

EFFECTS OF SMARTPHONE POP- UP ADS ON
ATTITUDE AND RECALL IN CONSUMERS CHOICE:
APPLIED STRUCTURAL EQUATION MODELS

By

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Abstract:

Smartphone advertisement plays an important role in the modern world. The study investigated the relationships among different key factors in terms of individuals' attitudes toward pop-up ads, in different conditions. Structural equation models are conducted to further study the causation relationships regarding individuals' interests, material recall, types of the pop-up advertisements and different brands.

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CHAPTER I

INTRODUCTION

Since the first commercial mobile phone was launched in the 1970s, mobile technology has created game-changing disruptions in the telecommunication industry (Goodwin, 2007). Evolution in mobile technology occurs at an extremely fast pace; with each generation, there is not only an increase in the speed of communication services, but also introduces new features. After 2G technology came into the market, consumers were able to use various new features such as packet-switched data services or cameras in their mobile phones.

When the first smartphone was introduced in the United States, the device did not attract much attention from consumers in the beginning. However, as mobile devices and their operating systems have advanced, smartphones technology has increased faster than any other technology in the telecommunication industry. According to a survey from Pew Internet, smartphones have outnumbered feature phones since 2012 (Wagstaff, 2012). The introduction of smartphones has played an important role in changing consumer experience in retail telecom services.

Smartphones not only provide original telephone features, but also various functions that can be used with other devices, such as televisions or computers. With the expansion of wireless network bandwidth, other features like online video services and social media apps have also become available. These new functions make smartphones different from regular feature phones. Smartphone and feature phone owners show significant differences in the mobile phone service they use. The similarities between smartphone and feature phone owners consist of their use of voice call and text message services. Smartphone owners can surf the Internet and watch TV using these devices, and feature phones don't support this very well.

The coverage of retail telecom services with smartphones may affect mobile phone services, as well as other telecom services such as broadband, computer, and cable TV. The key mobile phone features available in smartphones are associated with data usage. According to a report from Morgan Stanley Research, the critical factors that drive the growth of mobile internet traffic are web surfing and video viewership (Meeker et al., 2009). This suggests that there is likely to be an impact of smartphone use on broadband, computer, and cable TV services. In addition, newspaper, radio, and other devices are also impacted by the emerged of smartphone. For instance, since online services are available on smartphone, the need of print newspaper has decreased. Now readers can easily find the latest information from their cellphone

instead of waiting for a daily newspaper. Furthermore, cameras, recorders, calculators, navigation equipment, and other devices have been replaced by smartphones (Storey, 2016).

Given the fact that smartphones are convenient to use and provide multiple functions at once, almost everyone today owns at least one smartphone and the majority have their phone on hand at all times. The smartphone has become the main information receiver for individuals (Lee & Andrew, 2017). People are exposed to a lot of rapid information via their smartphone (such as news, social media, and advertisements), whether it is intentional or not. This situation suggests an interesting issue: what information do individuals want to know? What type of information is able to change individuals' attitude toward a particular product? These questions are extremely important in the social sciences and, particularly, in advertisement.

Advertisement is one of the major ways for companies to promote the advantages of their product (including services) to consumers, and thereby increases the consumers' tendency to make purchases. Different types of advertisement have been used, such as flyers, brochures, post mail, email, and TV and radio commercials around the world. All of these advertisements have a significant impacts on consumers (Nidhi et al., 2008). In the past, advertisements have shown tremendous influence on consumers from children and teenagers, to adults and elders (Nidhi et al.,

2008; Mahajan & Singh, 1997; Jason et al., 2003). Jason et al. (2003) suggested that TV commercials significantly influence children's eating behaviors. Furthermore, in Wanda and Bradley's (1989) study, girls expressed more desire than boys for TV-advertised foods and had more positive attitudes toward television commercials. More importantly, it should be noted that as long as commercials include adequate information, consumers will increase their purchase behaviors toward particular products (Herbert, 1965).

As the role smartphones play in the modern world becomes more important, the focus of smartphone advertising has grown. In the marketing world, different advertisements fit different devices and scenarios. For example, in television, commercials are broadly used; in newspaper, coupons and flyers are quite effective; and, in smartphones, one of the most popular methods of advertisement is the pop-up (Thumbvista, 2016). Pop-ups are generally new web browser windows that display advertisements. This type of advertisement happens when users try to open a website they are interested in. On a computer, users can easily deal with pop-ups by simply closing the new browsers. However, in smartphones, as soon as individuals click the link, the pop-up advertisement will automatically open and block the original website, and most of the time they are hard to close.

How do the smartphone pop-up advertisements influence individuals' attitude

toward particular products or services? What are the most effective ways for pop-up advertisements to express their purpose without annoying smartphone users? To address the issues related to smartphone pop-up advertisements, I am conducting research that uses multiple experimental designs as the basis for a preliminary analysis, including multiple multivariate analyses and two structural equation models (SEM). Structural Equation Modeling is a popular method for finding causal relationships between different latent variables (Bagozzi, 2012), which is suitable for this study since I am exploring individuals' attitudes.

This study is divided into two parts and the data is collected by an online survey. In section one, the main purpose is to study individuals' attitude toward different pop-ups and their related products and services. For this analysis, multivariate analysis is used to compare different groups in terms of demographic information, types of pop-up advertisements, and the latent factors, such as attitude toward advertisements and the related products. An SEM model is also established to further examine causal relationships between different latent variables. In section two, the mechanism of the pop-up ads is studied. With the same content but different formats and compositions, what is the most effective pop-up to influence individuals regarding their memorization and attitude toward the related product? For this analysis, multivariate analysis is used to compare different groups in terms of demographic information,

different mechanisms of pop-up advertisements, and the latent factors, such as attitude toward pop-ups and the related products. An overall structural equation model is built, including variables from study 1 and study 2.

The rest of this research overview is organized as follows: Chapter 2 reviews previous research on substitution effects and complementarities that arise in the area of mobile technology and pop-up advertisements. It also provides theoretical perspectives from the literature to identify the impact of smartphone advertisement on modern market world. Chapter 3 describes research design, data collection, and analysis. Information on the context and data are described in chapter 4, which includes the results. Then, chapter 5 presents the overall discussion, the overview of the importance of this current study, preliminary findings, future research plans, and limitations.

CHAPTER II

REVIEW OF LITERATURE

The world's first mobile phone was made on April 3, 1973, by John F. Mitchell and Martin Cooper, senior engineers at Motorola. The prototype mobile phone weighed 1.1kg and measured in at 228.6x127x44.4 mm. This device provided 30 minutes of talk-time and it took around 10 hours to charge. The original purpose of a mobile phone was to communicate to others with mobile phones or landlines while one was away from their home (Deffree, 2007). In 1983, Motorola released its first commercial mobile phone, known as the Motorola DynaTAC 8000X. The handset offered 30 minutes of talk-time, six hours standby, and could store 30 phone numbers. It also costed \$3995 dollars, which indicates that the mobile phone was designed for the businessman-type of person and not for daily use, during that period. After six years, the first 'handheld' mobile phone, produced by Nokia, named Mobira Cityman 900, launched in 1989 and weighed just 800g – it was a huge improvement and it allowed individuals to carry their mobile phones easily (Goodwin, 2007).

In the next decade, evolution in mobile technology occurred at an extremely fast

pace; with each generation, there was not only an increase in the speed of communication services, but also some new features were added. For example, they became lighter, cheaper, more durable, with longer talk-time, larger storage, and most importantly, had more features (Goodwin, 2007). With these added features and functions, mobile phones became not only a phone, but an electrical Swiss Army knife (SwAK), which fulfilled multiple needs of individuals. For example, in 2002, Samsung established the Samsung SGH-T100, with a calculator, calendar, voice control, thin-film transistor active matrix LCD display, and internet browser (Michael, 2002). This new generation was called feature phones and have additional functions above and beyond a basic mobile phone which is only capable of voice calling and text messaging. Feature phones, which is defined by PC Magazine Encyclopedia, provided voice calling and text messaging functionality, in addition to basic multimedia and Internet capabilities, and other services offered by the user's wireless service provider.

On June 2008, one of the most represented cellphones, the Apple iPhone 3G, was introduced. After it was formally announced, the world of cellphones has moved to another era: the smartphone era. Since then, smartphones have basically become a handheld personal computer with a mobile operating system. Smartphones are typically pocket-sized, and have the ability to access the Internet through cellular

networks or Wi-Fi. Smartphones were able to run a variety of third-party software components ("apps") from the Google Play Store or Apple App Store, and can receive bug fixes and gain additional functionality through operating system software updates (Pogue, 2009). Modern smartphones have a touchscreen color display with a graphical user interface that covers the front surface and enables the user to use a virtual keyboard to type and press onscreen icons to activate "app" features. They integrate and now largely fulfill most people's needs for a telephone, digital and video camera, GPS navigation, media player, clock, news, calculator, web browsing, handheld video games, flashlight, compass, address book, note-taking application, digital messaging, event calendar, etc.

In less than 30 years, mobile phones have evolved from tools used mostly for talking and texting, to highly complex, sophisticated devices that are central to almost every aspect of our lives (Storey, 2016). They have changed the way we communicate, letting us share unique experiences in real-time with friends and families, by uploading pictures, words, videos and status in social media programs such as Facebook and Instagram. Individuals use mobile phones to guide them while driving, making paper maps almost obsolete (Mims, 2012). Smartphones have enabled companies to create entirely new cloud-based business models, which allow consumers to use all they need by clicking a button on the phone. Ride-sharing

companies like Uber rely on the ubiquity of mobile devices that let users find and pay for rides that are automatically directed to their locations (Lee & Andrew, 2017).

