Users' Continuance Intention to Use a Mobile Application:
Adapting Store Personality as Application Personality

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ABSTRACT

This study examines factors that influence users' continuance intention to use a mobile application. There exist few empirical researches focused solely on examining factors influencing users' continuance intention of using mobile applications. An empirical analysis is conducted with data collected from 431 smartphone users in China. Two application personality dimensions (i.e., enthusiasm and unpleasantness) and one user perception dimension (i.e., aesthetics) were found to have no significant impact on application continuance intention while genuineness and sophistication from application personality dimensions and ease of use and perceived control from user perception dimensions have a positive significant influence. This study provides an insight to application developers on how to improve the quality and usability of mobile applications and enhance continues use.

KEYWORDS

Application Personality, Application Quality, Application Usability, Continuance Intention, Mobile Application, User Perception

INTRODUCTION

Every day new applications are added to the App Store and Google Store. People download many applications but only a few of them are used frequently. One in four users gives up on mobile applications after a single use (Perez, 2016). Companies are struggling so hard to retain those users who have downloaded their applications and drop them immediately. This situation has triggered questions like "Why is this the reality?" and "What is our perspective to solve this problem?" It is very essential to have a deep understanding of your product's users. Typically, it takes a few seconds to decide to download a mobile application. The problem arises when it comes to ensuring the continued use of these applications.

According to the Internet World Stats report (Miniwatts, 2020), 63.2% of the world's population has access to the Internet. In China, according to the Chinese government, in 2018, 802 million people actively using the Internet (i.e., about 47% of the total population) (McCarthy, 2018). Most surprisingly, 788 million people (i.e., about 98% of the people using the Internet) access the Internet through their mobile phones. This shows how mobile technology has become an indispensable part of their day to day life. The emergence of the smartphone and the use of the Internet has strongly affected service markets (Lee, Kim, & Hong, 2017). Users can easily search for information and download mobile applications, games, and videos with their mobile devices. Attracted by the great market, service providers have released a variety of mobile applications. The development of features of mobile applications has also helped businesses to effectively address their customers. Not only the big name brands like Walmart but also small businesses have started using the service offered by mobile applications. As of March 2017, the number of applications has exceeded 2 million in Apple's App Store, the cumulative application of the download was more than 180 billion times (iTunes, 2019; Statista, 2020). When the number of users increases, the need to explore the services offered by the mobile application arises (Kim et al., 2014). Despite the success of some, the majority of mobile applications fail outright or are not as successful as expected (Deloitte, 2012). For instance, only 1 percent of all mobile applications are downloaded more than one million times and, once downloaded, one in four mobile applications are never used again (Deloitte, 2012).

Mobile phones have brought many significant advantages to businesses like ubiquity, which allows users to conduct processing at anytime from anywhere. Ubiquity promotes user adoption of mobile applications. However, constraints of these mobile terminals like small screen size, inconvenient input, and slow responses may negatively affect the interaction of users and impede continuous use. No matter how hard service providers try to invest their effort and resources to release mobile applications to make their services available to users if they cannot retain users and facilitate continued usage, they will fail to recover their cost and achieve success (Zhou, 2013). Furthermore, the intense competition and lower switching costs have placed a significant influence on the service providers to come up with a practical solution to retain users. Hence, it is necessary to identify factors affecting the continuous usage of mobile applications.

Given so many mobile applications available today, the following question requires an answer: What are the key factors affecting users' continuance intention to use mobile applications? Adopting information technology theories such as Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT), many existing studies have examined the key factors that affect initial adoption and usage of mobile applications or purchase intention for applications (Hsu & Lin, 2015; Lina, 2015; Shi, 2009). However, most of these existing studies have given less attention to the post-adoption usage of mobile applications (Ha, Yoon, & Choi, 2007; Kleijnen, Ruyter, & Wetzels, 2004; Pergler, 2012; Suh, Lee, & Park, 2012; Watzdorf et al. 2010). The initial usage of a mobile application is affected by factors such as perceived ease of use, perceived usefulness, and compatibility (Kim, Mirusmonov, & Lee, 2010; Schierz, Schilke, & Wirtz, 2010). Users rely on different reasons to either continually use or immediately abandon a mobile application. In addition to the features and functionalities of the mobile application, emotional attachments (Ding & Chai, 2015) and privacy concerns (Lai & Shi, 2015) are also the factors affecting the adoption of mobile applications. While positive emotions are influenced by inherent benefits, negative emotions are influenced by instrumental benefits (Ding & Chai, 2015). Focusing on the negative factors affecting mobile applications' continued use, Lai and Shi (2015) found that users are less interested in adopting a mobile application that they feel is risky. This current study used the information systems success model proposed by Delone and Mclean (2004) as a theoretical base to address this gap by examining the factors affecting users' continuance intention to use mobile applications. Studies have shown that the success of information technology (IT) depends both on its initial adoption and subsequent usage (Chiu et al., 2005). While adoption of a mobile application is a significant first step towards realizing mobile application success, eventual

mobile application success further depends on its continuance use after initial use (Bhattacherjee, 2001; Chiu et al., 2005).

This study examines the impact of mobile application personality and user perception on application quality and usability, respectively, which in turn influences continuance intention to use a mobile application. Application Personality is operationalized by four independent variables (enthusiasm, genuineness, sophistication, and unpleasantness) adopted from store personality dimensions (Dastous & Lévesque, 2003), and user perception is operationalized by three independent variables (aesthetics, ease of use, and perceived control). Due to the lack of theoretically sound instruments for measuring mobile application usability holistically (Hoehle and Venkatesh, 2015), this study has adopted the suggestion of Hoehle and Venkatesh (2015) in operationalizing application usability.

This paper is organized as follows. In the next section, the theoretical background of the study is explained. The third section presents the research model with the research hypotheses. The fourth section explains the method of data collection and the measurements of all variables. The results of the data analysis are presented in the fifth section. The sixth section discusses the findings and implications of the study. The final section provides the conclusion of the study.

THEORETICAL BACKGROUND

So far, several studies have adopted information systems theories such as Technology Acceptance Model (TAM), Delone and Mclean Information Systems Success Model, Innovation Diffusion Theory (IDT), and many others to examine the initial adoption and usage of mobile applications. Ease of use, perceived need, and technical capabilities were identified as factors that affect IS implementation success; also, usefulness and ease of use were related to the behavioral intention to use an information system. Mostly, these factors were used by researchers in their endeavor to assess the initial usage of applications. This study has adopted the Information Systems Success Model proposed by Delone and Mclean (2004) as its theoretical base to examine the factors affecting the post-adoption of a mobile application. Application personality and user perception dimensions are proposed as the factors that affect users' continuance intention to use a mobile application. Application quality and application usability are mediators.

