

IT-Dependent Strategic Initiative to Increase the Marketing Performance of Mobile Security Solutions

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Abstract

Purpose - Since mobile devices can hold vast amounts of confidential and sensitive information, they are attractive targets for criminals. Both individuals and society as a whole can suffer serious consequences if these devices are compromised. However, even though the importance of securing mobile devices, many of users are not conscious of the severity of mobile threats and they still do not use any kind of security solutions. Facing this reality, this paper proposes a solution to motivate users to use security solutions.

Design/methodology/approach - The presented work has found how integrating the protection motivation theory and flow theory in a correct stage of consumer-product attachment can increase considerably the usage of security solutions in mobile devices. To develop the mentioned study, this work has executed a survey and field experiment to a considerable number of mobile users to determinate the effect of different types of fear appeals.

Findings - The resultant findings suggest that interactive and customized fear appeals delivered to the user in the early ownership stage of the product-customer attachment is a promising means of encouraging the adoption of mobile security solutions in end users.

Originality/value - This study provides theoretical means to the mobile market for: (1) insertion of fear appeal messages oriented to the marketing of mobile security solutions in new smart devices, and (2) creating new advertising market for device manufacturers (e.g. Samsung and Apple), mobile operators (e.g. Verizon, Telefonica), and security solution providers (e.g. TrendMicro and Symantec).

Keywords: Attachment, fear appeal, interactivity, mobile security, protection motivation theory, attachment

INTRODUCTION

GARTNER, Inc. predicted that more than 50% of users will use a smart device (smartphone or tablet) as their first device to do online activities [1]. This prediction has been confirmed by Smart Insights which has indicated that Internet usage in mobile devices (51%) was greater than in desktop/laptop computers (42%) in 2015 [2]. This kind of information shows how the popularity of smart mobile devices has increased rapidly around the world. One of the main reasons of mobile devices popularity is their ability to provide the functionalities to send messages, access emails, browse the web, and even perform financial transactions. Even more significant, mobile applications (apps) are turning the mobile device into a general-purpose computing platform.

As mobile devices grow in popularity, so do the motivations for attackers. Mobile malware, for example, is clearly on the rise, as attackers try with new business models by targeting mobile phones. In 2015, 3944 new android mobile malware variants were found which represents 77% more than 2014 [3], and it is easy to find those malwares as legitimate applications in the Android Market [4].

However, although the increase of number and level of threats to the mobile market, many of users are still not conscious of this problematic situation and they do not adopt any kind of protective measurement (e.g. antivirus, anti-spyware). According to Kaspersky, only 18% of smartphone owners thought about possible loss or theft of a mobile device in 2012 and still 40% of modern smartphones owners do not use any kind of antivirus software, number which is very low if we compare with the 83% of PC users using any kind of security protection (data taken from McAfee) and the numbers stays similar nowadays.

Given this situation, there is a need to effectively motivate users to adopt security solutions for their mobile devices. In this aspect, several previous works have used the fear appeals as a solution. For example, several works used the fear appeals to explain employee compliance with information security policies [5, 6] and another applied the protection motivation theory to explain several behaviors related to the field of security such as updating and protecting passwords

[7]. However, previous works presents two limitations in respect to the area of research of this work i.e. security of mobile devices: (1) they do not execute a study in increasing the intention of using security solutions in mobile devices (segmentation issue), and (2) they do not execute a study about when a fear appeal could be received with more relevancy and interest for the user, motivating them to execute a coping appraisal (timing issue).

Considering such limitations, this paper has decided to study the effects of interactive and customized fear appeals in motivating users to enhance the security of their mobile devices introduced during different stages of the consumer-product attachment. In doing so, this study integrates principles of interactivity theory and fear appeals in different stages of the consumer-product attachment. Interactivity explicates the psychological effects of a person who interact with a computer related environment [8]. Fear appeals are messages intended to deliver the gravity of a threat and a user's ability to handle with it [9]. Consumer-product attachment is the strength of the emotional bond a consumer experiences with a durable product which has five stages: preacquisition, early ownership, mature ownership, predisposal, and postdisposal [10].

Being more concrete, this paper theorizes that interactive/customized fear appeals in the early ownership stage will be more effective than in other stages of the consumer-product attachment in motivating users to adopt security solutions in their mobile devices. This study has developed a field experiment involving the delivery of static and interactive/customized fear appeals to determinate the effect of those messages. Additionally, this study has also executed a survey to gather the stage of consumer-product attachment which users are emotionally involved with their devices.