Smartphones have replaced countless things that at one time or another all individuals have used. They no longer need to have so many items that require storage and take up space. For example, since most smartphones are equipped with high-tech cameras, the traditional camera market is facing a threat (Cunningham, 2012). Not to mention smartphones enable individuals to instantly share their photos into social media programs. Professional photographer Eric Adams (2017) has mentioned, “smartphone cameras are finally, truly good. They absolutely will not displace my full-frame gear when I’m serious about shooting, but if I venture out into the world with one of these pups in my pocket, I won’t feel nearly the same gravitational pull to my all-around beefier kit that I usually do.” Additionally, print newspaper, which is greatly influenced by smartphones, has changed people’s reading behavior, from print paper to screen device (Elangovan & Harshit, 2015). From 2007 through 2011, the compound annual growth rate for newsprint tonnage dropped 11.7% in North America. In addition, Mike Lavery, president and managing director of the Alliance for Audited Media, stated that, “these digital editions account for nearly 20% of U.S. newspapers' daily total average circulation, up approximately 5% each year” (2013). Furthermore, television is another victim of the advancement of smartphones. Sung

and Lee (2002) conducted an empirical analysis in the Korean telecom market. They suggested that an increase in the number of mobile telephones resulted in a reduction in the number of fixed-line telephone service subscriptions. This situation can be explained by a relative decline in mobile network costs, network effects, and quality improvement of mobile services (Yoon & Song, 2003). Gwangjae (2013) also indicated that for consumers, in his five year study, the impact of smartphones has resulted their behavior switching from TV services to smartphone services.

Given the fact that smartphones are convenient to use and provides multiple functions at once, almost everyone today owns at least one and the majority have their phone on hand at all times. According to Statista, in the United States from 2010 to 2017, the number of smartphone users have grown from 0.63 billion to 2.24 billion, and the number of users is expected to increase by 0.1 billion every year in the coming decade (Statista 2017). In addition, Pew Research Center (2017) indicated that about three-quarters of U.S. adults (77%) say they own a smartphone, up from 35% in 2011, making the smartphone one of the most quickly adopted consumer technologies in recent history. On the other hand, the rapid change is not only happening on the number of users, but also the way smartphones are being used. In 2017, mobile devices are not just for calling or texting, Americans are using their phones for a variety of nontraditional phone activities, such as interacting with others

on social media, entertaining activities, making purchases or reading a book. Around half of U.S. adults (51%) report making online purchases via their smartphone, many are also turning to their phones while in a physical store (Pew Research Center, 2017). More importantly, smartphones have become one of the major information receivers for individuals. The Pew survey, released in 2017, found that 85% of U.S. adults now get their news on a mobile device at least some of the time, up from 72% in 2016 and 54% in 2013. Fifty-five percent of smartphone owners even say they get news alerts on their phones' screens. Furthermore, today 69% of U.S. adults are social media users. Social media, such as Facebook, Twitter and Instagram, is especially popular among younger adults, as 86% of 18- to 29-year-olds are social media users. But a substantial majority of those ages 30-49 (80%) and 50-64 (64%) use social media as well (Aaron, 2017).

Modern smartphones typically have the functions of high-resolution touch screens, Web browsers that can access and display standard Webpages properly, and high-speed data access via Wi-Fi and 4G services. These advantages have brought enormous convenience to modern society, but considering that smartphones are sharing most aspects of the Internet, addiction to smartphones is highly likely to cause Internet addiction. Internet addiction is a new disorder caused by the same type of social problems as other established addictions (O'Reilly, 1996). To further understand

how the smartphone addiction works and influences individuals, Min et al. (2013), have developed a scale called the Smartphone Addiction Scale (SAS), which is the first scale of the smartphone addiction aspect of the diagnostic manual to study this phenomenon. In their study, they found out people are becoming more attached to their smartphones, and self-report evidences indicated that a large number of users may be experiencing unwanted reliance on their smartphones. This phenomenon causes people to be exposed to a lot of information by their smartphone such as news, social media messages, entertainment notices, and advertisements- whether they are intended to or not.

According to cognitive approach (Weinstein & Mayer, 1986), when people receive information, a few steps are taking place to categorize the received information into different sub-groups. First, all the information enters the sensory register and is held there for only a few seconds. Second, the information is either processed immediately or is forgotten. Third, if the person chooses to process the information, it then moves from the sensory register to short-term memory (Weinstein & Mayer, 1986). Furthermore, to explain how people select the information they would like to process, Kuhlthau (1991) provided some suggestions in his study. As he mentioned, curiosity plays an important role in the information seeking process. Individuals tend to process the information they are interested in, or willing to

understand, in the very early stage of the information digestion procedure.

Interestingly, a similar study also suggested that when people receive information with some particular objective in mind, their judgmental processes work better (Wyer & Gordon, 1984). This leads to the dilemma of how to arise the curiosity in individuals and is always an issue in social science and particularly, in advertisement.

Advertising is a means of communication with the users of a product or service. Advertisements are messages paid for by those who send them and are intended to inform or influence people who receive them, as defined by the Advertising Association of the UK. Advertising is bringing a product (or service) to the attention of potential and current customers, focusing on one particular product or service (Carter, 2009). Advertisement is one of the major ways for companies to exhibit the advantages of their product (including services) to consumers, thereby to increase consumers' tendency to make purchases. Advertisements have the power to change consumers' attitude toward a particular brand. When ads are nicely displayed and with adequate information for consumers to receive, they are able to make consumers re-evaluate the advertised brand (Youjae, 1990). Also, those commercials equipped with suitable messages will increase their consumers' purchase behaviors toward particular products (Herbert, 1965).

Advertisement

Advertisement is important. Print advertisements include flyers, brochures, post mail, and email; advanced advertisements include TV commercials and radio commercials. Advertisements usually play a role in either introducing a product reinforcing the familiarity to the product and also convincing to purchase the product. Advertisements are among the most visible of the marketing strategy and have been the subject of a great deal of attention in the last ten to fifteen years. Advertisement cannot only change emotions but give subliminal message. Advertising today seems to be everywhere and ever present exerting a far reaching influence on the daily lives of people (Nidhi et al., 2008). Ads have been displayed all around the world and studies have shown that they have tremendous influence on consumers, from children and teenagers, to adults and elders. Jason et al. (2003), suggested that, TV commercials significantly influence children's eating behaviors because they would like to follow what they have seen from the commercials. For adolescents, in the age group of 12-18 years of age, television and satellite channels certainly affect their lifestyle. They tend to buy the product advertised by media, irrespective of its cost (Mahajan & Singh, 1997). In Wanda and Bradley's (1989) study, girls expressed more desire than boys for TV-advertised foods and had more positive attitudes toward television commercials. For males, ads of beers and sports programming are

significantly attractive to them (Slater et al., 1996). Advertising can have a powerful influence on every groups of people as long as they provide adequate information and use appropriate strategies.

One of the most effective strategies of advertising is the advertised price. The use of an advertised reference price with an advertised sale price focuses consumers' attention on the difference between the two prices. This leads to a perception of greater value concerning the purchase of the product. By using this strategy, consumers are less likely to search other retail locations and have an increased likelihood of purchase (Biswas & Blair, 1991). Lichtenstein et al. (1993) measured low price search as an activity that occurs prior to shopping. This behavior can be viewed as similar to the perceived benefits of search. Some consumers derive emotional value and entertainment from shopping for lower prices. This becomes a competition with rewards including lower price and pride; higher levels of discounts will have a more positive effect on consumers' assessment of an offer compared to lower levels of discount (Bruce & Abhijit, 2002).

Visual trigger is another powerful advertising strategy. Cognitive psychology has already provided substantial evidence that in a wide variety of memory tasks, pictures are remembered better than only words presented (Alesandrini, 1982). In his study, Shepard (1967) found out that previously seen pictures were recognized accurately

when presented alongside novel pictures to a greater extent than verbal material tested in the same way. Visual information has been shown to affect recall, not only immediately after exposure to a message, but also after delay. Shedler and Manis (1986) suggested that subjects recalled more vivid information than non-vivid information. These studies help us to organize a conclusion that an ad, which has visual information and equipped with discount, will have a greater influence on consumers.

On the other hand, Monroe and Krishnan (1985) provided a model to explain how price, quality, and brand affected and interacted with consumers' attitude, toward particular products. First of all, the link between perceived quality, evaluation, and choice can be explained in part by the acceptable price range concept (Monroe, 1979). Price and quality are crucial factors for consumers when considering making a purchase. In general, a lower price and better quality strengthen their willingness to buy the product. Furthermore, for consumers, brand names represent the quality of products and they are willing to pay more for its products (Haemoon, 2000).

Consumers have a higher chance of making purchases of those products which are made by a recognized brand with the same price or equal perceived quality (Willian et al., 1991).

Pop-up ads

Pop-up ads are a form of online advertising on the World Wide Web. Pop-ups are generally new web browser windows to display advertisements. Pop-up ads, which is created by Ethan Zuckerman (1994), in the late 1990s. This type of advertisement happens when users try to open a website which they are interested in. Pop-up ads have many variations; for example, certain types of downloaded content, such as images, free music, and others. Some others block the whole screen or force users to download certain things. Furthermore, sometimes when users try to close one pop-up but do not click the right button, may open other pop-up ads. All of those characteristics make pop-up ads the most hated form of advertisement. Irritation has been studied extensively in traditional media (Greyser, 1973) and can be caused by tactics that consumers perceive as annoying, offensive, or insulting. In addition, interruption was found to negatively affect consumers' attitudes towards the ads (Rettie, 2001). Pop-up ads are clearly interrupting. Users will adopt more negative behaviors when a site displays ads than when the site does not. Pop-up ads reduce a person's retention of both site and ad content more severely than in-line ads (Scott et al., 2004). However, even though pop-ups do have negative influences to consumers, especially regarding their attitude, consumers can still recall some of the materials of the pop-ups (Patrali et al., 2008). In addition, the size of the pop-up ads also have a

significant impact to consumers' attitude and material recall. Their findings suggested that despite the truth that most consumers hate pop-up ads, they might still work in a certain way.

