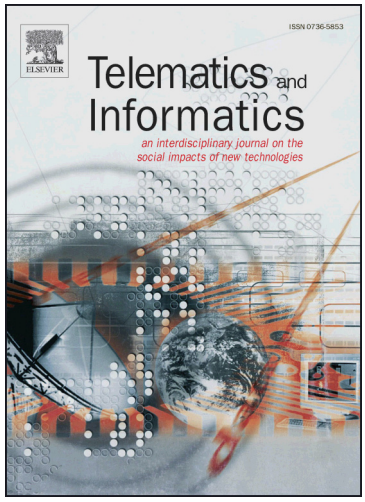

Examining the Antecedents and Consequences of Mobile App Engagement

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Examining the Antecedents and Consequences of Mobile App Engagement

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Examining the Antecedents and Consequences of Mobile App Engagement

Abstract

Understanding how and why consumers engage with mobile apps is critical to the success of ubiquitous mobile marketing. This study proposed and tested a structural model to investigate the antecedents and consequences of mobile app engagement. Results show that time convenience, interactivity, and compatibility positively influenced mobile app engagement, in turn leading to strong relationship commitment and self-brand connections. Furthermore, informational and experiential mobile apps moderated the effects of time convenience, interactivity, and compatibility on mobile app engagement. Theoretical and practical implications for effective app engagement strategies are discussed.

Keywords: mobile app, innovation, consumer engagement, relationship commitment, self-brand connections

The advent of the smartphone has enabled marketers to harness the power of spontaneous, non-geographically bound mobile applications (apps, hereafter). Over the past few years, the mobile app market has experienced tremendous growth and is expected to grow 270% from $70 billion in 2015 to $189 billion in 2020 (App Annie, 2015). Not surprisingly, mobile apps provide various benefits to both consumers and marketers. Consumers have quick, convenient, and easy one-touch access to apps while performing all manner of daily activities, such as buying products, paying bills, playing games, and keeping in touch with friends. Marketers have acknowledged that, in digital environments, mobile apps provide an essential brand communication channel, allowing seamless connecting with consumers and increasing brand loyalty (Wang, Malthouse, & Krishnamurthi, 2016). Mobile apps clearly help marketers build enduring relationships with their customers, potentially enhancing enjoyable customer interaction, favorable attitude toward a brand, and revenue growth (Bellman, Potter, Treleaven-Hassard, Robinson, & Varan, 2011). However, although app usage is widespread, nearly 80% of app users stop using a new app within 90 days (Perro, 2017). How do marketers increase mobile app retention and nurture consumer-brand relationships?

Building on a relational view of marketing, as opposed to the transactional view (Park & Kim, 2014), engagement has frequently been used to account for the motivational experiences that consumers have when connecting with media channels or brands (Kim, Lin, & Sung, 2013; Wu, 2016). Consumers are likely to express favorable responses to brands that design more engaging mobile apps (Bellman et al., 2011). Previous studies have confirmed that consumer engagement positively influenced online consumer experience (Mollen & Wilson, 2010), perceived value of mobile social networks (Wu, 2016), and advertising receptivity (Kilger &

Romer, 2007). However, relatively little research has been devoted to examined which app features foster consumer engagement and consumer-brand relationships in digital environments.

A growing body of information and communication technology research has focused on innovation. Indeed, technological innovation allows brands to develop and implement effective customer relationship management, which embraces the practical values of relationship marketing (Sun, 2006). Innovative advances in mobile app technology offer greater opportunities to engage individual consumers and build mutually beneficial relationships with them. Many branded mobile apps have effectively engaged consumers by heightening virtual connectivity and improving context-dependent functions of innovative mobile technologies (Pantano & Priporas, 2016). For instance, the Nike+ Run Club app allows users to track physical activity at their convenience, easily monitor calories burned, access personalized coaching, and interact with friends. These features could add innovative value to healthy living and foster long-term relationships with the brand. Following this logic, marketing practitioners are increasingly interested in how innovative features of mobile apps can be used to build relationships with customers. Nevertheless, how mobile app engagement leads to a sustainable relationship with a brand (personified by a mobile app) remains unknown. Given that consumer engagement is a prerequisite for the success of mobile app strategies for relationship marketing (Kim, Lin, & Sung, 2013), studying the consumer's relational processing of mobile app engagement has important implications for strategic retention management.