The resultant findings of this paper suggest that interactive/customized fear appeals in the early ownership stage of consumer-product attachment is a promising means of encouraging the adoption of mobile security solutions in end users. Being more specific, the present study contributes to the protection motivation theory in several ways. First, the study shows how the protection motivation theory can also be applied to motivate users in adopting security solutions for mobile devices. Second, the study shows how interactive/customized fear appeal messages can provide better effectiveness than the traditional static ones. Finally, the study experiment the fear appeals in different stages of the consumer-product attachment to show how the introduction of fear appeals with a correct timing is important for increase their effectiveness.

The rest of this paper is organized as follows. Section 2 reviews the background literature used as the knowledge base for this work such as fear appeal, protection motivation theory, interactivity theory, and consumer-product attachment. Then, Section 3 details the proposed research model and hypotheses. Later, Section 4 describes the methodology of the field experiment and Section 5 makes the data analysis and discussion of findings of the experiment. Finally, Section 6

concludes this paper and explains the expected contribution of this study in real mobile market.

THEORETICAL BACKGROUND

A. Fear Appeal

A fear appeal is a persuasive message with the intent to motivate individuals to follow with a recommended sequence of actions through the encouragement of fear associated with a threat. "Fear appeals are persuasive messages designed to scare people by describing the terrible things that will happen to them if they do not do what the message recommends" [11]. According to [11], a fear appeal is composed of several elementary components: (a) susceptibility to the threat, (b) the magnitude of the threat, (c) clear actions how to protect from the threat [12], and (d) the efficacy of the response. The first two components helps to increase the attention of the user to the fear appeal message, while the last two components are created to fortify the perception of efficacy of the response.

Fear appeals are explained by a number of theories, the most developed of them is the protection motivation theory [12, 13].

B. Protection Motivation Theory

Protection Motivation Theory was developed by Rogers in 1983 to help to clarify fear appeals. Protection Motivation Theory indicates that fear appeals triggers (a) threat and (b) a coping appraisal corresponding to the message [12]. A protective action corresponding to the coping appraisal will be executed only if it is perceived as personally relevant and dangerous by the receptor of the fear appeal message [9] (See Fig. 1).

Even though this theory was initially created to understand protective health behaviors, it has been applied to the field of information security. For example, several researches explained the employee compliance with information security policies using motivation theory [5, 6] while another explained security behaviors related with updating and protecting passwords [7].

The fear appeal concept and the protection motivation theory constitute the fundamental knowledge base this work is based on. This work uses this knowledge to show how this could be also used to increase user's intention to use security solutions for mobile devices.

C. Interactivity

The construct of interactivity was initiated in the field of communications research and then applied to the computer-mediated communication. Reference [8] defined interactivity as "the extent to which users can participate in modifying the form or content of a mediated environment in real time". Reference [14] also mentions that interactivity is very correlated to the construct of flow. Such work indicates that "two of interactivity's dimensions, control and intrinsic interest, are closely related to flow, and therefore, flow

theory can predict the same outcomes as interactivity”.

Flow theory [15] describes a state of concentration that a person can arrive when executing a specific task, and this concept can be applied to the to human-computer interactions [14, 16].

The interactivity concept and the flow theory provide the clues of the characteristics of the content that the fear appeal message should have. The intention of this paper is to use interactive and user customized fear appeal messages instead of static messages to increase the motivation of users in using mobile security solutions.

At this point, this work do not call into question that interactive fear appeal messages help to increase the relevancy level of threat felt by users. However, this work believes that the study of such messages in different stages of the consumer-product attachment can help to increase their effectiveness by a considerable margin.

D. Consumer-Product Attachment

Reference [10] define the degree of consumer-product attachment as “the strength of the emotional bond a consumer experiences with a durable product”. Consumer-product attachment involves the presence of an emotional link between a person and an object. An object to which a person is attached is considered to be special and typically means a lot to that person. Consequently, the person will experience emotional loss if that product is lost. In such circumstances it is unlikely for the person to dispose of the product.