Application Personality

The concept of Application Personality used in this study employed the works by Dastous and Lévesque (2003), who build the conception of Store Personality, and Poddar, Donthu, and Wei (2009), who used the Store Personality scale to an Internet environment. As early as 1958, Martineau (1958) introduced the idea that stores have a personality, which he presented as "the way in which the store is defined in the shopper's mind, partly by its functional qualities and partly by an aura of psychological attributes." Later, Dastous and Lévesque (2003) refined the conception of a Store Personality as "the mental representation of a store on dimensions that typically capture an individuals' personality." They specified five dimensions of store personality which are enthusiasm, sophistication, unpleasantness, genuineness, and solidity.

According to Poddar, Donthu, and Wei (2009), a commercial website is much like a store and fulfills all the functions of a store. A website is made up of product-related attributes, category associations, advertising styles, symbols and logos, and price (Aaker, 1997). The developer determines the personality linked with the website. This argument can be applied in the M-commerce environment as well. For mobile application personality formation, it is through service-related attributes, layout, and architecture, in-app advertising, symbols, and colors. From a service provider's point of view, there are a lot of mobile applications with paid content (in-app purchasing). Therefore, the service can also be a store environment where users can choose and buy. Consequently, this study has modified the Store Personality scale of measurement to the mobile context, of which enthusiasm, genuineness,

and unpleasantness are included. Solidity is not considered here as it presents that the Website is adequate for conducting its transaction process professionally (e.g., the depth of the selection, ease of the purchasing process). Website image is a mental representation that contains all dimensions that are associated with a website such as value for money, product selection, quality of service, etc. (Marcus, 1972). Mobile app personality is restricted to those mental dimensions of the usage. Solidity is a personality that may be important in the formation of website personality; it is not a personality to a mobile application. This study focuses on general mobile applications, not only applications with paid content. A mobile application is regarded as sophisticated portrayed through its overall layout and color scheme (Poddar, Donthu, & Wei, 2009). A mobile application that came as elegant, stylish, high class, or upscale is considered sophisticated. Unlike solidity, sophistication could be considered as a personality to a mobile application. Elegance and design are important factors for mobile applications that affect users' experience.

User Perception

User perception is about, from a mobile application users' or target audiences' perspective, how a mobile application influences its users in terms of attitude or behavioral intention. An individual's perception of an object may be independent of the object itself. Studies on demographics and psychological profiles of users on the Internet further suggest that differences in an individual's use and perception of the Internet as a tool would result in different online behaviors of individuals (Donthu & Garcia, 1999).

Perceiving a mobile application as appealing, easy to interact with, and having behavioral control can be expected to affect an application's usability along with the user perception about the mobile application. There is evidence from prior studies that users who have a good initial experience with a mobile application will develop a positive perception of the application (Ha, Yoon, & Choi, 2007; Hsu & Lin, 2015). This study has added three new variables to user perception. These three variables, i.e., aesthetics, ease of use, and perceived control represent the visual and utilitarian aspects of user perception respectively. These three variables of application personality are identified based on a review of literature from prior studies. These variables are then examined to decide which ones' are the most important factors on application usability, which will be explained in more detail later.

Application Quality

Mobile application quality is about the perception of the whole quality of a mobile application, which depends on the user's viewpoint. According to Yoo and Donthu (2001), as the use of mobile applications increases, the quality of the applications will become substantial for survival and success. High quality mobile applications attract more users to use the application. This study employed scales of perceived quality from Poddar, Donthu, and Wei (2009) to measure the perceived quality of a mobile application. According to Poddar, Donthu, and Wei (2009), the quality of a mobile application is measured as it is perceived by users.

Application Usability

Usability is operationalized as "the extent to which the user and the system can communicate clearly without misunderstandings through the interface" (Benbunan-Fich, 2001). Usability provides users the ability to utilize their functions well and properly (Calisir et al., 2010). ISO (1998) defines perceived usability as "the extent to which a product or service can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." A variety of conceptualization and measurement approach is used to study mobile application usability. Literature shows the lack of theoretically sound instruments for measuring mobile application usability holistically (Hoehle & Venkatesh, 2015). Mobile application usability and mobile device usability are two different things. Mobile application usability commonly refers to the extent to which the application installed on mobile devices is user-friendly (Adipat, Zhang, & Zhou, 2011);

while mobile device usability is concerned about the usability of the mobile device itself. This study specifically focuses on mobile application usability. Booth (2014) argued that usability has four factors: usefulness, effectiveness (ease of use), learnability, and attitude (likeability). The usability of a mobile application can bring about the greatest efficiency, learnability, amount of usefulness, and the least amount of discomfort for humans (Pearrow, 2000). Conceptualizing and testing a theoretical model of IS continuance, Bhattacherjee (2001) suggested that users' satisfaction with IS use and perceived usefulness are the determinants of their continuance intention. Three measurements are used for usability, i.e., efficiency, learnability, and usefulness.

Continuance Intention

Prior studies of customers' continuance intention involved different fields such as e-learning services (Chiu et al., 2005), information system (IS) usage (Limayem, Hirt, & Cheung, 2007), mobile application (Hoehle & Venkatesh, 2015), online banking services (Vatanasombut et al., 2008) and so on. To mention some, factors such as satisfaction, comprehensiveness of usage, perceived value, perceived ease of use, quality, usability, trust, flow, and so on were examined as predictors of post-adoption of a service.