Before the smartphone, print media was the primary information resource and newspaper ads dominated the advertising market. According to Newspaper Association of America (2003), the revenue of the print-only newspaper ads was \$44.9 billion dollars, and at the same time, there was only \$1.2 billion revenue from digital ads. As expected, since smartphones were established and flourished, digital ads' revenue started to rise with a \$4 billion dollar increase every year. Meanwhile, even though in the following three years (2004 – 2006) the total revenue of print newspaper ads did not significantly decrease, but it was happening. From 2007 to 2008, there was a 20% drop in print newspaper ads, which equaled to \$8 billion dollars. A bigger drop happened the following year: print newspaper ads revenue went down \$23 billion and digital ads revenue was \$22 billion dollars. According to Newspaper Association of America (2016), the revenue is expected to go down continuously. Meanwhile, as users migrate to mobile, advertisers are following them. In 2016, \$40.5 billion was spent on mobile advertising, a 41% increase from the \$28.72 billion spent in 2015, Pew reported. That large of a jump represents a slowdown from the previous two years, which had mobile growth over 170%, source

told from US Ad Spending Forecast (UASF; 2014). Furthermore, UASF forecasted that in 2019, mobile advertising will represent 72 percent of all US digital ad spending and generate up to \$65.87 billion of revenue.

The broad growth of media consumption on mobile devices continues to reshape the media and advertising landscape. In 2017, advertising spent on mobile platforms surpassed spending on desktop (or “display”) advertising for the first time, and is expected to increase the revenue gap between desktop much more in the coming future (David, 2017). This phenomenon makes more companies willing to invest and emphasize their focus on smartphone ads market.

In recent years, different types of pop-up ads are created and adopted to smartphones. When using computers, users can simply close the new browsers to avoid pop-up ads or the browsers have an ads-block system. Unlike computers, in a smartphone, users do not have much functions to be used to prevent the pop-up ads from happening. This issue suggests that users have to face all the pop-up ads on their smartphone, with no choice. How these pop-up ads influence users’ attitude toward the products they represent on smartphones is an issue which deserves to be studied. Many studies have suggested the importance of smartphones and how smartphones influence and change people’s lives. On the other hand, traditional advertisements have been widely studied, such as print ads, TV commercials, and even computer

pop-up ads. However, the overall relationship between smartphone pop-up ads, users' attitude, and how those ads impact to their presented product, has not been well explained.

In this study, some of the key factors are addressed in terms of the issues related to smartphone pop-up advertisement. This study is divided into two parts and the data is collected by an online survey. In section one, the main purpose is to study individuals' attitude toward different pop-ups and their related products and services. In section two, the mechanism of the pop-up ads is studied. With the same content but different formats and compositions, the most effective pop-up to influence individuals regarding their memorization and attitude toward the related product will be investigated.

First, interests and curiosity are crucial for consumers regarding their recall and attitude toward particular advertisements, according to previous studies. This study assumes that this situation will still be able to apply in the smartphone pop-up ads.

- *H1: Participants' attitude toward ads will decrease after being interrupted by the pop-up smartphone advertisement.*
- *H2: A pop-up ad, which matches either users' interest or curiosity, will have a positive influence to their material recall and attitude toward the product.*
- *H3: A random pop-up ad will have a positive influence on users' recall, but*

negative influence on their material recall and attitude toward the product.

Brand plays an important role for consumers when considering making a purchase. A recognized brand will make consumers experience higher perceived-value, in terms of price and quality, thus leading to a better attitude toward products and potential purchasing behaviors.

- *H4: A pop-up ad of a famous brand will have a positive influence on users' material recall, attitude toward advertisement in general and attitude toward the particular brand.*
- *H5: A pop-up ad of a fake brand will have a negative influence on users' material recall, attitude toward advertisement in general and attitude toward the particular brand.*
- *H6: A pop-up ad with the combination of famous brands and participants' interests will further strengthen participants' material recall, attitude toward advertisement in general, and positive attitude toward the product.*
- *H7: A random pop-up ad of fake brands will further strengthen users' material recall but negative attitude toward the product and advertisement in general.*

Structural equation modeling (SEM) is a popular method for finding causal relationships between indicators and different latent variables (Kenneth, 2008). A

structural equation model will be established to further examine causal relationships between different latent variables.

Second, the size of the pop-up ads had significant influence for consumers' materials recall (Patrali et al., 2008); however, the attitude of consumers toward particular products in terms of the size of pop-up ads still remain unclear. The study assumes that size of the pop-up ad will serve as a moderator, which means it will strengthen the effects of those factors on consumers' attitude originally provided.

- *H8: When its size is larger, a pop-up ad with the combination of famous brands and consumers' interests will even further strengthen users' material recall and positive attitude toward the product.*

User experience, according to the international standard on ergonomics of human system interaction, International Organization for Standardization, defines user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" (2009). In website design, placement and position of each element and function are important. A website should be able to allow users feeling comfortable to navigate and easy to use (Fleming, 1998). When users face a mechanism which they are not used to, it takes a longer time for them to use the mechanism and sometimes makes them feel uncomfortable (Kuniavsky, 2003). Traditionally, the close button is on the top, right corner of the website, and

this is the position that most consumers are used to and feel comfortable when they navigate a website. In the study, the untraditional close button is also being used in the smartphone pop-up ads as a factor, which is assumed to make users feel uncomfortable when they use it, and this situation will further strengthen the negative attitude toward those particular products.

- *H9: A pop-up ad of famous brands with an untraditional close button will further strengthen users' material recall but negative attitude toward the product.*

An overall second structural equation model, including variables from section one and section two, will be established to further examine causal relationships between different latent variables.

CHAPTER III

METHODOLOGY

The subject matter of this chapter includes a description of the participants in the study, the design of the study, the instrument, and the outline of the procedures to be used.

Participants

Data were collected from Amazon mTurk, and the project was approved by the Institutional Review Board (IRB) of the participating researcher's University at Oklahoma State University. 331 smartphone users participated the study, age from 18 to more than 40, 36% (119) were female and 64% (212) were male. Participants received 50 cents by taking the survey as incentive.

To include participants with partially missing data, we conducted the longitudinal analyses using full information maximum likelihood (FIML) method of estimation. FIML does not delete cases that are missing from one or two time points of data collection (pairwise deletion), nor does it delete a case if the case is missing a

variable within a time point of data collection (listwise deletion), thus reducing bias in parameter estimates (Enders, 2001).

Design of the study

The study is divided into two sections. In section one, independent t-tests and dependent t-test analyses were used for the purpose of describing differences regarding participants' attitude toward smartphone pop-up ads and material recall among conditions regarding brand effect and consumers' interests. Brand effect (i.e., famous brand versus fake brand) and the content of the pop-up ads (i.e., related to consumers' interest, related to the link, related to neither of the two) were dummy coded for the purpose of conducting the multiple regression model and structural equation model. Multiple regression models were then created for the purpose of describing the relationships between participants' attitude toward smartphone pop-up ads and material recall among conditions regarding brand effect and consumers' interests. A structural equation model was performed for the purpose of 1) examining causal relationships between indicators and latent variables and 2) studying whether conditions make significant influences to the overall model (see figure 1 below).

In section two, how different mechanisms of the pop-up ads influence participants' material recall and attitude toward particular product is studied. Pop-up

ads in section two have the same content but different formats and compositions.

Independent t-tests were used for the purpose of describing differences in participants' attitude toward smartphone pop-up ads and material recall, among conditions regarding the position of the close bottom and the size of the ads.

Two overall structural equation models were performed by combining two sections for the purpose of examining causal relationships between brand effect, mechanism, content of the pop-up ads, participants' material recall, attitudes toward the products and overall attitude toward pop-up ads.

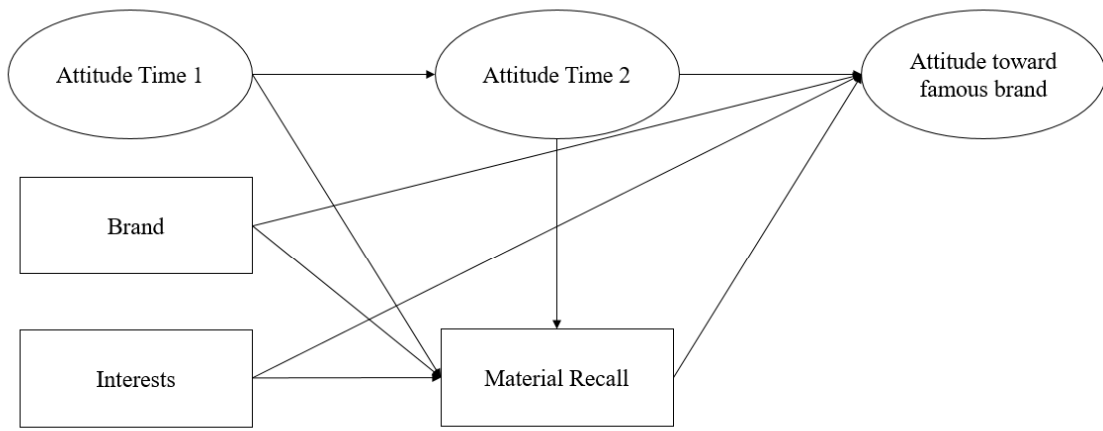


Figure 1. Hypothetical Model

Measure

Demographic information questionnaire

Demographic information were collected on age, gender, smartphone usage, and participants' interests.

Modified IUAIA (Internet Users' Attitudes toward Internet Advertisement) scale

The IUAIA scale (Wiley, 1999) was originally used to test user's attitude toward internet advertisement; in this study, it was modified for the use of smartphone. With the modified IUAIA scale, consumers' attitude can be measured. The scale included 16 items and all responses were collected on a 5-point Likert scale, ranging from strongly disagree to strongly agree. For participants, five major themes were tested in the scale to overall attitudes toward smartphone pop-up ads: 1) advertising utility, 2) feelings of indignity toward advertising, 3) trust of advertising, 4) advertising's effect on product prices and 5) advertising regulation. (Appendix 1).

In the presented sample, both of the two waves showed reliable reliability. In time 1, the modified IUAIA scale with a Cronbach's alpha of .91. In time 2, the modified IUAIA scale with a Cronbach's alpha of .91.