It is important to establish that the main concern in this work is the strength of the emotional connection a person experiences in different stages of this attachment process and not the exact nature of the different emotions that are elicited (e.g. [17]). Also, it is important to mention that people mostly report that they experience positive emotions towards the products to which they feel attached. Schultz, Kleine, and Kernan [18] counted 83 different emotions when they asked 95 respondents to describe the feelings they experienced while thinking about an object that would be extremely hard to part with. In most cases, these emotions were positive, such as happiness, love, pride, security, and comfort. However, in certain cases the emotions could also be negative (e.g., sadness), for instance when the object was a memento of hard times.

From the perspective of sustainability, it is remarkable to indicate that the grade of consumer-product attachment changes over time. Ball and Tasaki differentiate five stages in the development of attachment for a particular product: preacquisition, early ownership, mature ownership, predisposal, and postdisposal. Although the length of these stages may differ considerably between products, they seem to apply to all types of products [19].

Feelings for a product may already start to develop before the product is actually obtained. A person planning to buy a product, but lacking necessary money to buy it, may already visualize about how it will be to own or use the product [17,

20]. Producers can stimulate such feelings towards new products through advertising. These feelings are likely to enhance the degree of product attachment a person experiences after the product has been acquired.

The moment of product acquisition is very important in providing the first occasion for physical contact with the product and for opening up the possibility for memories to be formed. If the product is a gift, a special person may present it at a special occasion. The current owner may have bought the product in a special store or in a place far from home. These circumstances affect a person’s initial feelings toward a product and are likely to affect the emotions experienced during ownership.

The objects in people’s homes belong to one of the three intermediate stages distinguished by Ball and Tasaki: early and mature ownership and predisposal [19]. During ownership, consumption activities can be defined as storing, using, maintaining, repairing, and disposing of the purchased product [21]. A consumer’s emotions with regard to a specific product are likely to change over time due to dynamics in the target product (e.g. loss in functionality, change in appearance), the consumer (e.g. increased age, change in family life cycle, move to another house), the consumer-product interaction (e.g. different usage, ownership), and the situational context (e.g. fashion changes, technological improvements). Given the large number of durable products that are bought and owned in affluent societies, it is likely that disattachment for many products starts soon after the product is acquired, whereas only few products remain cherished for a long time.

RESEARCH MODEL AND HYPOTHESES

Following the preceding discussion, the research model is presented in Fig. 2. First, the proposed model has employed the protection motivation theory to predict that fear appeal presented to mobile device users will motivate them to use security solutions as happened in other fields, such as fear appeals motivating users towards more secure behavior [9, 11] and implementing security in an information systems context [5, 6]. According to the mentioned explanation, the paper hypothesizes the following:

Hypothesis 1. *Fear appeal messages increase the intention to use mobile security solutions.*

Protection motivation theory explains that fear appeals will conclude in rapid protective response only if the threat included in the message is perceived to be personally significant [9, 11], and the emotions raised by such fear appeal needs be concrete and strong in order to persuade the person more effectively [9]. Additionally, Johnston and Warkentin created a theory which indicates that fear appeals can be more effective if they are customized for a specific person [9]. In this light, customization, interactivity and flow will augment the perception of the user when received the fear appeal message. In other words, customization, interactivity, and flow will increase user motivation, boost

proactive behavior, and rise perceived relevance [14, 16, 22]. Therefore, this paper predicts that interactive and customized fear appeals will boost users' perception of the fear appeal resulting with higher adoption of coping appraisals and protective actions. Following the same idea, this paper theorizes that, as fear appeals provide educational and motivating information, interactive fear appeals will have better results than interactivity alone and it also will be more effective than the simple static fear appeals. Therefore, this paper hypothesizes the following:

Hypothesis 2: *Interactive and customized fear appeal messages increase more intention to use mobile security solutions than static fear appeal messages.*

Additionally, it is important to mention that people mostly report that they experience positive emotions towards the products to which they feel attached. Therefore, most of people take care of their products more when they feel an emotional connection. Schifferstein & Zwartkruis-Pelgrim argument that such degree of consumer-product attachment changes over time [10]. Their argument suggests that early ownership stage shows higher consumer-product attachment than the rest of stages (see Fig. 3). Therefore, this paper also hypothesizes:

Hypothesis 3: *Fear appeal messages in early ownership stage increase more intention to use mobile security solutions than in other stages of consumer-product attachment.*

Finally, combining H1 and H4, it is possible to determinate that:

Hypothesis 4: *Interactive and customized fear appeal messages in early ownership stage of consumer-product attachment can maximize users' intention to use mobile security solutions.*

RESEARCH METHOD

The presented paper has used two research methods: (1) survey and (2) field experiment (see Fig. 4). First, a survey was executed to classify the experimental group according to different aspects i.e. consumer-product attachment stage of users with their mobile device, knowledge in computer (mobile devices), and age. Later, by embracing the field experiment method, it was able to study the effectiveness of interactive and customized fear appeals in motivating users to use security solutions. The field experiment was chosen because it has the benefit of increased generalizability and realism as they are positioned in real environments in which variables are more closed to real-world values [23]-[25]. Additionally, this work has decided to execute a controlled experiment because it has the advantage of superior precision and internal validity compared to other methods.