RESEARCH MODEL AND HYPOTHESES

The research model shown in Figure 1 is developed to examine the factors that affect users' continuance intention to use a mobile application. Particularly, the research model is used to investigate the relationship of application personality and user perception with application quality and application usability respectively; and the relationship of application quality and application usability with application continuance intention. In the research model, enthusiasm, genuineness, sophistication,

Figure 1. Research Model
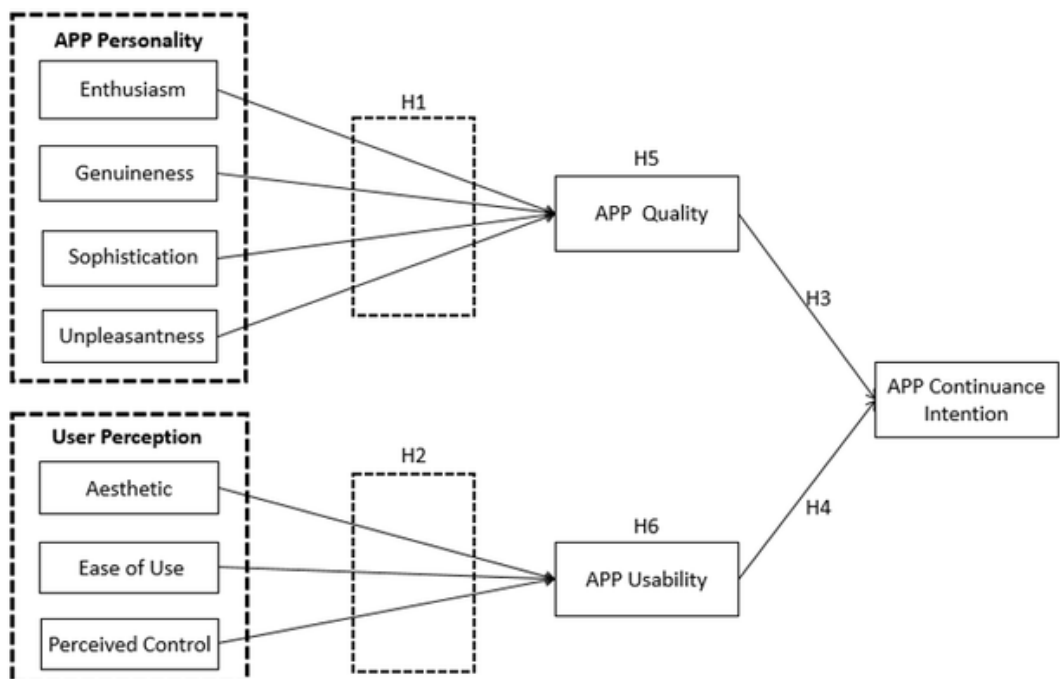
and unpleasantness are constructs of application personality whereas aesthetics, ease of use, and perceived control are constructs of the user perception.

Application Personality on Application Quality

Application personality is related to the internal representation of a mobile application on dimensions that resemble the reflection of the dimensions of individual personality. Users determine their sight of mobile application quality after considering the mental representation of the applications (Poddar, Donthu, & Wei, 2009). On the other hand, the perceived quality of an application is the role of, not only how a mobile application looks, but also how the interaction is assessed by its users. The four dimensions of application personalities are enthusiasm, genuineness, sophistication, and unpleasantness. The ultimate consumers perceive the personality of a mobile application through these four dimensions.

An enthusiastic personality of a mobile application is portrayed through being friendly, lively, and has a welcoming atmosphere (Poddar, Donthu, & Wei, 2009), possibly resulting from the way the application is structured, the color scheme, or even the overall layout. A mobile application interface that implies reliability appears to have a genuine personality (Poddar, Donthu, & Wei, 2009). Most of the time, the genuineness of a mobile application, measured by being reliable, trustworthy, and honest, is built through third-party endorsements. Similarly, a mobile application is regarded as sophisticated portrayed by its overall layout and color scheme (Poddar, Donthu, & Wei, 2009).

Finally, a mobile application with an unpleasant personality likely causes annoying or irritating behavior. There are many ambient, layout, themes, and social components that could be poorly designed and thus make the whole process of interacting with the mobile application seem unpleasant and offensive (Dastous, 2000; Poddar, Donthu, & Wei, 2009). The reliability, privacy, service, and purchasing intention of consumers are affected by their perception of the web design (Dang & Pham, 2018).

According to Dastous and Levesque (2003), the first three dimensions are positive influence factors, and unpleasantness presents a negative aspect. A mobile application with a strong positive personality dimension would reflect to be a high-quality application, otherwise, a mobile application with an unpleasant personality probably incites users to consider it as low quality. Therefore, it is hypothesized that:

Hypothesis One: Application quality relates positively to mobile application personality dimensions: (a) Enthusiasm, (b) Genuineness, and (c) Sophistication; and (d) negatively to Unpleasantness.

User Perception of Application Usability

This study has proposed three independent variables, i.e., aesthetics, ease of use, and perceived control, representing the visual, utilitarian, and affective aspects of user perception in this study.

As Pullman and Gross (2004) commentary, "when companies succeed in not only satisfying certain needs but also making the interactions pleasurable, people are more inclined to stay loyal". In this aspect, aesthetics will be conceptualized as a non-instrumental quality, playing an important role in service appealingness and rating of interactive systems like a mobile application (Hassenzahl & Tractinsky, 2006; Thüring & Mahlke, 2007; Tractinsky et al., 2006). "Aesthetics would also need to be considered by designers and engineering psychologists when designing for usability" (Sonderegger & Sauer, 2010). According to Ku and Chen (2020), the visual appeal of a mobile application could be upgraded by its design credibility and its functional benefit. In brief, if users have positive affective impressions of an application through aesthetic drivers, they seem more to underestimate any negative problems that may arise during their virtual experiences or head off those that are not visually appealing; and their subsequent interactions with applications tend to be keeping with their

initial judgments (Sánchez-Franco & Martín-Velicia, 2011). Therefore, aesthetics plays a significant and important role in the integration of online relationships.

Perceived ease of use is defined as the user's subjective perception regarding the amount of effort necessary to learn and use a technology (Hampton-Sosa & Koufaris, 2005). Many studies have used the ease of use to examine the acceptance (adoption) of information technologies and mobile applications by users (Davis, 1989; Hu et al., 1999; Koufaris, 2002; Lee, Eze, & Ndubisi, 2011). Perceived ease of use has been used to measure the usability of a Web site in a way it is similarly applied in this study (Agarwal & Venkatesh, 2002; Hampton-Sosa & Koufaris, 2005). In addition, ease of use is also used to examine the usability of a mobile application. Given its utilitarian nature, ease of use is treated, in this study, as the utilitarian aspect of user perception.

Perceived control differs from the variable of perceived behavioral control (one's perception of one's ability to perform a given behavior), as described in the theory of planned behavior (Ajzen, 1991). Perceived control is referred to as an effective aspect of user perception of control over users' actions (Csikszentmihalyi & Csikszentmihalyi, 1992). Specifically, perceived control measures users' feelings of calmness, confusion, and control. When applied in the context of electronic commerce, perceived control has a positive influence on customer behavior (Koufaris, 2002; Koufaris, Kambil, & Labarbera, 2001; Novak, Hoffman, & Yung, 2000). In an online environment, perceived control is a measure of users' control over the online environment and their actions (Koufaris, 2002). With a mobile application, perceived control is an effective measure of users' control over the environment and their actions (Koufaris, 2002). A mobile application with high usability enables users to perform their actions in the mobile application with consistent and predictive results (Palmer, 2002). Therefore, users of a high usability mobile application will feel more in control of their actions. By extension, this study hypothesizes that:

Hypothesis Two: Application usability positively relates to mobile application personality dimensions: (a) Aesthetics, (b) Ease of use, and (c) Perceived control.