Material Recall questionnaire

Based on the content of the pop-up ads, four material-recall questionnaires were

created for the purpose of testing participants' memorization of the advertisements. Each of the questionnaire had four questions, and all of the questions include dichotomous response options (Yes or No). The overall score of correct answer was measured and was used as one of the dependent variables. (Appendix 2)

Brand Based Attitude Scale

Three questionnaires were created for the purpose of understanding participants' attitude toward certain brand. Each scale included 5 items and all responses were collected on a 5-point Likert scale, ranging from strongly disagree to strongly agree. For participants, four major themes were tested in the scale to overall attitudes toward smartphone pop-up ads: 1) the brand reputation, 2) feelings of indignity toward the brand, 3) trust of the brand, and 4) overall attitude toward the brand. In the current sample, all of the three scales showed reliable reliability. For the attitude toward famous brand (i.e., luxury brand) scale, Cronbach's alpha equaled to .81. For the attitude toward fake brand scale, Cronbach's alpha was .87. Lastly, for the attitude toward famous brand (i.e., sports) scale, Cronbach's alpha equaled .87. (Appendix 3)

Brands used in the study

LV, commonly referred to as Louis Vuitton, is a French fashion house and luxury retail company founded in 1854 (Louis Vuitton, 1854). According to Luxe (2019), Louis Vuitton ranked the top three most popular luxury brand in the world. In the

study, Louis Vuitton was used as a famous brand.

Tori Smith, a fake brand, which is used to compare to other brands. In the study, Tori Smith was created by the researcher as a luxury brand.

ESPN (Entertainment and Sports Programming Network) is a U.S.-based sports television channel owned by ESPN Inc, the company was founded in 1979 by Bill Rasmussen (ESPN, 1979). ESPN was one of the top five most popular live sports channel around the world (Dumax TV, 2017).

M&M's, one of the most popular “colorful button-shaped chocolates” in the world, which is introduced by Frank C. Mars in 1941 (M&M's, 1941). M&M's was the most favorite chocolate in the United States (Dan, 2015) (Appendix 4)

Procedure

An online website was developed by dreamweaver (2017) and was presented online by using Neocities (2013). The website included 1). Common knowledge, such as news, articles, and entertainments. These information will be used as the original links for participants to click and read. 2). Pop-up ads with slogan, pictures of the products, and discount information. Pop-up ads were used to block the original links to interrupt participants. Qualtrics (2017) were used to serve as the primary survey tool.

Participants' consent were obtained prior to data collection. Before the survey was taken, participant was asked to read the consent form to fully understand their responsibility and rights regarding the survey. Participants completed a survey that took approximately 15 minutes by using their smartphone. Participants were told that the purpose of the survey was to find out about smartphone users attitudes toward smartphone advertisements and the related products. Participants were assured that the information in the survey would be kept confidential. In addition, after the finishing the survey, a debriefing process was presented to explain the purpose about the study to the participants.

For both section one and section two, the procedures were the same. Participants were required to use their smartphones to answer the survey. They first answered the demographic information and attitude toward smartphone ads (modified IUAIA scale), and then were asked to read an article regarding the history of Eiffel Tower (A&E Television Networks, 2017). (Appendix 4) As long as participants clicked the link of the news, a pop-up ad came out and blocked the original webpage they supposed to read. Type of news and pop-up ads were randomly assigned for each participant. After participants finished reading, they were asked to answer the material recall questionnaire, the brand based attitude scale and their attitude toward smartphone ads (modified IUAIA scale).

Analytical Strategy

The proposed model (Figure 1) tested the associations between participant's attitude toward advertisement, material recall, and attitude toward the certain brand in different conditions. A path was included to examine the direct effects of attitude toward advertisement time 1 on attitude toward advertisement time 2. A second path was included to examine the direct effects of attitude toward advertisement time 2 on attitude toward the brand.

The model of Figure 1 was tested with structural equation modeling with R 3.5.1, using the Latent Variable Analysis (lavaan) package. First, exploratory factor analyses (EFA) was used to examine how different items were regressed onto their respective factors. Confirmatory factor analyses (CFA) were then performed on participants' attitude toward advertisement, attitude toward the famous brand, and attitude toward the fake brand with the present sample. Second, structural equation model (SEM) was used to model developmental relationships participants' attitude toward advertisement, material recall, and attitude toward the certain brands. Three goodness-of-fit indices were used to allow for comprehensive evaluations of all tested models, given that each operates on different assumptions: the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). CFI ranges from 0 to 1, with 1 indicating perfect model fit;

values of approximately .9 or above are usually interpreted as evidence of good model fit (Bollen, 1989; Hoyle & Panter, 1995). RMSEA and SRMR values of less than .08 indicate adequate model fit (Hu & Bentler, 1998). Change of CFI was used as a guideline to compare nested models; a change in CFI smaller than or equal to .01 indicates that the null hypothesis of invariance should not be rejected (Cheung & Rensvold, 2002).

Two structural equation models were built to study the causation relationship among participant's attitude toward advertisement, material recall, interest, and participants' attitude toward the certain brand.

For each of the SEMs, three steps were established to lead to the final best-fitting model. In step 1, the paths between participants' attitude toward advertisement on time 1 and time 2, and participants' attitude toward advertisement on time 2 to participants' attitude toward the certain brand were tested. In step 2, material recall was added as a mediator to determine which mediation paths were significant. In step 3, another two predictors were added (whether it is a famous brand and whether the advertisement matches with participant's interest), to examine whether they have significant influence to the presented factors.

CHAPTER IV

RESULTS

To evaluate the research questions, paired t-test, independent t-test, multiple regression, factor analysis and structural equation modeling were used. Independent t-tests were used to test the specific two groups in different conditions and with different combinations. Bonferroni corrections were used to control risk of type I error. Multiple regressions were used to test whether there were liner relationships and interaction effects among different independent variables. Structural equation models were used to study the causation relationships among factors and indicators.

H1: Participants' attitude toward ads will decrease after being interrupted by the pop-up smartphone advertisement.

A paired t-test was performed to test the difference between participants' attitude toward advertisements before (time 1, $M = 18.86$) and after they were interrupted by the pop-up advertisements (time 2, $M = 18.16$). After the participants were interrupted by the pop-up advertisements, there was a significant decrease of their attitude toward advertisements ($n = 331$, $t(330) = 3.288$, $p = .001$)

- *H2: A pop-up ad, which matches either users' interest or curiosity, will have a positive influence to their material recall and attitude toward the product.*
- *H3: A random pop-up ad will have a positive influence on users' recall, but negative influence on their material recall and attitude toward the product.*

An independent sample t-test was conducted to test the difference between the two groups, which was first, the pop-up advertisement which matched with participants' interests and second, the pop-up advertisement that did not match with participants' interests, regarding participants' material recall of the content of the pop-up advertisement. There was a significant difference between the two groups ($t(123) = 2.106, p = .037$).

A second independent sample t-test was then conducted to test the difference between the same two groups, regarding participants' attitude toward advertisement in general. There was no significant difference between the two experiment groups ($t(123) = .401, p = .689$): when the type of the pop-up advertisement matched with participants' interest, participants showed no significantly better attitude toward advertisement in general.

- *H4: A pop-up ad of a famous brand will have a positive influence on users' material recall, attitude toward advertisement in general and attitude toward the particular brand.*

- *H5: A pop-up ad of a fake brand will have a negative influence on users' material recall, attitude toward advertisement in general and attitude toward the particular brand.*

An independent sample t-test was conducted to test the difference between two groups: the pop-up advertisement with a famous brand and second, the pop-up advertisement with a fake brand, regarding participant's material recall of the content of the pop-up advertisement. There was a significant difference between the two groups ($t(123) = 3.31, p = .001$): when the participants experienced a pop-up advertisement with a famous brand, the participants showed significantly better material recall regarding the content of that pop-up advertisement.

Another independent sample t-test was then conducted to test the difference between the same two groups, regarding participants' attitude toward advertisement in general. There was no significant difference between the two groups ($t(123) = .160, p = .873$): when the participants experienced a pop-up advertisement with a famous brand, the participants showed no significantly better attitudes toward advertisement in general.

To further study the other hypothesis, the third independent sample t-test was performed to test the difference between the two groups, which was first, the pop-up advertisement with a famous brand and second, the pop-up advertisement with a fake

brand, regarding participant's attitude toward the famous brand. There was no significant difference between the two groups ($t(43) = 1.43, p = .143$).

The fourth independent sample t-test was also performed to test the difference between the same two groups, regarding participants' attitude toward the fake brand. There was no significant difference between the two experiment groups ($t(43) = .698, df = 43, p = .489$): when the participants experienced a pop-up advertisement with famous brand, the participants showed no significantly better attitudes toward the fake brand. Results of the t-tests were reported in table 1.

Table 1.

Independent Sample t-test

	<i>t</i>	<i>df</i>	<i>p</i>
Material Recall	3.310	123	.001
Attitude toward ads	.160	123	.873
Attitude toward famous brand	1.144	43	.143
Attitude toward fake brand	.698	43	.489

Note. Different dependent variables between famous brand and fake brand.

- *H6: A pop-up ad with the combination of famous brands and participants' interests will further strengthen participants' material recall, attitude toward advertisement in general, and positive attitude toward the product.*

An independent sample t-test was conducted to test the difference between the two specific groups: the pop-up advertisement with a famous brand and second, the pop-up advertisement with a fake brand, regarding participants' attitude toward advertisement in general. Participants in both of these two groups have shown interests in luxury stuff and shopping, which suggested that the advertisement matched with their interests. There was no significant difference between the two experiment groups ($t(123) = .160, p = .873$): when the participants experienced a pop-up advertisement with a famous brand, the participants showed no significantly better attitudes toward advertisement in general.

A second independent sample t-test was performed to test the difference between the same two groups regarding participants' material recall in terms of the content of the advertisement. Participants in both of these two groups have shown interests in luxury stuff and shopping, which suggested that the advertisement matched with their interests. There was a significant difference between the two experiment groups ($t(59) = 2.707, p = .009$): when the participants who had interest in shopping experienced a pop-up advertisement with a famous brand, the participants showed

significantly better material recall regarding the content of the advertisement.