The first purpose of the current study was to identify the innovative characteristics that consumers perceive in mobile apps and empirically test their effects on mobile app engagement, relationship commitment, and consumer-brand connections in a structural model of relationship building. The second purpose was to examine whether differences between informational and

experiential apps exist in the relationships between innovative characteristics of mobile apps and consumer engagement. Managerially, the findings of this study should help mobile marketers fine-tune their relationship marketing strategies that involve mobile apps.

Theoretical Background

Mobile App Engagement as a Motivational Experience

Considerable attention has been paid to consumer engagement from various perspectives (Tarute, Nikou, & Gatautis, 2017). In the interactive advertising literature, consumer engagement has been understood as an umbrella term for digital media mechanisms that contribute to the generation of brand value (Mollen & Wilson, 2010). As suggested by the Advertising Research Foundation (ARF), engagement is turning on a potential consumer to a brand idea enhanced by the surrounding context (Elliott, 2006). From a behavioral perspective, Van Doorn et al. (2010) viewed customer engagement as "a customer's behavioral manifestations that have a brand or firm focus, beyond purchase, resulting from motivational drivers" (p. 254).

However, consumer engagement can be characterized as a psychological process that evolves from an ongoing experience with a focal agent or object (e.g., Bowden, 2009; Brodie, Ilic, Juric, & Hollebeek, 2011). The notion of engagement—being involved, occupied, and interested in something —is recognized as the sum of motivational experiences (Higgins, 2006, p. 442). According to Calder, Malthouse, and Schaedel (2009), engagement is manifested through consumer experience with a particular media channel (i.e., a consumer's beliefs about how media fit into his or her life). Extending this proposition, the current study conceptualizes mobile app engagement as the quality of motivational experiences that consumers have when connecting with a mobile app and how those experiences satisfy their functional, experiential, and social expectations.

Consumer engagement is conceptually different from other relational concepts, such as involvement and participation (Brodie et al., 2011; Mollen & Wilson, 2010). Engagement, as a psychological state, embraces the dynamic and interactive relationship with a focal agent/object (e.g., a brand, product, or media) that satisfies the instrumental (i.e., utility) and experiential (i.e., emotional satisfaction) values of a consumer (Brodie et al., 2011). However, involvement represents a sense of personal relevance of an object or product based on inherent needs and interests (Fang, Zhao, Wen, & Wang, 2017). Participation reflects the behavioral consequences of engagement (Brodie et al., 2011).

A considerable number of researchers have investigated the potential determinants of individual engagement with traditional mass media (Kilger & Romer, 2007), websites (Calder, Malthouse, & Schaedel, 2009), and virtual brand communities on social networking sites (Islam & Rahman, 2017; Tsai & Men, 2013). For example, Kim, Kim, and Wachter (2013) found that mobile engagement intention was established through motivation, perceived value, and satisfaction. Extending attention already given to traditional and digital media engagement, the findings of the current research should shed light on the innovative nature of consumer engagement with mobile apps.

Conceptual Framework and Hypotheses

Diffusion of innovation theory (Rogers, 1983) provides a conceptual basis for identifying innovative characteristics that shape mobile app engagement. This theory has been used to examine complex patterns of new technology adoption, suggesting five attributes of innovation: relative advantage, compatibility, complexity, trialability, and observability. Innovation, defined as the extent to which people are relatively earlier in adopting a new idea, product, or method than other members of a social system (Rogers, 1983), is essential to understanding the consumer

engagement-decision process. For example, consumers with a high degree of innovativeness are highly likely to adopt wearable technology (Jeong, Kim, Park, & Choi, 2017).