Application Quality and Usability on Continuance Intention to Use Application

Chae et al. (2002) proposed the quality of users' subjective sense to identify the important dimensions of mobile application quality in increasing user satisfaction and customer loyalty for mobile Internet services. Perceived application quality affects users' continuance intentions to use an application; in other words, users would appear to have continuance using intentions toward a mobile application only when they sense it offers good quality in its dealings. In regular use situations like playing a game, users are not only looking for enjoyment but also an application that interacts with them attempts to meet their needs, and exerts concern about their interests (Poddar, Donthu, & Wei, 2009).

Hypothesis Three: Application quality positively influences continuance intention to use an application.

Usability plays a key factor role when services use the Internet. Consumers may have serious concerns about using internet technology; much of their worries illuminate from their perceptions of the degree of ease associated with such use, the perceptions of the required skills, infrastructures (e.g., computers, internet, and so on) (Nguyen & Barrett, 2006; Tarhini et al., 2016). A mobile application with high usability enables users to perform their intended actions with consistent and predictable results (Palmer, 2002). According to Casaló, Flavián, & Guinalíu (2008), "usability may help the individual to acquire a degree of ability that will ensure that the mobile application occupies a favored position compared to the others belonging to the same category, so enhancing the level of lock-in and loyalty." There are theoretical reasons and empirical evidences that show usability as a significant factor for individuals' continued use of technological applications (Agarwal & Venkatesh, 2002;

Devaraj, Fan & Kohli, 2002; Hong, Thong, & Tam, 2004; Venkatesh & Agarwal, 2006; Venkatesh & Ramesh, 2006; Wells, Valacich, & Hess, 2011). Thus, it is hypothesized that:

Hypothesis Four: Application usability positively influences continuance intention to use an application.

Also, application quality and usability may mediate the influence of application personality on users' continuance intentions to use an application, respectively. Therefore, we hypothesize:

Hypothesis Five: Application quality mediates the relationship between mobile application personality dimensions (a) enthusiasm, (b) genuineness, (c) sophistication, and (d) unpleasantness and continuance intention to use an application.
Hypothesis Six: Application usability mediates the relationship between mobile application personality dimensions (a) aesthetics, (b) ease of use, and (c) perceived control and continuance intention to use an application.

RESEARCH METHODOLOGY

This paper utilizes a survey method to investigate factors that influence users' continuance intention to use a mobile application. Structural equation modeling (SEM) with Statistical Package for the Social Sciences (SPSS 23) and AMOS 23 is used to analyze the survey data collected from 431 smartphone users in China. SEM is a multivariate statistical analysis technique that is used to analyze structural relationships. Using a combination of factor analysis and multiple regression analysis it analyses a structural relationship between measured variables and latent constructs. We have preferred to employ SEM in this study because it helps as estimates the multiple and interrelated dependence in a single analysis. In SEM there are two types of models. The measurement model represents the theory that specifies how measured variables come together to represent the theory. The structural model represents the theory that shows how constructs are related to other constructs.

Operational definition and measurement items adopted from previous researches are summarized in Table 1 below. After the pilot study, the main survey is conducted using a collected questionnaire from an online WeChat's direct message.

Measurements

The questionnaire used in this research has two parts. The first part collects participant's demographic information (i.e., gender, age, education, occupation, and smartphone average usage time). The second part is prepared by items adopted from previous studies to measure each construct. Table 1 illustrates the variables and measurement items. A total of 32 measurement items are put together to check the perception of users. The items for enthusiasm, genuineness, sophistication, unpleasantness, and application quality are adapted from Poddar, Donthu, and Wei (2009). Aesthetics is measured using three items from Sánchez-Franco and Martín-Velicia (2011). The items for ease of use are adapted from Lund (2001) and the measurements for perceived control are from Koufaris, Kambil, and Labarbera (2001). Application usability is measured with five items (Casaló, Flavián, & Guinalíu, 2008). As to continuance intention to use a mobile application, items from Bhattacherjee (2001) are adopted. Items of 10 constructs used in this study are assessed using a 7-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (7)".

Pilot Survey

An online survey is used to collect sample data from smartphone users in China. Before conducting the survey, the English version questionnaire is translated to the Chinese language. The questionnaire in

Table 1. Variables and Measurements

Variables	Operational Definitions	Measurement items	References
Enthusiasm	User's judgment about the mobile application presents a friendly, lively, and generally welcoming atmosphere, resulting in the structure of the mobile application. (e.g., the color scheme, or the even over layout).	1. This Mobile Application can be described as welcoming to all. 2. This Mobile Application can be described as friendly. 3. This Mobile Application can be described as lively.	Poddar, Donthu, and Wei (2009)
Genuineness	User's judgment about the mobile application when its interface implies reliability (i.e., reliable, trustworthy and honest).	1. This Mobile Application can be described as reliable. 2. This Mobile Application can be described as trustworthy. 3. This Mobile Application can be described as honest.	
Sophisticated	User's judgment about the mobile application when it seems as high class, stylish, or selective.	1. This Mobile Application can be described as a high class. 2. This Mobile Application can be described as stylish. 3. This Mobile Application can be described as selective.	
Unpleasantness	User's perception of the overall process of dealing with the mobile application feels unpleasant and irritating.	1. This Mobile Application can be described as irritating. 2. This Mobile Application can be described as superficial. 3. This Mobile Application can be described as outmoded.	
Application Quality (AQ)	The perceived overall quality of an application according to the user's viewpoint.	1. This Mobile Application is of high quality. 2. The likely quality of this Mobile Application is extremely high. 3. This Mobile Application must be of very good quality.	Poddar, Donthu, and Wei (2009); Yoo and Donthu (2001)
Aesthetic (AES)	A subjective perception of a mobile application to display freshness and rightness that elicits stimulation and pleasure and is consistent with the user's preferences.	1. This Mobile Application screen design (i.e., colors, boxes, menus, etc.) is attractive. 2. This Mobile Application looks creatively designed. 3. The overall look and feel of this Mobile Application is visually appealing.	Sánchez-Franco and Martín-Velicia (2011); Zeng, Salvendy, and Zhang (2009)
Ease of Use (EOU)	User's subjective perception regarding the amount of effort necessary to learn and use a technology.	1. Overall, I think this Mobile Application is easy to use. 2. Overall, I think this Mobile Application is simple to use. 3. Overall, I think this Mobile Application is user-friendly.	Hampton-Sosa and Koufaris (2005); Lund (2001)
Perceived Control (PC)	One's perception of one's ability to perform a given behavior.	1. During my using this Mobile Application I felt confused. 2. During my using this Mobile Application I felt calm. 3. During my using this Mobile Application I felt in control.	Ajzen (1991); Koufaris, Kambil, and Labarbera (2001)
Application Usability (AU)	The extent to which the user and the system can communicate clearly and without misunderstandings through the interface.	1. The structure and contents of this Mobile Application are easy to understand. 2. This Mobile Application is simple to use, even when using it for the first time. 3. It is easy to find the information or function I need from this Mobile Application. 4. It is easy to move within this Mobile Application. 5. Overall, I think this Mobile Application is useful.	Benbunan-Fich (2001); Casaló, Flavián and Guinalíu (2008)
Continuance Intention (CI)	The degree to which a user feels he or she will keep using a mobile application.	1. I intended to continue to use this Mobile Application. 2. I predict I would continue to use this Mobile Application. 3. I plan to continue to use this Mobile Application in the near future.	Bhattacherjee (2001); Casaló, Flavián, and Guinalíu (2008)