Third, an independent sample t-test was conducted to test the difference between the same two specific groups regarding participants' attitude toward the famous brand. Participants in both of these two groups have shown interests in luxury stuff and shopping, which suggested that the advertisement matched with their interests. There was a significant difference between the two experiment groups ($t(24) = 2.363, p = .027$): when the participants who had interest in shopping experienced a pop-up advertisement with a famous brand, the participants showed significantly better attitude toward the famous brand. Results of the t-tests were reported in table 2.

To further understand the effect from the combination of brand effect and whether it matched with participants' interests to participants' material recall regarding the content of the advertisement, a linear regression model was performed. If it was a famous brand and whether it matched with participant's interest served as the two predictors to predict the outcome variable, which was the material recall regarding the content of the pop-up advertisement. The regression model was significant, all the assumptions were met, included independence, homogeneity of variances, normality of residuals. In addition, VIF (1.01) and tolerance (.099) were also checked to ensure there was no multicollinearity issue. The result of the regression model was significant ($n= 331 F = 16.179, p < .000$), with an R^2 of .090. Result of the regression

model was reported in table 3. The two predictors (famous brand, $p < .001$, and match with interest, $p = .010$) had a significant effect on the dependent variable with a standardized coefficient equaled to $.264$ and $.136$, respectively. According to the results of the regression models, with the combination of famous brand and consumers' interests will further strengthen participants' material recall, regarding the content of the advertisement.

Furthermore, to understand the effect from the combination of brand effect and the match of participants' interest to their attitude toward the brand, another linear regression model was conducted. If it was a famous brand and whether it matched with participants' interests served as the predictors to predict the outcome variable, which was participants' attitude toward the brand. The regression equation was not significant ($F = 2.355$, $p = .107$), with an R^2 of $.101$. The two predictors (famous brand, $p = .128$, and match with interest, $p = .154$) had no significant effect on the dependent variable. According to the analysis, the combination of famous brand and consumers' interests will not further strengthen participants' attitude toward the brand. Result of the regression model was reported in table 4.

Table 2.

Independent Sample t-test

	<i>t</i>	<i>df</i>	<i>p</i>
Attitude toward ads	.160	123	.873
Material recall	2.707	59	.009
Attitude toward ads	2.363	24	.027

Note. When match with interests, different dependent variables between famous brand and fake brand.

Table 3.

Linear Regression

	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Constant	1.890	.134		14.065	.000
Match	.276	.106	.136	2.590	.010
Group	.682	.136	.264	5.010	.000

Note. Match: whether participants' interest match with the type of the advertisement or not. Group: whether it is a famous or fake brand.

Note. Dependent variable: material recall of the advertisement.

Table 4.

Linear Regression

	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Constant	9.077	1.789		5.075	.000
Match	1.752	1.122	.227	1.522	.128
Group	1.630	1.122	.213	1.453	1.54

Note. Match: whether participants' interest match with the type of the advertisement or not. Group: whether it is a famous or fake brand.

Note. Dependent variable: participant's attitude toward the famous brand.

- *H7: A random pop-up ad of fake brands will further strengthen users' material recall but negative attitude toward the product and advertisement in general.*

An independent sample t-test was conducted to test the difference between the two specific groups, which was first, the pop-up advertisement with a famous brand and second, the pop-up advertisement with a fake brand, regarding participants' material recall in terms of the advertisement. Participants in both of these two groups have shown no interests in luxury stuff and shopping, which suggested that the content of the pop-up advertisement did not match with their interests. There was no significant difference between the two experiment groups ($t(43) = .698, p = .489$): when the participants who had no interest in shopping experienced a pop-up advertisement with a fake brand, the participants showed no significantly worse material recall toward the advertisement.

A second independent sample t-test was conducted to test the difference between the same two groups regarding participants' attitudes toward the fake brand. Participants in both of these two groups have shown no interests in luxury stuff and shopping, which suggested that the content of the pop-up advertisement did not match with their interests. There was no significant difference between the two experiment groups ($t(43) = .709, p = .482$): when the participants who had no interest in shopping experienced a pop-up advertisement with a fake brand, the participants showed no

significantly worse attitude toward the fake brand. Results of the t-tests were reported in table 5.

Table 5.

Independent Sample t-test

	<i>t</i>	<i>df</i>	<i>p</i>
Material recall	.698	43	.489
Attitude toward fake brand	.014	78	.989

- *H8: When its size is larger, a pop-up ad with the combination of famous brands and consumers' interests will even further strengthen users' material recall and positive attitude toward the product.*

An independent sample t-test was conducted to test the difference between the two specific groups: the pop-up advertisement with a larger screen and second, the pop-up advertisement with a median screen, regarding participants' attitude toward the famous brand. Participants in both of these two groups have shown interests in sports and exercises, which suggested that the content of the pop-up advertisement matched with their interests. There was no significant difference between the two experiment groups ($t(78) = .014, p = .989$): when the participants who had interests in sports and exercise experienced a pop-up advertisement with a larger screen regarding a famous brand which related to sports, the participants showed no significantly better attitude toward the famous brand.

Furthermore, another independent sample t-test was then conducted to test the difference between the same two groups regarding participant's material recall regarding the advertisement. Participants in both of these two groups have shown interests in sports and exercises, which suggested that the content of the pop-up advertisement matched with their interests. There was no significant difference between the two experiment groups ($t(78) = 1.311, p = .194$): when the participants

who had interests in sports and exercise experienced a pop-up advertisement with a larger screen regarding a famous brand which related to sports, the participants showed no significantly better participant's material recall regarding the content of the advertisement. Results of the t-tests were reported in table 6.

Table 6.

Independent Sample t-test

	<i>t</i>	<i>df</i>	<i>p</i>
Attitude toward fake brand	.014	78	.989
Material recall	1.311	78	.194

- *H9: A pop-up ad of famous brands with an untraditional close button will further strengthen users' material recall but negative attitude toward the product.*

An independent sample t-test was conducted to test the difference between the two specific groups, which was first, the pop-up advertisement with a traditional close button and second, the pop-up advertisement with an untraditional close button, regarding participants' attitude toward the famous brand. There was no significant difference between the two experiment groups ($t(124) = 1.387, p = .168$): when the participants experienced a pop-up advertisement with an untraditional close button regarding a famous brand, the participants showed no significant difference in terms of the attitude toward the famous brand.

Furthermore, another independent sample t-test was conducted to test the difference between the same two groups, which was first, the pop-up advertisement with a traditional close button and second, the pop-up advertisement with an untraditional close button, in terms of participants' material recall regarding the advertisement. There was no significant difference between the two experiment groups ($t(124) = 1.256, p = .211$): when the participants experienced a pop-up advertisement with an untraditional close button regarding a famous brand, the participants showed no significant difference in terms of participant's material recall regarding the content of advertisement. Results of the t-tests were reported in table 7.

Table 7.

Independent Sample t-test

	<i>t</i>	<i>df</i>	<i>p</i>
Attitude toward famous brand	1.387	124	.168
Material recall	1.256	124	.211

Note. Different dependent variables between the traditional close button and untraditional close button group.

Exploratory factor analyses

The data were randomly split into two groups for the purpose of doing exploratory factor analyses and confirmatory factor analysis with different samples. Exploratory factor analyses for attitude toward famous brand. A Maximum Likelihood Factor analysis was conducted for the entire sample on the 5 attitude items. Only one factor was extracted with an eigenvalue equaled 3.22 and it accounted for 55.03% of the total variance. All factor loadings were greater than .64 on the factor. Result of the factor analysis was reported in table 8.

Exploratory factor analyses for attitude toward fake brand. A Maximum Likelihood Factor with varimax rotation analysis was conducted for the sample on the 5 attitude items. Only one factor was extracted with an eigenvalue equaled 3.55 and it accounted for 64.40% of the total variance. All factor loadings were greater than .62 on the factor. Result of the factor analysis was reported in table 9.

Exploratory factor analyses for initial attitude toward advertisement. A Maximum Likelihood Factor with varimax rotation analysis was conducted for the entire sample on the 7 attitude items. Only one factor was extracted with an eigenvalue equaled 4.34 and it accounted for 56.05% of the total variance. All factor loadings were greater than .64 on the factor. Result of the factor analysis was reported in table 10.

Exploratory factor analyses for initial attitude toward advertisement after the treatment. A Maximum Likelihood Factor with varimax rotation analysis was conducted for the entire sample on the 7 attitude items. Only one factor was extracted with an eigenvalue equaled 4.30 and it accounted for 55.15% of the total variance. All factor loadings were greater than .66 on the factor. Result of the factor analysis was reported in table 11.

Table 8.

Factor loadings for Attitude toward famous brand

Items	Attitude toward advertisement
My initial impression of Louis Vuitton is good.	.660
Louis Vuitton has good quality control on their products.	.702
Louis Vuitton is a very stylish brand.	.640
If affordable, I would like to make purchase on Louis Vuitton's products.	.782
Overall, I like Louis Vuitton.	.895

Note. All items are significant.

Table 9.

Factor loadings for Attitude toward fake brand

Items	Attitude toward advertisement
My initial impression of Tori Smith is good.	.852
Tori Smith has good quality control on their products.	.617
Tori Smith is a very stylish brand.	.982
If affordable, I would like to make purchase on Louis Tori Smith's products.	.665
Overall, I like Tori Smith.	.841

Note. All items are significant.

Table 10.

Factor loadings for Attitude toward advertisement time 1

Items	Attitude toward advertisement
In general, I have confident that using information I see in an ad to make a purchase decision	.726
In general, advertising results in lower prices for the products I buy	.729
Most advertising is informative	.638
I like to look at most advertisements that I am exposed to	.846
In general, I feel I can trust advertising	.707
Products that I have used usually live up to the promises of quality and performance made in their advertisements	.760
In general, I like advertising	.815

Note. All items are significant.

Table 11.

Factor loadings for Attitude toward advertisement time 2

Items	Attitude toward advertisement
In general, I have confident that using information	.730
I see in an ad to make a purchase decision	
In general, advertising results in lower prices for	.712
the products I buy	
Most advertising is informative	.663
I like to look at most advertisements that I am	.803
exposed to	
In general, I feel I can trust advertising	.748
Products that I have used usually live up to the	.721
promises of quality and performance made in their	
advertisements	
In general, I like advertising	.810

Note. All items are significant.