Drawing upon the diffusion of innovation perspective, Kang, Mun, and Johnson (2015) developed and tested a structural model of perceived innovation characteristics, showing that time convenience, interactivity, compatibility, and effort expectancy led to higher intention to download and use retail apps. However, their work focused on women who used specific location-based retail apps, reducing generalizability. Furthermore, they did not fully capture how perceived innovative characteristics might influence mobile app engagement, relationship commitment, and consumer-brand connections, which had previously been identified as important outcomes in relationship marketing studies. To fill this gap, this current study used a heterogeneous sample to explore the innovative determinants of mobile app engagement and their effects on consumer-brand relationships via two types of mobile apps (i.e., informational and experiential).

Time Convenience

Time convenience is the degree to which a consumer perceives that mobile app technology provides instantaneous and timely benefits (Kleijnen, Ruyter, & Wetzels, 2007). The concept of time convenience reflects the "relative advantage" of mobile apps derived from the diffusion of innovation theory (Kang, Mun, & Johnson, 2015). Time convenience of mobile apps allows consumers to obtain brand/product information or access promotions without any temporal constraint (Zhao & Balagué, 2015).

Previous studies suggest that time convenience leads to greater perceived value of mobile channel usage (Kleijnen, De Ruyter, & Wetzels, 2007). Notably, increased perceived value—defined as "the consumer's overall assessment of the utility of a product based on perceptions of

what is received and what is given" (Zeithamal, 1988, p. 14)—serves to maximize expected utility (Anderson & Srinivasan, 2003). Perceived value of mobile services is primarily driven by convenience value that reflects the speed of achieving a goal or task effectively and efficiently (Pihlström & Brush, 2008). Perceived value has been shown to activate mobile engagement intention (Kim, Kim, & Wachter, 2013; Kim, Baek, Kim, & Yoo, 2016). Engagement is likely to increase when consumers perceive the utility value in their digital experience (Brodie et al., 2011; Mollen & Wilson 2010). Consistent with the aforementioned point of view, Wu (2016) found that time convenience increased media engagement by increasing mobile app usage and information sharing through online social networks. For this reason, when consumers perceive mobile apps as temporally convenient and an instantaneous way to achieve a specific goal or task, they are likely to feel engaged with the apps due to an increase in utility value. Therefore, the following hypothesis was proposed:

H1: Time convenience will positively relate to mobile app engagement.

Interactivity

Researchers have conceptualized and operationalized interactivity in various ways. In general, there are two complementary perspectives: (a) technological properties and (b) user perception (Yim, Chu, & Sauer, 2017). One view suggests that the interactivity of a medium is defined in terms of its technological components, such as speed, mapping, and range capability (Steuer, 1992). Another view is that interactivity encompasses the subjective perceptions of users (McMillian & Hwang, 2002). Yim, Chu, and Sauer (2017) found that perceived interactivity can be shaped by a technologically effective delivery process that motivates an individual to communicate. The current study focused on user perceptions of interactivity, defined as "the degree to which two or more communication parties can act on each other, on the

communication medium, and on the messages and the degree to which such influences are synchronized" (Liu & Shrum, 2002, p. 54).

Perceived interactivity is related but also conceptually distinct from time convenience. The concept of interactivity captures the nature of reciprocity (Johnson, Bruner, & Kumar, 2006), two-way communication (Alba et al., 1997), and dialogue (Evans & Wurster, 1997) between users. Thus, mobile apps allow consumers to alternate between two active roles: sender and receiver. In fact, the extent to which a message exchange is reciprocal has been shown to influence perceived interactivity (Song & Zinkhan, 2008), and time convenience, by increasing the immediacy of information access and flow, facilitates quick responses.