the Chinese language is again back-translated to English to realize the effectiveness of the translation and maintain the questionnaire's validity. To ensure the feasibility of the survey, before the main survey, we conducted a pilot study first. From the total questionnaires we have distributed, 74 of the people who use a smartphone have answered the survey questionnaire online. All the variables seemed to have significant reliability except for perceived control (PC), where we have deleted the

item PC1. And some of the variables like enthusiasm (ENT), sophistication (SOP), perceived control (PC), application quality (AQ), and application usability (AU) does not have significant validity. Therefore, items like ENT1, SOP1, SOP3, PC3, AQ2, AU1, AU4, and AU5 were deleted; as their factor loadings are lower than 0.6.

The first item of enthusiasm (ENT), which reads as "This Mobile Application can be described as welcoming to all", is deleted as users may not think it exudes a welcoming atmosphere from the structure, the color scheme, or even the overall layout of a mobile application. As to sophistication (SOP), only one item about being stylish is used which is modified from Poddar, Donthu, and Wei (2009). The application personality reflects the user's mental imagery as it relates to the application; on the other hand, it is the "set of human characteristics associated with the typical user of the store or service" (Aaker, 1997). If users often realize that a specific product or service is sophisticated, that product or service makes the people develop a sophisticated personality. This personality becomes more important if users start to recommend their mobile application preferences to their friends and family. The second item of application quality (AQ), which reads as "The likely quality of this Mobile Application is extremely high", is deleted as users do not determine the quality of a mobile application by the way an application looks like. In the case of perceived control (PC), many studies measured items which refers to users' feelings of calmness, confusion, and control, and other aspects (Ghani, Supnick, & Rooney, 1991; Koufaris, 2002; Koufaris, Kambil, & Labarbera, 2001; Novak, Hoffman, & Yung, 2000), only one item is adopted about calmness which is modified from (Koufaris, Kambil, & Labarbera, 2001). As smartphone and mobile applications become more popular, users have had more chances to interact with applications; they do not have confusion about application anymore and do not care how much they feel in control during the using process. So, roles like confusion and control are no longer important. And for the application usability (AU), although a lot of studies defined many aspects (attributes) of usability for online behavior (Chiu et al., 2005; Hoehle & Venkatesh, 2015; Sánchez-Franco & Martín-Velicia, 2011), in this study we have used only two items about learnability and efficiency which is modified from Casaló, Flavián and Guinalíu (2008) because the role of usefulness is not important for all applications.

Main Survey

The main survey is conducted for two weeks by collecting data from 435 smartphone users in China. Following the questionnaire design, the survey was conducted on the SoJump website (http://www.sojump.com), a professional online survey service platform in China. The questionnaires were distributed online via WeChat's direct message for the survey. The response rate was 100 percent. All participants had answered all the questions and submitted them. After deleting 4 because of incompleteness, the final valid sample size was 431. As the demographic information shows (Table 2), a total of 70.5 percent of the respondents were female. Most of the respondent's age ranges from 18 to 25 (34.6%). The majority groups of the respondents were office workers (56.6%) and about 44.5% of the total respondents hold bachelor's degrees. Besides, close to half of the respondents (43.2%) spend more than 5 hours a day using their smartphone.

RESULTS

A total of 431 data is collected from the online survey in China to test the research model. Structural Equation Modeling (SEM) with SPSS 23 and AMOS 23 is used to evaluate the survey data. SPSS is used to test Cronbach's alpha. AMOS is used to conduct a Confirmatory Factor Analysis (CFA) and examine the validity. Following the two-step approach recommended by Anderson and Gerbing (1988), first, the measurement model is examined to test reliability and validity, and then the structural model is inspected to evaluate the model fitness and test the research hypotheses using AMOS.

Table 2. Demographics of Respondents (N=431)

Demographic Profile		Frequency	Percentage
Gender	Male	127	29.5%
	Female	304	70.5%
Age	<18	31	7.2%
	18~25	149	34.6%
	26~30	121	28.1%
	31~40	100	23.2%
	41~50	15	3.5%
	>50	15	3.5%
Education	High school	56	13%
	Collage	107	24.8%
	Bachelor	192	44.5%
	Master	60	13.9%
	Doctorate	13	3%
	Other	3	0.7%
Occupation	Student	142	32.9%
	Working	244	56.6%
	Retired	16	3.7%
	Unemployed	24	5.6%
	Other	5	1.2%
Smartphone average usage time	< 1 hour	9	2.1%
	1~2 hours	27	6.3%
	2~3 hours	52	12.1%
	3~4 hours	76	17.6%
	4~5 hours	81	18.8%
	> 5 hours	186	43.2%