Confirmatory factor analyses

To evaluate participants' attitude toward advertisement and the famous brand, a confirmatory factor analysis was conducted to evaluate the hypothesized attitude factor structure, with the other half of the sample. First, each of the seven initial attitude items (attitude time 1), attitude after treatment items (attitude time 2), and the five attitude toward famous brand items were regressed onto their respective factors. The hypothesized three-factor model fit the data well: RMSEA = .061, (90% confidence interval: .051 – .069), CFI = .944, SRMR = .110. Indicator loadings for each factor were statistically significant and high ($.56 \leq \lambda_s \leq .84$).

To evaluate participants' attitude toward advertisement and the fake brand, a second confirmatory factor analysis was conducted to evaluate the hypothesized attitude factor structure. First, each of the seven initial attitude items (attitude time 1), attitude after treatment items (attitude time 2), and the five attitude toward famous brand items were load onto their respective factors. The hypothesized three-factor model fit the data well: RMSEA = .060, (90% confidence interval: .051 – .071), CFI = .950, SRMR = .073. Indicator loadings for each factor were statistically significant and high ($.70 \leq \lambda_s \leq .86$). The results of two models were reported in table 12.

Table 12. Goodness of Fit Indices for Confirmatory Factor Analysis

Model	χ^2	<i>df</i>	CFI	SRMR	RMSEA
Famous	330.58	149	.94	.11	.06
Fake	295.76	132	.95	.07	.06

Structural Equation Model

Model 1: attitude toward the famous brand.

The fit of the two direct paths from attitude toward advertisement time 1 to time 2, and attitude toward advertisement time 2 to attitude toward the famous brand was adequate, $\chi^2(150) = 330.98, p < .001, CFI = .95, RMSEA = .060, SRMR = .108, AIC = 12343.44, BIC = 12567.77$. Model was presented in figure 2. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta = .92, p < .001$). Attitude toward advertisement at time 2 significantly predicted attitude toward famous brand ($\beta = .67, p < .001$).

Model 2: material recall as mediator.

The fit of the model was adequate, $\chi^2(166) = 354.99, p < .001, CFI = .94, RMSEA = .059, SRMR = .100, AIC = 13265.26, BIC = 13508.60$. The result of the model was presented in figure 3. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta = .92, p < .001$) but not material recall ($\beta = .10, p = .58$). Attitude toward advertisement at time 2 significantly predicted both attitude toward famous brand ($\beta = .78, p < .001$) and material recall ($\beta = .40, p = .034$). The path from Material recall to attitude toward famous was marginally significant ($\alpha = .10$) but not at .05 ($\beta = .29, p = .061$).

Model 3: another two predictors (whether this is a famous brand and whether it matches with participants' interest) were added.

The fit of the model was adequate, $\chi^2(260) = 384.81, p < .001, CFI = .95, RMSEA = .053, SRMR = .09, AIC = 13236.68, BIC = 13502.83$. Model was presented in figure 4. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta = .91, p < .001$) but not material recall ($\beta = .09, p = .61$). Attitude toward advertisement at time 2 significantly predicted both attitude toward famous brand ($\beta = .74, p < .001$) and material recall ($\beta = .37, p = .027$). Both the two of the new added predictors significantly predicted material recall (whether this is a famous brand: $\beta = .26, p < .001$, and whether it matches with participants' interest: $\beta = .15, p = .002$)

After comparing the AIC and BIC scores, model three was the best fitting model (i.e. model 1, model 2 and model 3). The results of the models were reported in table 13.

Table 13.

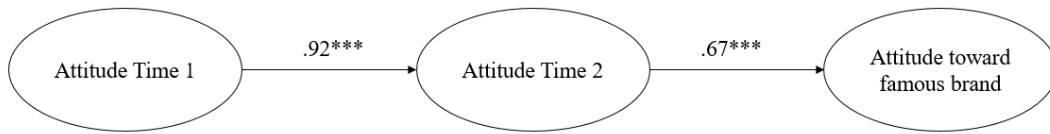
Goodness of Fit Indices for Structural Equation Models

Model	χ^2	<i>df</i>	CFI	SRMR	RMSEA
Model 1	330.98	150	.95	.11	.06
Model 2	354.99	166	.94	.10	.06
Model 3	384.81	260	.95	.09	.05

Model 1: attitude toward the famous brand.

Model 2: material recall as mediator.

Model 3: Two predictors, Match and Brand were added.



*Figure 2. Attitude toward the famous brand. * $p < .05$ ** $p < .01$ *** $p < .001$*

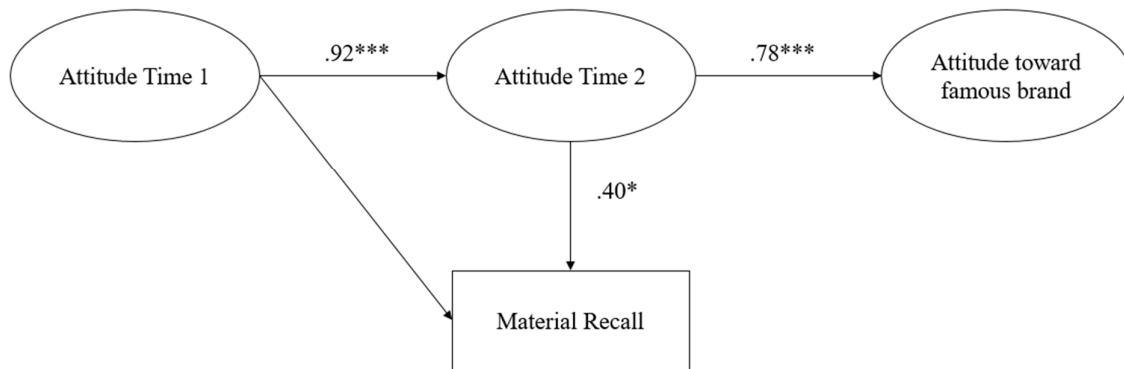


Figure 3. Material recall as mediator. * $p < .05$ ** $p < .01$ *** $p < .001$

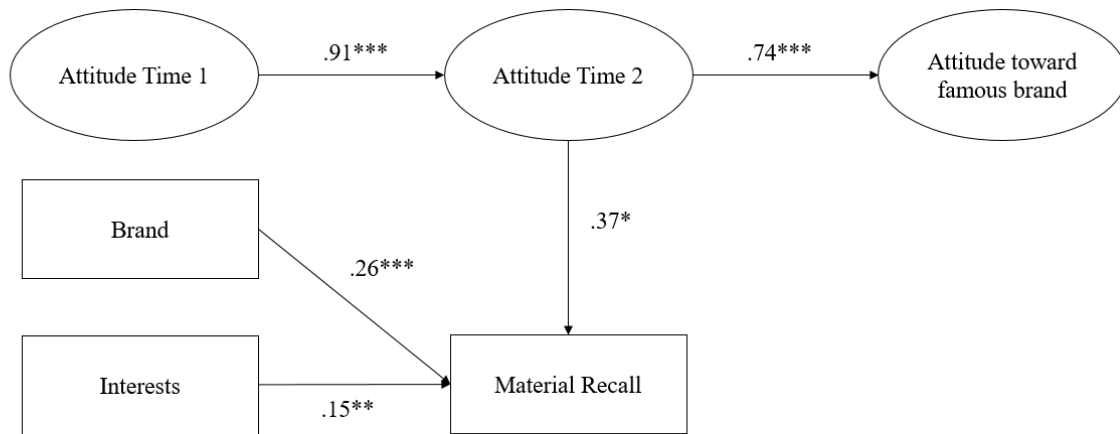


Figure 4. Two more predictors 1) whether this is a famous brand and 2) whether it matches with participants' interest were added. * $p < .05$ ** $p < .01$ *** $p < .001$

Model 4: attitude toward the fake brand.

The fit of the two direct paths from attitude toward advertisement time 1 to time 2, and attitude toward advertisement time 2 to attitude toward the fake brand was adequate, $\chi^2(150) = 350.89, p < .001, CFI = .94, RMSEA = .064, SRMR = .077, AIC = 12330.73, BIC = 12555.06$. The result of the model was presented in figure 5. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta = .92, p < .001$). Attitude toward advertisement at time 2 significantly predicted attitude toward fake brand ($\beta = .88, p < .001$).

Model 5: material recall as mediator.

The fit of the model was adequate, $\chi^2(166) = 365.51, p < .001, CFI = .94, RMSEA = .060, SRMR = .074, AIC = 13255.40, BIC = 13498.73$. The result of the model was presented in figure 6. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta = .92, p < .001$). Attitude toward advertisement at time 2 significantly predicted both attitude toward fake brand ($\beta = .91, p < .001$) and material recall ($\beta = .41, p = .034$).

Model 6: another two predictors (whether this is a famous brand and whether it matches with participants' interest) were added.

The fit of the model was adequate, $\chi^2(200) = 400.13, p < .001, CFI = .94, RMSEA = .055, SRMR = .069, AIC = 13228.08, BIC = 13494.22$. The result of the

model was presented in figure 7. Attitude toward advertisement at time 1 significantly predicted attitude toward advertisement at time 2 ($\beta=.92, p < .001$). Attitude toward advertisement at time 2 significantly predicted both attitude toward the fake brand ($\beta =.93, p < .001$) and material recall ($\beta = .40, p = .027$). Both of the two new added predictors significantly predicted material recall (whether this is a famous brand: $\beta = .26, p < .001$, and whether it matches with participants' interest: $\beta = .15, p = .002$)

After compared the AIC and BIC scores, the result suggested that model six was the best fitting model among the three models (model 4, model 5 and model 6). The result of the model was reported in table 14.

Table 14.

Goodness of Fit Indices for Structural Equation Models

Model	χ^2	<i>df</i>	CFI	SRMR	RMSEA
Model 1	350.89	150	.94	.08	.06
Model 2	365.51	166	.94	.07	.06
Model 3	400.13	200	.94	.07	.06

Model 1: attitude toward the fake brand.

Model 2: material recall as mediator.

Model 3: Two predictors, Match and Brand were added.