A. Survey

Before execution of field experiment, a survey was executed to all participant of the experiment. The survey had the objective to gather important data to be used for classification

of users (i.e. age, level of knowledge in computer and mobile devices, and stage of consumer-product attachment with their mobile devices). To determinate the period of different stages of the consumer-product attachment of mobile devices, this work has used the statistics of mobile phone replacement per year (see Fig. 5). Fig. 5 indicates how modern people change their phones very frequently; for example, 67.80% of the population in Korea buy a new mobile phone each year. From this knowledge base, this paper has established the different stages of the consumer-product attachment of mobiles devices as shown in Table I. This work has added an additional stage between the early ownership and mature ownership called young ownership to make a more detailed analysis of the experiment. The pre-acquisition and post-disposal stages were not considered in this study because users cannot execute a coping appraisal (adopt a security solution) in those stages.

Group Definition for Field Experiment. The participants of the experiment were separated into two groups in order to separate the study of effects of static appeal messages and interactive/customized appeal messages. Each group was structured compliant with two mandatory characteristics to maintain the objectivity of the experiment.

(1) Similarity of groups: members (experiment participants) of both groups must have similar characteristics in terms of knowledge in computers (mobile devices) and age, characteristics that determinates their perspective in front of mobile device threat. In the present experiment, a group of university students of several majors (from different schools) were selected for the experiment as they are familiar with mobile devices and satisfy the similarity knowledge in computers and mobile devices (e.g. computer science department students).

2) Diversity inside each group: Each group must own members (experiment participants) in different stages of consumer-product attachment. This characteristic will ensure the analysis of effectiveness of fear appeals according to the mentioned stages.

It is important to remember that the data provided by the survey was used for the creation of such groups.

B. Field Experiment

Mobile Applications for Field Experiment. For the experiment of the proposed hypotheses, two different mobile applications (apps) were developed. The platform selected for the experiment was Android because its high rate of market share in mobile devices (66.01% in July 2016 according NetMarkeshare) and because Android allows apps developed by independent developers to access to the personal data (e.g. contact list, calling list, etc.) stored in the device. The first app contains a static fear appeal message while the second app contains an interactive/customized fear appeal message. Here the term "customized" means that the fear appeal shows threats using data stored in user's device such as name, contact list, calling list, and so forth.

Experiment Execution. Once selected the experimental group, the experiment was executed. The first group were

asked to install and use the first app while the second group were asked to install and use the second app.

Dependent Variable. The dependent variable selected for the present experiment was the level of motivation of users for using the mobile security solution. This level was measured with the number of installations of mobile security solution linked to the fear appeal message of the mobile applications.

DATA ANALYSIS AND RESULTS

A. Selection of experiment population

Initially, around 3500 university students participated in the survey. This group included students from various universities and schools (i.e. students from computer science, electronic engineering, business administration, security and defense, mechatronics, finance, marketing, tourism and sports training schools). The age range of the participants was 19-30 years old.

Once executed and obtained the results of the survey, people with the following conditions were excluded from the field experiment:

(1) First, people who had already installed security software in their devices were excluded because they do not represent the market this study is intended for since they already showed their intentions to use mobile security solutions.

(2) Additionally, people using iOS based devices (e.g. iPhone and iPad) were excluded because the field experiment application was developed only for Android operating system. The application was developed only for Android because iOS do not allow independent applications to access to the personal information of users which is a requirement for the generation of customized fear appeals.

After executing the mentioned process of selection, the final population for the field experiment were separated in two different groups: one for static fear appeal and another for interactive & customized fear appeal. (3) In this process, some people were excluded to satisfy the requirements of similarity and diversity explained in the previous section.

The final population for the field experiment was 2000 people where 50% were taken for the Static Fear Appeal group and the remaining 50% were included in the Interactive & Customized Fear Appeal group (see Table II and III).