Reliability and Validity

First, the three most important assumptions in SEM namely multivariate normality, multicollinearity, and sample size were observed. The maximum Mahalanobis distance of our data is 143.302. After computing for the Mahalanobis distance critical, which is 51.18, twenty-nine (29) outliers were identified. Those outliers were excluded for analysis from our sample size. The collinearity statistics data shows that the value of Tolerance for all the items is greater than 0.01 and VIF values are all less than 10. Therefore, the multicollinearity assumption is also satisfied. SEM sample size calculator suggested a recommended minimum of 232 sample size, but the total sample used in the study is 404. Hence, the sample data is more than enough. Furthermore, the assumptions of linearity (mostly of them have a linear relationship), homoscedasticity (adding a loess line to the scatter plot showed no sharp angles. It is relatively straight line), variance (no variance of any one of the measured variables is greater than 10 times more than any of the other variance), and positive definiteness (Determinant=9.492E-9) are also not violated. Therefore, all the assumptions are adequately addressed. Second, Bartlett's Test of Sphericity has displayed a significant result which means at least two of

the variables are strongly correlated, so a Factor Analysis could be done. Factor loadings from a rotated component matrix extracted using Varimax rotation are shown in Table 3. The reliability of each construct is evaluated using a Composite Reliability (CR) and Cronbach's alpha values. Table 3 presents the validity and reliability test results (including related statistical values of factors and scales). According to Table 3, the Cronbach's alpha value, except for Sophistication (SOP) (slightly less than 0.7) and Perceived Control (PC), which each had two items, is over the acceptable value of 0.7 (Bagozzi and Yi 1988; Nunnally and Bernstein 1967). Except for SOP and PC, because of having only two items, and Enthusiasm (ENT) (AVE=0.478 & CR=0.730) all other constructs have shown

Table 3. Validity and Reliability

Construct	Mean	SD	Skewness	Items	Factor Loadings	Cronbach's Alpha	CR	AVE
ENT	6.05	0.74	-0.69	ENT1	.788	0.72	0.730	0.478
				ENT2	.419			
				ENT3	.464			
GEN	5.75	0.88	-0.37	GEN1	.804	0.87	0.867	0.685
				GEN2	.786			
				GEN3	.772			
SOP	5.86	0.84	-0.43	SOP1	.464	0.68		
				SOP2	.781			
UNP	1.99	1.10	1.71	UNP1	.836	0.82	0.821	0.605
				UNP2	.829			
				UNP3	.799			
AES	5.20	1.06	-0.04	AES1	.867	0.91	0.914	0.780
				AES2	.837			
				AES3	.876			
EOU	6.29	0.73	-1.15	EOU1	.641	0.84	0.841	0.638
				EOU2	.745			
				EOU3	.748			
PC	4.29	0.77	0.15	PC2	.586	0.42		
				PC3	.582			
AQ	5.58	0.88	-0.15	AQ1	.590	0.85	0.851	0.657
				AQ2	.576			
				AQ3	.551			
AU	6.04	0.74	-1.04	AU1	.711	0.81	0.825	0.598
				AU2	.796			
				AU4	.595			
CI	6.24	0.96	-1.71	CI1	.839	0.94	0.939	0.838
				CI2	.875			
				CI3	.878			

CR = Composite Reliability, AVE = Average Variance Extracted

an acceptable value of Composite Reliability (CR>0.7) and Average Variance Extracted (AVE>0.5). Fornell and Larcker (1981) suggest that if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate. Since the CR for Enthusiasm is higher than 0.6 the result could be accepted as satisfactory. Lastly, the discriminant validity test is conducted where Enthusiasm, Sophistication, and Perceived Control have failed to achieve the minimum requirement. Factor correlations and correlations squared are used to compare the AVEs of each item (refer to Table 4). Although the results show that a significant number of the items satisfy the minimum requirement, a considerable number of items fail to achieve the expected value.

Fit Indices of the Proposed Model

The model is tested for model fit and parameter estimates. The main indices to verify the fitness of the model are X2/df and the associated p-value, CFI, GFI, AGFI, SRMR, RMR, NNFI, RMSEA, IFI, PGFI, and PNFI. The generally recommended values are shown under each fit index (refer to Table 5).

As shown in Table 5, the ratio of all the results is all following the required minimum acceptable point, showing that the measurement model fits the empirical data satisfactorily.

Hypothesis Testing

Individuals' responses to online questions about an intention to continually use mobile applications were collected and analyzed. Structural equation modeling is used in our paper to construct a predictive model of user continuance use toward IS infusion (Koo, Chung, & Kim, 2015).

Structural model analysis is done to test the significance of the hypotheses. As to the relationship between application personality and application quality, only two of the four items i.e., Genuineness

Table 4. Factor Correlation Matrix with Square Root of the AVE on the Diagonal

	EOU	ENT	GEN	SOP	UNP	AES	PC
EOU	0.816						
ENT	0.791	0.715					
GEN	0.577	0.750	0.811				
SOP	0.732	0.843	0.612	0.518			
UNP	-0.646	-0.652	-0.574	-0.492	0.701		
AES	0.434	0.568	0.479	0.887	-0.283	0.781	
PC	0.757	0.780	0.722	0.883	-0.625	0.443	0.551

Table 5. Model Fit Indices of the Proposed Model

Absolute					
X2/df	*GFI*	RMSEA	RMR	SRMR	AGFI
2.064	.902	.051	.045	.000	.867
<5	≥0.8	≤0.10	≤0.10	≤0.08	≥0.50
Incremental			**Parsimony**		
CFI	*NNFI*	*IFI*	*PGFI*	*PNFI*	
.955	.917	.955	.666	.728	
≥0.90	≥0.90	≥0.90	≥0.50	≥0.50	

and Sophistication are verified to positively influence application quality, and Enthusiasm and Unpleasantness are not verified to positively and negatively influence application quality, respectively. Thus, H1a and H1d are not supported; while H1b and H1c are supported. And as to the relationship between user perception and application usability, except Aesthetics, the other two variables are verified to positively influence application usability. Thus, H2b and H2c are supported. H3 is accepted due to the impact of application quality on continuance intention to use a mobile application is strongly positive. H4 is also supported by the result that application usability positively affects continuance intention to use a mobile application. Table 6 below summarizes the result of hypothesis testing.

Mediating Effect Analysis

To test the mediating effect, the hypothesis that states application quality in mediating the relationship between application personality and continuance intention to use a mobile application and the hypothesis that states application usability is mediating the relationship between user perception and continuance intention to use a mobile application, are tested.

The test for mediation is done using AMOS bootstrapping, which now becomes more popular in the literature, with 2000 iteration to make the estimates more reliable. For each of the mediation hypotheses direct and indirect effect is extracted together with the p-value related to it. Accordingly, Table 7 summarizes the result of the mediation effect.