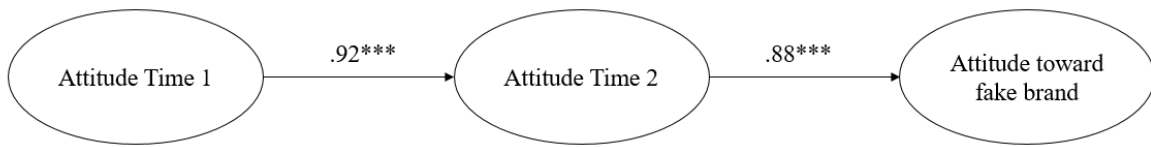


Figure 5. Attitude toward the fake brand. * $p < .05$ ** $p < .01$ *** $p < .001$

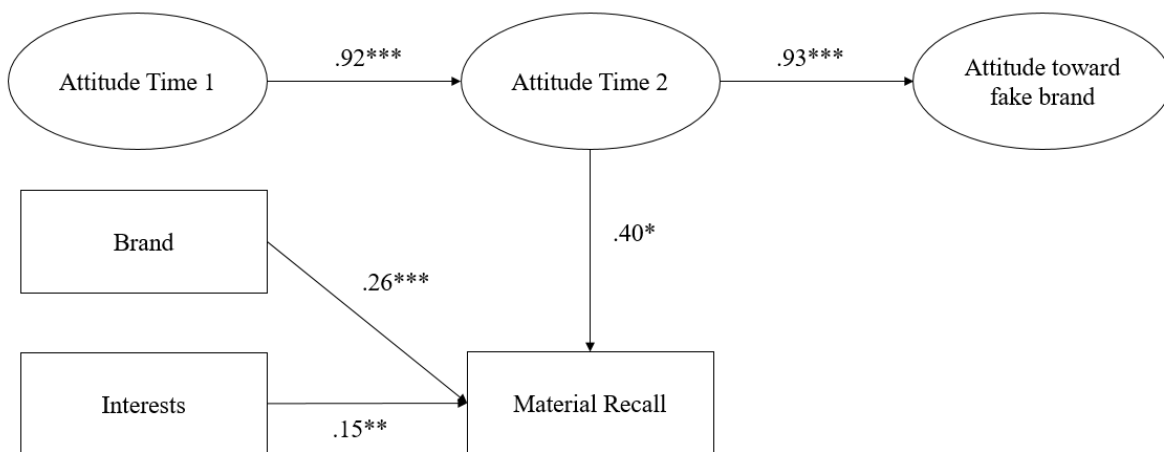
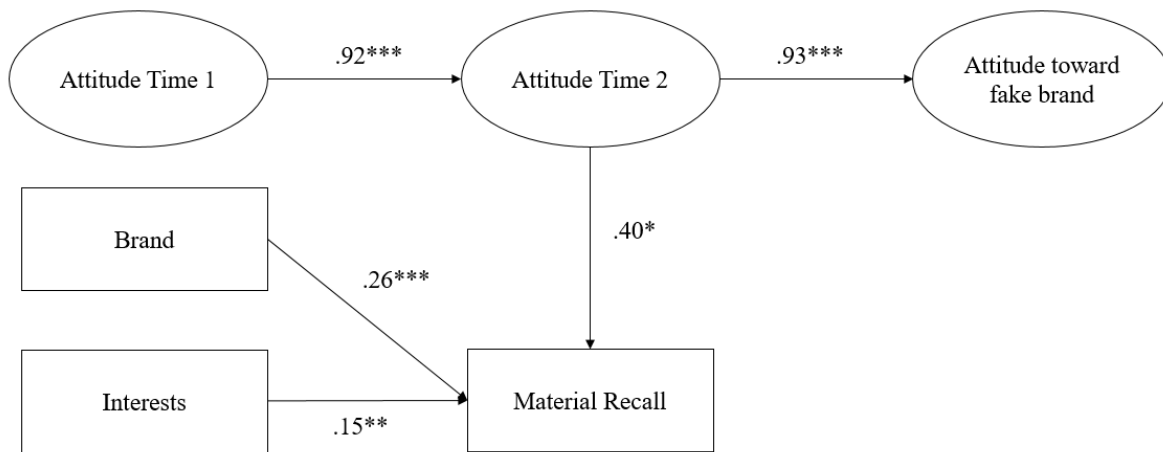


Figure 6. Material recall as mediator. * $p < .05$ ** $p < .01$ *** $p < .001$



*Figure 7. Two more predictors 1) whether this is a famous brand and 2) whether it matches with participants' interest were added. * $p < .05$ ** $p < .01$ *** $p < .001$*

CHAPTER V

DISCUSSION

The main purpose of the study was to examine how smartphone users' attitudes change toward advertisements in general after the interruption by a smartphone pop-up ad, how individuals' interests influence their ability to recall the content of the pop-up advertisement, and their attitude toward the related brand, in different conditions.

Using a combination of the modified IUAIA scale (Wiley, 1999) (i.e., general attitude toward advertisement), material recall questionnaire (i.e., how correctly the participants can recall the content of the pop-up advertisement) and the brand based attitude scale (participants' attitude toward the related brand), the structural features of the relationship among attitude, pop-up advertisement and brand effect was established.

First of all, according to the results, individuals' attitude toward advertisement significantly decreased after they were interrupted by the pop-up advertisement, and this result matched with the first hypothesis of current study. This result leads to a

potential discussion, which is that, individuals tend to avoid, and/or have negative attitudes, toward advertisement, in general. Cho (2004) provided an explanation for this situation, in his study, he explained that individual cognitively, affectively, and behaviorally avoid advertising messages on the Internet. Koslow (2005) also pointed out that, in particular situation, unsought, honest, but persuasive advertising claims may be difficult for consumers to believe. Koslow's study helped to justify the negative attitude that individuals have, toward advertisements, due to the reason that they did not trust those advertisements. Thus, when using a smartphone, as long as the same scenario happened, the interruption of the pop-up advertisement potentially leads to a decrease of the positive attitude towards advertisement, of those participants.

Secondly, another finding from the current study was if the type of the pop-up advertisement matched with participants' interest, participants tended to have a significantly better material recall regarding the content of the pop-up advertisement. A rationale regarding this situation was provided by Kuhlthau (1991). According to the study, individuals are likely to process the information they are interested in, or willing to understand, in the very early stage of the information digestion procedure, individuals have better memorization regarding certain objects which they have interest. (Kuhlthau, 1991). Both Kuhlthau's (1991) study and the current study

matched with the hypothesis: when smartphone users' interests matched with the type of the pop-up advertisement, these participants tended to have better memory to recall the content of the certain pop-up advertisement, because they were more willing to process and understand the content of the advertisement, automatically or not.

In the study, the influence of brand effect on smartphone advertisement was also examined, and the current study suggested that brand effect did exist in terms of the usage of smartphone advertisement. Two perspectives were studied: attitude toward the brand and the ability to recall the content of the advertisement. First of all, for individuals, only the present of a brand name can provide a huge impact to them. For consumers in general, brand names represent the quality of products, individuals have the tendency that they are willing to pay more for its products, when the brand are recognizable and famous (Haemoon, 2000). In addition, consumers have a higher chance of making purchases of those products which are made by a recognized brand with the same price or equal perceived quality (Willian et al., 1991). These previous studies have suggested the importance of the famous and how it can influence individuals' attitude. Secondly, individuals tend to pay more attention and have higher brand awareness to those brands which have better credibility (Wang & Yang, 2010). With the current data, similar results were revealed: when participants experienced a pop-up advertisement with a famous brand, they showed significantly better memory

recall regarding the content of that smartphone pop-up advertisement.

On the other side, when the type of the pop-up advertisement did not match with participants' interest, the results were different. There was no significant difference between the famous brand and fake brand, in terms of both participants' material recall and their attitude toward the brand, when the type of pop-up advertisement did not match with their interests. According to Kuhlthau's (1991) study, individuals process the information in the very early stage of the information digestion procedure they are interested in (Kuhlthau, 1991). That being said, individual do not process or memorize those information they are not interested in. According to the finding of the study, individuals did not even pay attention to the content of the advertisement, when they had no interests in it at all. There was neither a better attitude nor a worse attitude toward the brand, they just didn't care.

The current study also tried to reveal that if a smartphone pop-up advertisement with the combination of famous brands and participants' interests will further strengthen participants' material recall and positive attitude toward the product. First, it should be noted that, brand image and brand awareness are found to positively moderate the relationship between brand credibility and consumers' brand purchase intention (Wang & Yang, 2010). Their study indicated the importance of the influence from a recognized brand. Another study has also indicated that, individual

behaviorally remember certain content which related to their interests, and when they receive information with some particular objective in mind, their judgmental processes work better (Wyer & Gordon, 1984). The current data suggested a similar result with previous studies: when smartphone users' interests matched with the content of the pop-up advertisement who had experienced a pop-up advertisement with a famous brand, the participants showed not only significantly better material recall regarding the content of the pop-up advertisement, but they also showed a significantly better attitude toward the particular brand. Furthermore, the finding of the study also suggested that participants' material recall regarding the content of the smartphone pop-up advertisement was further strengthened by the combination of the famous brand and whether participants' interests matched with the content of the smartphone pop-up advertisement. This means, for example, if an individual has interest in cars and he/she sees a car advertisement which is established by a famous brand, which has a good credibility, the person will have an even stronger memorization and better attitude, toward the brand, compared to those individuals in general.

The size of the pop-up ads on computer has significant influence for consumers' materials recall (Patrali et al., 2008). This being said, for individuals, the larger the size of the pop-up advertisement is, the better the material recall they supposed to

have. However, when applied this concept to smartphone use, similar result did not occur. In the current study, there was no significant difference between the large size and median size of the pop-up advertisement in terms of participants' material recall and attitude toward the brand. One of the potential explanations was that the size of the screen of the smartphone was relatively small, when compared to the screen of a computer or television. When the file size is small, it's hard for individuals to pay attention and to perceive and adapt information (Chen et al., 2003). According to that, there was a possibility for individuals, when using their smartphones, was that it's hard for them to even recognize the difference between the sizes of a larger or median pop-up advertisement, in a relatively small screen.