B. Data Analysis and Findings

Once defined the groups, the field experiment was executed as explained in section 4. The data obtained from the experiment is detailed in Table IV and V. Table IV illustrates the number of participants of the first group and how many people decided to install or not to install a security software after consuming the static fear appeal message. On the other hand, Table V indicates the number of participants of the second group and how many people decided to install or not to install a security software after consuming the interactive & customized fear appeal message.

Using the data of Table IV and V, it is possible to understand that the percentage of installation of a security software in users who received a fear appeal message ranged between 66-98% depending to their consumer-product attachment stage. In other words, 66-98% (of people who did not have any security software installed in their devices) decided to install a security software when they were motivated with a fear appeal message. This data analysis strongly supported the Hypothesis 1, which predicted that fear appeal messages increase the intention to use mobile security solutions.

Additionally, Table IV and V allows to understand that the people who received an interactive & customized fear appeal message registered 12.29% more installation of security software than those who received a static fear appeal message. This data analysis strongly supported the Hypothesis 2 which predicted that interactive and customized fear appeal messages increase more intention to use mobile security solutions that static fear appeal messages.

On the other hand, according to Table VI, the rate of installation of security software of users was 90.63%, 86.11%, 85.40%, and 75.61% in the different stages of consumer attachment. It indicates that the effectiveness of fear appeal messages in early ownership stage is 4.51% higher than the young ownership, while the effectiveness of the appeal messages in young ownership is 0.71% higher than the mature ownership. It is interesting to see how the effectiveness of fear appeal messages is reduced considerably in the pre-disposal stage, indicating that the feeling of attachment to the mobile device in such stage is reduced considerably. In conclusion, the presented data shows how the rate of effectivity of fear appeal messages is superior when the consumer attachment stage of users is earlier than others. This data analysis strongly supported the Hypothesis 3, which predicted that fear appeal messages in early ownership stage increase more intention to user mobile security solutions than in other stages of consumer-product attachment.

Finally, according to Table VII, the rate of installation of security software of users in early ownership stage who received a static fear appeal message was 14.58% lower than the rate of users in the same stage but receiving an interactive & customized fear appeal message. The difference of rate of installation in both groups in the other stages of consumer-product attachment were 7.78%, 7.23% and 19.09%. It is interesting how the effectivity of interactive & customized fear appeal messages increases significantly in early ownership and pre-disposal stages. This data analysis strongly supported the Hypothesis 4, which predicted that interactive and customized fear appeal messages in early ownership stage of consumer-product attachment can maximize users' intention to use mobile security solutions.

CONCLUSIONS

This work has proposed a solution to motivate users to use security solutions in their mobile devices and it found how integrating the protection motivation theory and flow theory in a correct stage of consumer-product attachment can

increase considerably the usage of security solutions in mobile devices. This study believes that it has provided the theoretical means to the real mobile market for: (1) the insertion of fear appeal messages oriented to the marketing of mobile security solutions in new smart devices (e.g. smartphone, tablet PCs, etc.), and (2) creating new advertising

market for (a) device manufacturers (e.g. Samsung, Apple, and LG) and (b) mobile communication operators (e.g. Vodafone, Telefonica, T-Mobile, Verizon) and new marketing market for security solution providers (e.g. Trend Micro, and Symantec) for inserting fear appeal messages.

TABLE I
 PROPOSED STAGES OF CONSUMER-PRODUCT ATTACHMENT FOR MOBILE DEVICES

Stage	Period
Pre-acquisition	-
Early ownership	0~2 months
Young ownership	2~6 months
Mature ownership	6~12 months
Pre-disposal	12~ months

TABLE II
 NUMBER OF PEOPLE IN GROUP 1 (STATIC FEAR APPEAL) SEPARATED FOR EACH STAGE OF CONSUMER-PRODUCT ATTACHMENT

Stage	Number of people
Early ownership	144
Young ownership	180
Mature ownership	346
Pre-disposal	330

TABLE III
 NUMBER OF PEOPLE IN GROUP 2 (INTERACTIVE & CUSTOMIZED FEAR APPEAL) SEPARATED FOR EACH STAGE OF CONSUMER-PRODUCT ATTACHMENT

Stage	Number of people
Early ownership	144
Young ownership	180
Mature ownership	346
Pre-disposal	330

TABLE IV
 RESULT OF FIELD EXPERIMENT IN GROUP 1 (STATIC FEAR APPEAL)