Previous studies have shown that interactivity positively contributes to website usability (Ko, Cho, & Roberts, 2005), the financial performance of online retailers (Gu, Oh, & Wang, 2013), and perceptions of relationship management and organizational regulation (Lee & Park, 2013). In a similar vein, Islam and Rahman (2017) found that interactivity positively influenced consumer engagement in an online brand community, suggesting that interactivity plays an important role in connecting consumers to brands.

Several interactive features of mobile apps further enable marketers to provide unique brand experiences (Kim, Lin, & Sung, 2013) and increase consumer engagement in a way that makes branded information highly persuasive (Calder, Malthouse, & Schaedel, 2009). As Weevers (2011) pointed out, interactive mobile app features can strengthen consumer relationships, thereby enhancing brand value. In addition, a mobile app is a highly interactive medium that enables message recipients to reply to and engage with others immediately. Engagement can be facilitated by the spontaneous conversations that innovative technology permits (O'Brien & Elaine, 2008). Given the interactive features of mobile apps that help

consumers better connect with others and sponsoring brands, interactivity was expected to increase mobile app engagement. Thus, the following hypothesis was proposed:

H2: Interactivity will positively relate to mobile app engagement.

Compatibility

Compatibility is the extent to which an innovation is perceived to be consistent with the existing values, past experiences, and needs of potential consumers (Zolkepli & Kamarulzaman, 2015). The degree of compatibility is associated with heightened levels of personalization or customization, which is "the process of using a customer's information to deliver a targeted solution to that customer (Vesanen, 2007, p. 410). Indeed, some mobile apps offer a personalized technology platform equipped with location-awareness technology (Yun, Han, & Lee, 2013). Using global positioning system (GPS)-enabled mobile apps, marketers strive to reach their customers on a more personal level than ever before. For example, the TripAdvisor app makes use of location-based information in order to provide users with more tailored recommendations about hotels, flights, and restaurants (e.g., a "just for you" app feature that offers customized results for each individual based on their previous search activity, travel preferences, and behaviors). Another way that mobile marketers leverage compatibility is by using personalized push notifications. To illustrate, the H&M app uses push notifications and in-app messages to suggest additional items that match previous purchases.

Consumers are likely to stay engaged with mobile apps that have customization attributes, such as mobile keyword search, personal choice helper, push notifications, and location-based data (Kim, Lin, & Sung, 2013). Fang et al. (2017) found that high mobile app compatibility predicted psychological consumer engagement. In this sense, consumers are highly engaged with specific mobile apps when in-app content matches their needs and preferences. Based on these

findings, we expected that perceived compatibility would positively contribute to mobile app engagement. Thus, the following hypothesis was proposed:

H3: Compatibility will positively relate to mobile app engagement.

Effort Expectancy

Effort expectancy reflects a subjective perception of how easy or difficult understanding and using the system is (Fang et al., 2017; Venkatesh, Morris, Davis, & Davis, 2003). In psychology, effort refers to the amount of time, energy, and resources people invest in pursuing the desired goals (Baek & Yoon, 2017; Baek, Yoon, & Kim, 2015; Yoon, Kim, & Baek, 2016). In this study, effort expectancy is a measure of ease associated with using a mobile app. Effort expectancy is conceptually similar to perceived ease of use, a key component of the Technology Acceptance Model (TAM), which explains why individuals adopt new information technology (Davis, 1989). TAM posits that perceived ease of use will positively influence attitude toward an innovation, thereby increasing innovative technology adoption. However, TAM has been criticized for its inability to account for other possible factors that transcend perceived ease of use (Moon & Kim, 2001). As an extension of TAM, Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), which suggests that performance expectancy, effort expectancy, social influence, and facilitating conditions are the primary antecedents of innovative technology adoption. Among these factors, previous studies have found that effort expectancy predicted mobile banking adoption (Zhou, Lu, & Wang, 2010), mobile app satisfaction (Ryu, Kim, & Kim, 2014), and mobile app downloading and usage intention (Kang, Mun, & Johnson, 2015). For this reason, when consumers feel that a mobile app is easy to use and that learning the app functions does not require much effort (e.g., time, energy,

or resources), they are more likely to engage with the mobile app. Therefore, the following hypothesis was proposed:

H4: Effort expectancy will positively relate to mobile app engagement.