In website design on smartphone, placement and position of each element and function are important. When users face a mechanism which they are not used to, it takes a longer time for them to use the mechanism and sometimes makes them feel uncomfortable (Kuniavsky, 2003). In the study, even the result is not significant, but the result suggested that, when the participants experienced a pop-up advertisement with an untraditional close, the participants showed a better material recall regarding the content of advertisement. To explain the result, one of the potential explanations was that, participants took longer time to close the pop-up advertisement and that made them stayed longer on the advertisement, which helped to remember better in

terms of the content of it. However, due to the small sample size of the group, the result was not statistically significant ($n = 168$).

Conclusion

This study delineates how smartphone users' attitude change toward advertisement in general after the interruption by the smartphone pop-up ads, how individuals' interests influence their ability to recall the content of the pop-up advertisement and their attitude toward the related brand, in different conditions and provides an overall model to explain the causation relationships among different factors. The current study makes several contributions to the literature. Individual displays different attitudes toward the smartphone pop-up advertisement and shows different levels of material recall regarding the content of the advertisement. Brand plays an important role when applying it to the world of pop-up advertisement, whether the target individual interested in it or not. When it is a famous brand with a good credibility, almost any types of advertisement would have a positive impact. However, when it is a new or a brand with no good reputation, the advertisement should be carefully designed and target a certain population, to receive a positive feedback. The design of the advertisement is also important. An untraditional close button can potentially help individual to remember better in terms of the content of

the material.

Limitation and Future Study

Some potential limitations can be studied and addressed for future study. For example, the design of the pop-up advertisement. Some of the recent pop-up ads have a special function, as long as the participants do not successfully click the close button correctly, they will be led to the website which they possibly do not want to go, and this can be an important factor which influence participant's attitude toward not only the advertisement but also the brand. However, in this study, this function was not investigated. Secondly, in the current study, only certain types of interests are examined, for example, shopping, sports, and candy. More interests should be studied in terms of the relationships with the brand and products. Third, regarding the overall attitude toward advertisement, some more detailed factors (i.e., participants' attitude toward the famous/fake brand in terms of particular perspective) should be studied to help to further understand which factor can potentially impact participants, when they make decisions. In addition, for some certain groups, the sample size is relatively small. More data should be collected in terms of having more generalizable results.

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APPENDICES

APPENDICES I
Adjusted Internet Users' Attitudes toward Internet Advertisement Scale

Adjusted Internet Users' Attitudes toward Internet Advertisement:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In general, I like advertising					
Most advertising is informative					
I like to look at most advertisements that I am exposed to					
I often use advertising to help make my purchase decisions					
In general, I have confident that using information I see in an ad to make a purchase decision					
Most advertising insults my intelligence					
I often feel offended by advertisements					
I often felt misled by advertisements					
In general, I feel I can trust advertising					
Products that I have used usually live up to the promises of quality and performance made in their advertisements					
In general, advertising results in lower prices for the products I buy					
I usually get better value for my money in advertised brands of products than in unadvertised brands					
I think advertising has effect on the prices of advertised products					
Smartphone ads are annoying because they often block my screen					

APPENDICES II
Material Recall Scales

Material Recall Scale (LV)

Yes

No

The ad talked about purse

The ad showed 10% off discount.

The colors of the ad are white and black

There was a Louis Vuitton ad

Material Recall Scale (Tori Smith)

Yes

No

The ad talked about purse

The ad showed 10% off discount.

The colors of the ad are white and grey

There was a Timmy ad

Material Recall Scale (ESPN)

Yes

No

The ad talked about sports

The ad showed the upcoming game.

The colors of the ad are red and black

There was a CNN ad

Material Recall Scale (M&M's)

Yes

No

The ad talked about peanut chocolate

The ad showed 10% off discount.

The main colors of the ad are red and black

There was a M&M's ad

APPENDICES III
Attitudes toward Brands Scales

Participants' Attitudes toward Louis Vuitton:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My initial impression of Louis Vuitton is good.					
Louis Vuitton has good quality control on their products.					
Louis Vuitton is a very stylish brand.					
If affordable, I would like to make purchase on Louis Vuitton's products.					
Overall, I like Louis Vuitton.					

Participants' Attitudes toward Tori Smith:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My initial impression of Tori Smith is good.					
Tori Smith has good quality control on their products.					
Tori Smith is a very stylish brand.					
If affordable, I would like to make purchase on Tori Smith's products.					
Overall, I like Tori Smith.					

Participants' Attitudes toward M&M's:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My initial impression of M&M's is good.					
M&M's has good quality control on their products.					
M&M's produces tasty snacks.					
I would like to make purchase on M&M's' products.					
Overall, I like M&M's.					

APPENDICES IV
Brands in the Study



TORI SMITH

Fashion Your Style





When Gustave Eiffel's company built Paris' most recognizable monument for the 1889 World's Fair, many regarded the massive iron structure with skepticism. Today, the Eiffel Tower, which continues to serve an important role in television and radio broadcasts, is considered an architectural wonder and attracts more visitors than any other paid tourist attraction in the world.

Designing and Building the Eiffel Tower

In 1889, Paris hosted an Exposition Universelle (World's Fair) to mark the 100-year anniversary of the French Revolution. More than 100 artists submitted competing plans for a monument to be built on the Champ-de-Mars, located in central Paris, and serve as the exposition's entrance. The commission was granted to Eiffel et Compagnie, a consulting and construction firm owned by the acclaimed bridge builder, architect and metals expert Alexandre-Gustave Eiffel. While Eiffel himself often receives full credit for the monument that bears his name, it was one of his employees—a structural engineer named Maurice Koechlin—who came up with and fine-tuned the concept. Several years earlier, the pair had collaborated on the Statue of Liberty's metal armature.

Did you know? The base pillars of the Eiffel Tower are oriented with the four points of the compass.

Eiffel reportedly rejected Koechlin's original plan for the tower, instructing him to add more ornate flourishes. The final design called for more than 18,000 pieces of puddle iron, a type of wrought iron used in construction, and 2.5 million rivets. Several hundred workers spent two years assembling the framework of the iconic lattice tower, which at its inauguration in March 1889 stood nearly 1,000 feet high and was the tallest structure in the world—a distinction it held until the completion of New York City's Chrysler Building in 1930. (In 1957, an antenna was added that increased the structure's height by 65 feet, making it taller than the Chrysler Building but not the Empire State Building, which had surpassed its neighbor in 1931.) Initially, only the Eiffel Tower's second-floor platform was open to the public; later, all three levels, two of which now feature restaurants, would be reachable by stairway or one of eight elevators.

Millions of visitors during and after the World's Fair marveled at Paris' newly erected architectural wonder. Not all of the city's inhabitants were as enthusiastic, however: Many Parisians either feared it was structurally unsound or considered it an eyesore. The novelist Guy de Maupassant, for example, allegedly hated the tower so much that he often ate lunch in the restaurant at its base, the only vantage point from which he could completely avoid glimpsing its looming silhouette.

The Eiffel Tower Becomes a Permanent Feature of the Paris Skyline

Originally intended as a temporary exhibit, the Eiffel Tower was almost torn down and scrapped in 1909. City officials opted to save it after recognizing its value as a radiotelegraph station. Several years later, during World War I, the Eiffel Tower intercepted enemy radio communications, relayed zeppelin alerts and was used to dispatch emergency troop reinforcements. It escaped destruction a second time during World War II: Hitler initially ordered the demolition of the city's most cherished symbol, but the command was never carried out. Also during the German occupation of Paris, French resistance fighters famously cut the Eiffel Tower's elevator cables so that the Nazis had to climb the stairs.

Over the years, the Eiffel Tower has been the site of numerous high-profile stunts, ceremonial events and even scientific experiments. In 1911, for instance, the German physicist Theodor Wulf used an electrometer to detect higher levels of radiation at its top than at its base, observing the effects of what are now called cosmic rays. The Eiffel Tower has also inspired more than 30 replicas and similar structures in various cities around the world.

Now one of the most recognizable structures on the planet, the Eiffel Tower underwent a major facelift in 1986 and is repainted every seven years. It welcomes more visitors than any other paid monument in the world—an estimated 7 million people per year. Some 500 employees are responsible for its daily operations, working in its restaurants, manning its elevators, ensuring its security and directing the eager crowds flocking the tower's platforms to enjoy panoramic views of the City of Lights.

Author
Eiffel Tower Edition

IRB PERMISSION



Oklahoma State University Institutional Review Board

Date: 03/27/2019
Application Number: ED-19-12
Proposal Title: Effects of Smartphone Pop-up Ads on Attitude and Recall in Consumers
Choice: Applied Experimental SEM Models.

Principal Investigator: Wei-Kang Kao
Co-Investigator(s):
Faculty Adviser: Jam Khojasteh
Project Coordinator:
Research Assistant(s):

Processed as: Expedited
Expedited Category:

Status Recommended by Reviewer(s): Approved

Approval Date: 03/25/2019

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent, and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a status report to the IRB when requested
3. Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
4. Maintain accurate and complete study records for evaluation by the OSU IRB and, if applicable, inspection by regulatory agencies and/or the study sponsor.
5. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,
Oklahoma State University IRB

VITA

WEIKANG KAO

Candidate for the Degree of

Doctor of Philosophy

Dissertation: EFFECTS OF SMARTPHONE POP- UP ADS ON ATTITUDE
AND RECALL IN CONSUMERS CHOICE: APPLIED STRUCTURAL
EQUATION MODELS

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Statistics)

Education:

Completed the requirements for the Doctor of Philosophy in Education
Psychology (Research, Evaluation, Measurement and Statistics at Oklahoma
State University, Stillwater, Oklahoma in May, 2019.

Completed the requirements for the Master of Science in Education Psychology
(Research, Evaluation, Measurement and Statistics at Oklahoma State
University, Stillwater, Oklahoma in May, 2014

Completed the requirements for the Bachelor of Science in your Psychology at
Kaohsiung Medical University, Kaohsiung, Taiwan in 2009.