Item	Early ownership	Young ownership	Mature ownership	Pre-disposal
Number of participants	144	180	346	330
Number of participants who installed the security software	120	148	283	218
Number of participants who did not installed the security software	24	32	63	112
Rate of installation after fear appeal	83.33%	82.22%	81.79%	66.06%
Rate of no installation after fear appeal	16.67%	17.78%	18.21%	33.94%

TABLE V
 RESULT OF FIELD EXPERIMENT IN GROUP 2 (INTERACTIVE & CUSTOMIZED FEAR APPEAL)

Item	Early ownership	Young ownership	Mature ownership	Pre-disposal
Number of participants	144	180	346	330
Number of participants who installed the security software	141	162	308	281
Number of participants who did not installed the security software	3	18	38	49
Rate of installation after fear appeal	97.92%	90.00%	89.02%	85.15%
Rate of no installation after fear appeal	2.08%	10.00%	10.98%	14.85%

TABLE VI
 RESULT OF FIELD EXPERIMENT IN GROUPS 1 AND 2 (ACCUMULATED)

Item	Early ownership	Young ownership	Mature ownership	Pre-disposal
Number of participants	288	360	692	660
Number of participants who installed the security software	261	310	591	499
Rate of installation after fear appeal	90.63%	86.11%	85.40%	75.61%

TABLE VII
 COMPARISON OF FIELD EXPERIMENT RESULT IN BOTH GROUPS

Group type	Item	Early ownership	Young ownership	Mature ownership	Pre-disposal
Static Fear Appeal Group	Total participants	144	180	346	330
	Number of install	120	148	283	218
	Install rate	83.33%	82.22%	81.79%	66.06%
Interactive & Customized Fear Appeal Group	Total participants	144	180	346	330
	Number of install	141	162	308	281
	Install rate	97.92%	90.00%	89.02%	85.15%