Table 6. Parameter estimates and hypothesis test

Hypotheses		Estimate	T-value	P	Conclusion
H1(a)	AQ ← ENT	.158	1.172	.241	Not Supported
H1(b)	AQ ← GEN	.188	2.755	.006	Supported
H1(c)	AQ ← SOP	.834	6.099	***	Supported
H1(d)	AQ ← UNP	-.109	-1.855	.064	Not Supported
H2(a)	AU ← AES	.019	.513	.608	Not Supported
H2(b)	AU ← EOU	.514	5.009	***	Supported
H2(c)	AU ← PC	.538	4.917	***	Supported
H3	CI ← AQ	.201	3.630	***	Supported
H4	CI ← AU	.581	8.690	***	Supported

***=p<0.001, **=p<0.05

Table 7. Result of the mediating effect

Hypothesis	Direct Effect (X→Y)	Indirect Effect	Result
ENT→AQ→CI	-.113 (ns)	.134***(s)	Full mediation
GEN→AQ→CI	-.028 (ns)	.129***(s)	Full mediation
SOP→AQ→CI	.228*** (s)	.059***(s)	Partial mediation
UNP→AQ→CI	-.040 (ns)	-.047***(s)	Full mediation
AES→AU→CI	-.149*** (s)	.016(ns)	Partial mediation
EOU→AU→CI	.365*** (s)	.071(ns)	Partial mediation
PC→AU→CI	-.008 (ns)	.021(ns)	Full mediation

***=p<0.001; ns = "not significant"

DISCUSSION

After analyzing the data, the following findings are derived. First, two dimensions of application personality genuineness and sophistication have a positive and significant influence on application quality. Sophistication has the most impact on application quality. Surprisingly, enthusiasm hasn't shown a significant positive influence on application quality and unpleasantness also hasn't shown a negative and significant influence on application quality. Thus, it could be said that application users are not concerned about the risk and privacy issues all the time and are not disturbed by the unpleasantness of an application. Furthermore, it is confirmed that the perceived whole quality of an application only partly depends on the user's viewpoint. Second, two of the three dimensions of user perception ease of use and perceived control have shown a positive and significant influence on application usability. Aesthetics happen not to have a significant influence on the usability of an application. Even though prior studies suggest that the success of an information system (IS) is how they arousal superiority interactions, of which aesthetics forms an important part (Schaik & Ling, 2009), the findings suggest that aesthetics is not positively influencing the usability. In nutshell, if users have positive emotional impressions of a mobile application by aesthetics, they will more probably underestimate any negative effect that may come up during their virtual experiences or head off those which are not visually appealing. Unfortunately, aesthetics, which provides utilitarian benefits in an online setting, does not affect the continuance intention of users. The benefits that an application provides can be not be addressed by the important connection between aesthetics and usability. In the case of ease of use and perceived control, even though one item is captured for perceived control, it still has a positive and significant influence on application usability. However, application users still care about how easily they can interact with the application and how much they feel calm during that process. Third, after the mediating effect test, the results support the hypotheses proposed in this study. Particularly, three fully mediating effect is found in the relationship between enthusiasm, genuineness, and unpleasantness and continuance intention to use application by application quality; and one fully mediating effect on the relationship between perceived control and continuance intention to use application by application usability.

The results (refer to Table 7, Figure 2, and Figure 3) support that enthusiasm, genuineness, and unpleasantness affect users' continuance intentions to use an application because of application quality.

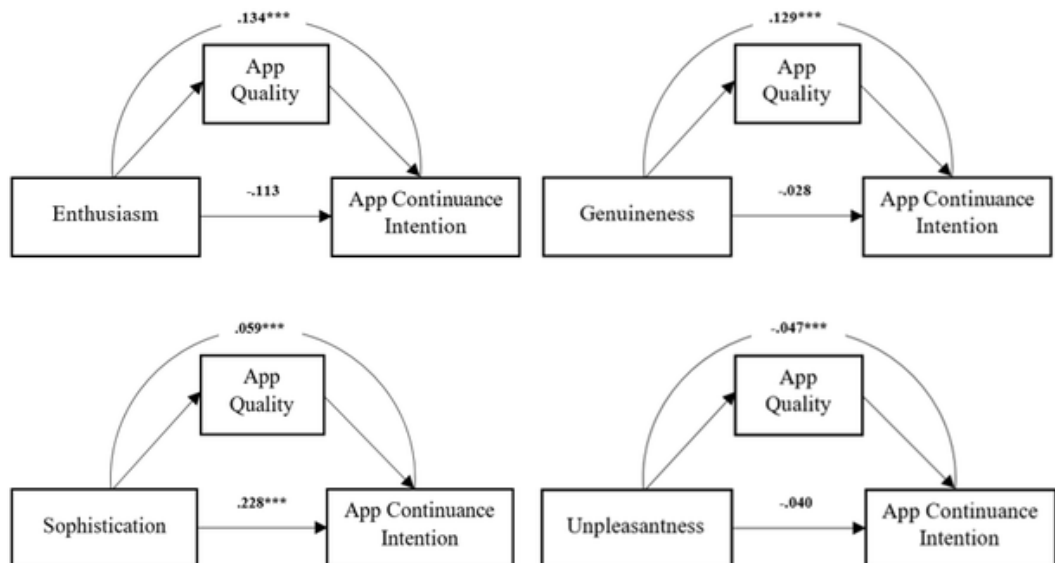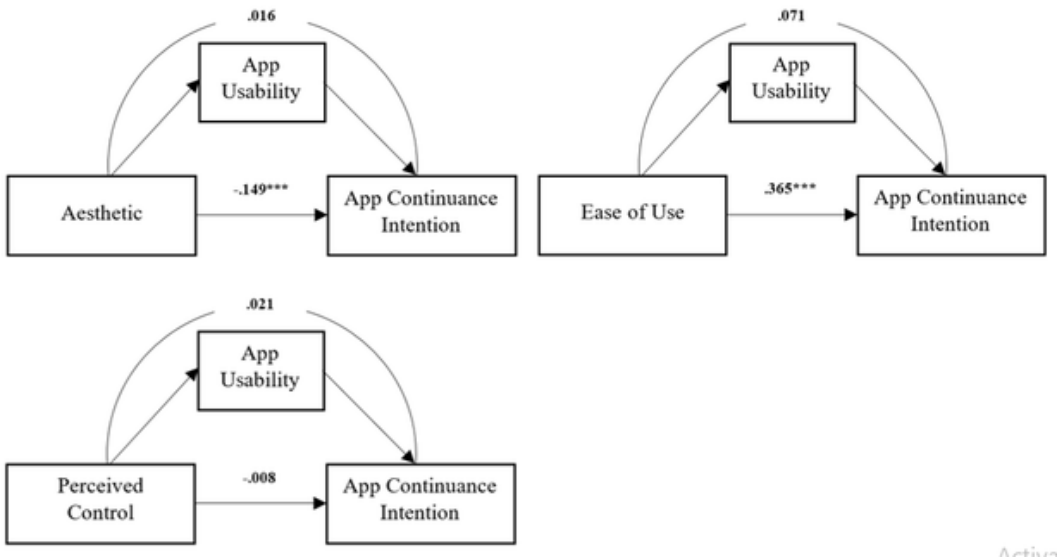**Figure 2. Application Quality Mediation**

