how the distance factors influence customers' engagement, and subsequently affect their responses to the promotion. Going into greater detail, researchers can investigate how customers share mobile promotions with their friends and invite them to play the social game together, as well as the impact of customers' social game engagement on their responses to promotions. An in-depth investigation on the relationship between customers' activities during a promotion and their responses to the promotion are deemed of great interest.

With the growing appeal of augmented reality, marketers are eagerly incorporating this new technology into their marketing campaigns. For example, the mobile marketing campaign created by Mini Coupe asked customers to use the Mini Coupe mobile app to capture a simulated Mini Car using augmented reality (Mini Coupe 2012). The simulated car was a hypothetical projection which could be only viewed from a mobile phone. This promotion actually created an opportunity for future researchers to study the hypothetical dimension from the construal level theory in the digital marketing context (Trope et al. 2010). Researchers can find out whether the level of hypotheticality influences customer response to promotions. For example, when marketers are building an augmented

environment in their marketing campaign, whether the simulated object is a simulation of a real car or an illusionary dragon can potentially influence customers' perceptions and lead to different promotion responses.

Overall, there is a wide scope for future research in the exploration of digital marketing environment, thus contributing to a better understanding of how customers behave in different marketing scenarios.

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# Appendix

For the hazard model specification, the choice of Weibull distribution for the parametric form is based on the extensive comparison with Exponential, and Gompertz models using proportional hazards formulations. Table A-1 presents the results of these models specifications with the frailty assuming gamma distribution. Estimation results with the frailty assuming inverse-Gaussian distribution are shown in Table A-2.

From the AIC, AICc, and BIC from Table A-1, we see that the model with exponential survival distribution has the best model fit when we assume the frailty to follow a gamma distribution. On the other hand, in Table A-2, the model with Weibull survival distribution has the best model fit if we assume the frailty to be a inverse-Gaussian distribution. However, the exponential survival distribution is the special case of the Weibull survival distribution when the hazard rate is constant. Therefore, we choose the Weibull survival distribution for the hazard model specification.

**Table A-1 Hazard Model Results with Frailty using Gamma distribution**

| VARIABLES | (1) Exponential | (2) Weibull | (3) Gompertz |
|---|---|---|---|
| Spatial Distance | -1.294*** | -1.227*** | -1.272*** |
| | (0.430) | (0.415) | (0.432) |
| Social Distance | -9.313*** | -8.875*** | -9.198*** |
| | (1.892) | (1.857) | (1.890) |
| Temporal Distance | 0.020 | 0.019 | 0.021 |
| | (0.035) | (0.034) | (0.035) |
| Spatial * Social | 2.355*** | 2.131*** | 2.309*** |
| | (0.598) | (0.596) | (0.601) |
| Spatial * Temporal | 0.011 | 0.009 | 0.011 |
| | (0.014) | (0.014) | (0.014) |
| Social * Temporal | 0.064 | 0.054 | 0.062 |
| | (0.044) | (0.043) | (0.044) |
| Spatial*Social*Temporal | -0.024 | -0.019 | -0.023 |
| | (0.018) | (0.017) | (0.018) |
| Num Offer View | 0.269*** | 0.224** | 0.262** |
| | (0.103) | (0.095) | (0.103) |
| Num Friends use app | -0.023 | -0.005 | -0.018 |
| | (0.045) | (0.044) | (0.045) |
| Fan Status | 2.110* | 1.974* | 2.169* |
| | (1.177) | (1.117) | (1.175) |
| Num Facebook Friends | -0.002 | -0.001 | -0.002 |
| | (0.002) | (0.002) | (0.002) |
| Num Fan Pages Joined | -0.003** | -0.002** | -0.003** |
| | (0.001) | (0.001) | (0.001) |
| Female | -0.400 | -0.431 | -0.408 |
| | (1.143) | (1.105) | (1.145) |
| Round2 | -0.645 | -0.600 | -0.439 |
| | (0.854) | (0.855) | (0.858) |
| Round3 | -1.415* | -0.894 | -0.965 |
| | (0.780) | (0.782) | (0.784) |
| Tuesday | 0.342 | 0.400 | 0.306 |
| | (1.639) | (1.592) | (1.641) |
| Thursday | -0.571 | -0.284 | -0.654 |
| | (1.167) | (1.144) | (1.167) |
| Friday | -2.487* | -2.154* | -2.567* |
| | (1.331) | (1.308) | (1.334) |
| Saturday | 0.349 | 0.580 | 0.244 |
| | (1.316) | (1.301) | (1.319) |
| Sunday | 1.033 | 1.083 | 1.012 |
| | (1.515) | (1.465) | (1.517) |
| Constant | 9.059*** | 8.262*** | 8.756*** |
| | (1.895) | (1.853) | (1.897) |
| ln($\theta$) | 1.934*** | 1.847*** | 1.928*** |
| | (0.172) | (0.180) | (0.173) |
| ln($p$) | | -0.077** | |
| | | (0.037) | |
| gamma | | | -0.002 |
| | | | (0.002) |
| Observations | 147 | 147 | 147 |
| Number of customers | 78 | 78 | 78 |
| Log likelihood | -25.13 | -24.64 | -25.08 |
| AIC | 94.25 | 95.28 | 96.16 |
| AICc | 102.411 | 104.256 | 105.136 |
| BIC | 160.0 | 164.1 | 164.9 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table A-2 Hazard Model Results with Frailty using Inverse-Gaussian distribution**