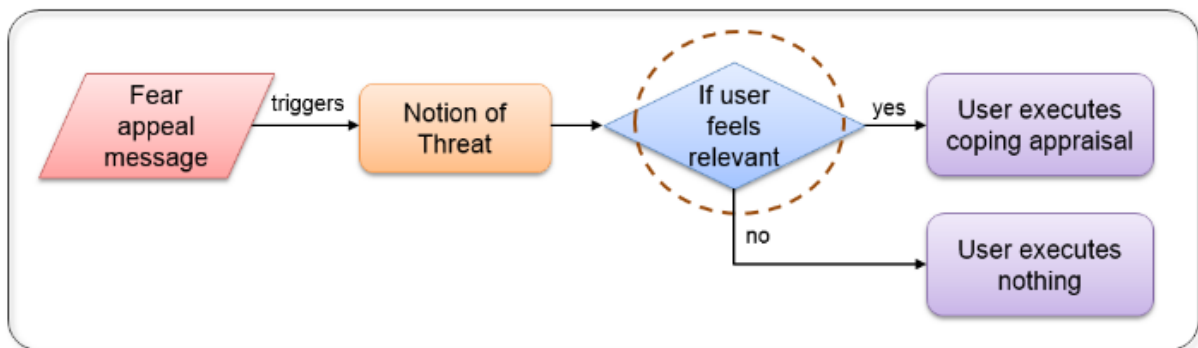


Figure 1. Protection Motivation Theory

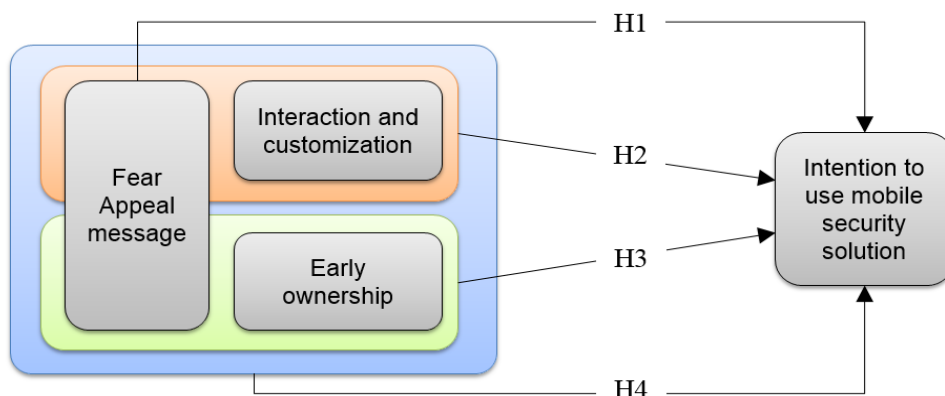


Figure 2. The Proposed Research Model

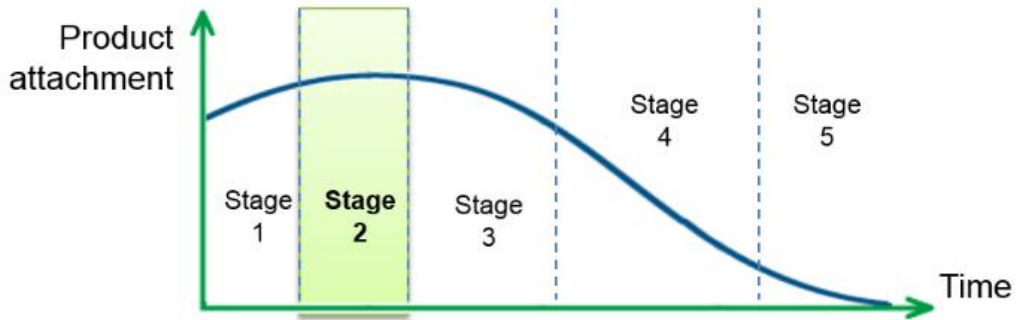


Figure 3. Consumer-Product Attachment over the time

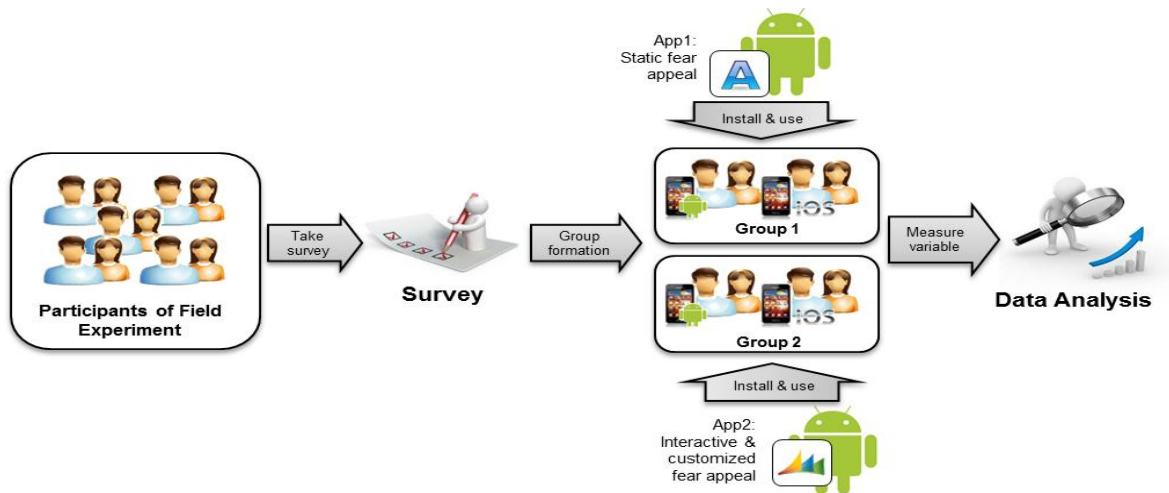


Figure 4. Overall Diagram of Used Method

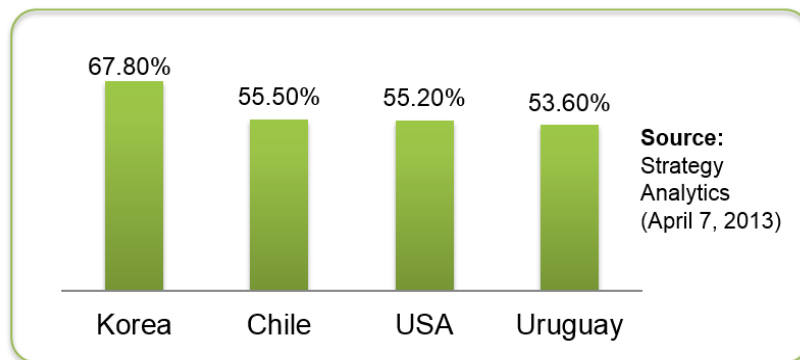


Figure 5. Percentage of Mobile Phone Replacement in a Year

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