Figure 3. Application Usability Mediation

Reliability, trustworthiness, and honesty are shown to be significant features of mobile applications in realizing continued use. Being high class and stylish are also preferred by users. Besides, users would like the application to be user-friendly and easy to use. The control over the mobile application they use also gives comfort to the users. Perceived control affects users' continuance intentions to use an application because of application usability. In other words, the quality of an application cannot stimulate users' intent to continue using a mobile application without quality evaluation, positive affective impression, and calmness. For enthusiasm, genuineness, and unpleasantness, application quality serves as a perfect mediator and so does application usability for perceived control.

Lastly, application quality and usability have a positive and significant influence on users' continuance intention to use a mobile application. Therefore, an important condition for the success of a mobile application is ensuring users' experience, via the interface, perceiving both their perceptual and functional needs.

The findings could have been different if there were more than one item to measure perceived control and sophistication, the gender composition of in the study is proportional (about 70% of the respondents were female, and if a specific mobile application was considered. Even though this study believes there would not be any significant difference in the result because of the gender composition of the respondents, future studies should consider the proportion. Furthermore, depending on its applicability, future studies should take into account the type of mobile application being used.

Theoretical Implications

Several theoretical implications can be drawn from this study. First, the key factors in users' continuance intention to use an application are empirically verified. Only a few prior researchers studied the continuance intention of using a mobile application. Therefore, this study will prompt new questions for further studies and provide more guidelines for mobile application developers seeking to enhance the experience for their customers. Second, this study has come up with valuable and meaningful results that provide experiential guidelines for further research related to application personality and user behavior across different types of mobile applications. This study provides evidence as to how new customers might use their perceptions of an application to form beliefs about the service after their first usage. Third, this study explores application personality and investigates whether a website

personality approach applies to a mobile environment. Specifically, this study investigates application personality, in association with user perception, influences on application quality, usability, and users' continuance intentions to use a mobile application. This empirical research also contributes to future studies by using constructs from four different categories to studying users' continuance behavior, i.e., perceived application personality, user perception, perceived application quality, and perceived application usability.

Practical Implications

Understanding the mobile application personality offers firms a competitive advantage in the marketplace. The personality can get the groundwork for a company or brand's application policies and have an impact on everything from the mode application interaction with their customers to advertising strategy. The results suggest that mobile application providers should develop a long-term strategy to improve the usability and quality aspect of the service to maintain or enhance users' loyalty.

To enhance long-term use and gain users' loyalty, mobile application developers should focus on easing users' effort necessary to learn and use applications and being honest about the service being delivered to them. Even though sophistication and perceived control were measured with only one item, our findings show that both had a significant positive impact on application quality and application usability, respectively. This suggests that mobile application developers should give strong regard to the user's judgment that a mobile application should be stylish and should create the feeling of being calm while using the application.

CONCLUSION

The success of an information system is not judged by its initial adoption rather it is dependent on its continuance usage. Mobile application service providers should give key attention to retaining users and facilitating their continuance usage. The objective of this study is to investigate the influencing factors of continuance intention to use a mobile application. As a result, two of the application personality dimensions genuineness and sophistication; and two of the dimensions of user perception ease of use and perceived control have a significant positive influence on application quality and application usability respectively. Users give more value to the reliability, trustworthiness, and honesty of the mobile application they use. The style of the mobile application or an application that is considered to be a high class is preferred more by users. In addition, those applications that are user-friendly and simple to use are given priority over the complex ones. Users also feel comfortable when they have control over what they are doing with the applications. Besides, application quality and usability have a significant positive influence on users' continuance intention to use a mobile application. Being a high-quality application and easy to understand and use are shown to be preconditions for continuous use. Application quality is fully mediating the relationship between application personality dimension enthusiasm, genuineness, and unpleasantness and users' continuance intention to use a mobile application and application usability is fully mediating the relationship between user perception dimension perceived control and users' continuance intention to use a mobile application. All the remaining applications and user perception dimensions are partially mediated by application quality and application usability.

Limitations

This research work also has some limitations. First, the model did not distinctly contain all the related personality dimensions. For example, dimensions of information quality, service quality, users' perceived value, and reputation were required to be considered for analyzing user behavior. Future studies should consider all the deemed necessary personality dimensions that could be applied to a mobile application setting. Second, the data is collected from an online survey only in China. Because cultural differences have been found to influence online behavior (Chae et al., 2002), results may be

different for participants from other countries or geographic regions. Further work is also needed to examine how prior experience with a mobile application can influence perceptions of usability. The effects of the determinants in the research model may change with increasing user experience over time. Third, as shown in Table 3, the mean value of some constructs is over 6. Therefore, the skewness of the constructs is assessed. Skewness measures the value of the asymmetry of the distribution of a construct. The value of skewness of a normal distribution is 0, usually implying symmetric distribution. West, Finch, and Curran (1995) proposed a reference to normality, while sample sizes greater than 300, determining substantial non-normality it depends on the absolute values of skewness larger than 2. Referring to Table 3, all the constructs appeared to be acceptable. But the mean value of some constructs is still too high, considering the first question of the questionnaire (refer to Table 3), on a subconscious level that participants will most likely choose a satisfactory application. Furthermore, for the most commonly used applications, people's demand for certain features is relatively uniform and high. Thus, future studies should consider focusing on one or more categories of applications. Finally, even though this study is primarily focused on examining the application personality and user perception dimensions of a mobile application, factors like the education level, age, and gender could also be used to observe their moderating effect on application quality. Forgas-Coll et al. (2013) found that although gender doesn't a significant influence, educational level of the user has a significant positive influence on the website quality and e-satisfaction. There may be a positive relationship between application usability and application quality. Ruyter, Bloemer, and Peeters (1997) also assure that perceived usability is significantly associated with perceived quality. Thus, future studies should consider other factors that might moderate the relationship between a mobile application and its continued use.

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