| VARIABLES | (1) Exponential | (2) Weibull | (3) Gompertz |
|---|---|---|---|
| Spatial Distance | -2.154*** | -1.887*** | -2.167*** |
| | (0.457) | (0.409) | (0.457) |
| Social Distance | -12.198*** | -9.743*** | -12.173*** |
| | (1.829) | (1.687) | (1.825) |
| Temporal Distance | -0.115*** | -0.081*** | -0.114*** |
| | (0.034) | (0.030) | (0.034) |
| Spatial * Social | 2.321*** | 1.865*** | 2.331*** |
| | (0.528) | (0.510) | (0.528) |
| Spatial * Temporal | 0.041*** | 0.034*** | 0.041*** |
| | (0.013) | (0.012) | (0.013) |
| Social * Temporal | 0.139*** | 0.085** | 0.139*** |
| | (0.041) | (0.038) | (0.041) |
| Spatial*Social*Temporal | -0.027* | -0.019 | -0.028* |
| | (0.015) | (0.014) | (0.015) |
| Num Offer View | 0.354*** | 0.247*** | 0.353*** |
| | (0.098) | (0.094) | (0.099) |
| Num Friends use app | 0.040 | 0.063 | 0.041 |
| | (0.048) | (0.040) | (0.048) |
| Fan Status | 0.923 | 1.350** | 0.943 |
| | (0.593) | (0.610) | (0.594) |
| Num Facebook Friends | -0.000 | -0.001 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| Num Fan Pages Joined | -0.000 | 0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| Female | -2.134*** | -1.876** | -2.134*** |
| | (0.741) | (0.734) | (0.742) |
| Round2 | -0.256 | 0.026 | -0.210 |
| | (0.747) | (0.782) | (0.750) |
| Round3 | -1.376* | 0.497 | -1.247* |
| | (0.703) | (0.716) | (0.716) |
| Tuesday | 0.958 | -1.095 | 0.972 |
| | (1.552) | (1.569) | (1.556) |
| Thursday | 3.512*** | 2.427*** | 3.471*** |
| | (0.967) | (0.928) | (0.967) |
| Friday | 1.158 | 0.631 | 1.125 |
| | (1.083) | (1.061) | (1.084) |
| Saturday | 0.936 | 0.310 | 0.894 |
| | (0.961) | (0.986) | (0.962) |
| Sunday | 1.624 | 1.034 | 1.592 |
| | (1.252) | (1.182) | (1.251) |
| Constant | 11.898** | 9.873*** | 11.838** |
| | (5.438) | (3.139) | (5.350) |
| ln(theta) | 7.624 | 6.194** | 7.587 |
| | (5.178) | (2.733) | (5.086) |
| ln(p) | | -0.330*** | |
| | | (0.049) | |
| gamma | | | -0.001 |
| | | | (0.002) |
| Observations | 147 | 147 | 147 |
| Number of customers | 78 | 78 | 78 |
| Log likelihood | -48.89 | -35.77 | -48.88 |
| AIC | 141.8 | 117.5 | 143.8 |
| AICc | 149.961 | 126.476 | 152.776 |
| BIC | 207.6 | 186.3 | 212.5 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1