Relationship Commitment

Relationship commitment is an important construct in relationship marketing (Morgan & Hunt, 1994) and has garnered increasing attention in the consumer psychology literature (Sung & Campbel, 2009). Scholars have defined relationship commitment in various ways: "an enduring desire to maintain a valued relationship" (Moorman, Zaltman, & Deshpande, 1992, p. 316) "an implicit or explicit pledge of relational continuity between exchange parties" (Dwyer, Schurr, & Oh, 1987, p. 19), and "an individual's attachment to reach a goal" (Baek & Reid, 2013, p. 638; see also Locke, Latham, & Erez, 1988). The basic premise of the investment model postulates that commitment readily brings about persistence in a purposive relationship (Rusbult, 1980). In line with previous studies, we consider relationship commitment to be an individual's long-term orientation toward a relationship with mobile apps. Sung and Campbell (2009) have suggested that relationship commitment involves the intention to persist and have psychological attachment to the focal agent/object. Previous studies have shown that consumer engagement played a pivotal role in building strong commitment to the brand (Bowden, 2009; Hollebeek, 2011). Along these lines, Hwang and Lim (2015) found that user engagement with social TV made the audience more committed to the television channel. Based on the aforementioned reasons, the following hypothesis was proposed.

H5: Mobile app engagement will positively relate to relationship commitment.

Self-Brand Connections

Self-brand connections are ways in which consumers incorporate brands into their self-concepts (Escalas, 2004). This idea is an important aspect of the relationship marketing paradigm, whereby creating consumer-brand relationships should be taken into consideration in determining long-term business success (Brodie et al., 2011; Dwivedi, Johnson, & Mcdonald, 2016; Kim, Kim, & Wachter, 2013). According to the meaning transfer model (McCracken, 1989), consumers develop brand meanings over time from indirect (e.g., mobile apps) and direct experiences with the brand and use these meanings to construct self-identities (Escalas, 2004).

In the current study, we suggest that consumer engagement might also affect self-brand connections (Brodie et al., 2011). Specifically, consumer engagement is inherently tied to the concept of self (Sprott, Czellar, & Spangenberg, 2009). Consumers are likely to engage with a brand that can be counted on to satisfy their self-relevant needs (Escalas, 2004; Sprott, Czellar, & Spangenberg, 2009). As suggested by self-expansion theory (Aron, Steele, Kashdan, & Perez, 2005), consumers are fundamentally motivated to incorporate a focal agent/object (e.g., a brand, product, or medium) into their self-perception to express a desired image (Malär et al., 2011). The stronger the engagement with an object (e.g., mobile app) that might become an integral part of a user's self-expression, the stronger the self-brand connection will be (Fedorikhin, Park, & Thomson, 2008). Given that mobile app engagement creates the potential to make personal connections with sponsoring brands (Bellman et al., 2011; Kim, Lin, & Sung, 2013), stronger engagement with a branded mobile app is likely to trigger consumer-brand connections.

Meanwhile, we expected that relationship commitment would be positively linked to self-brand connections. Prior research has suggested that consumers commit to brands that they believe will maintain a desired sense of self, thereby triggering self-brand connections (Albert et al., 2013; Escalas, 2004; Escalas & Bettman, 2003). For this reason, consumers with committed

relationships to a mobile app are likely to become satisfactorily connected to the sponsoring brand. Thus, the following hypotheses were proposed:

H6: Mobile app engagement will positively relate to self-brand connections.

H7: Relationship commitment will positively relate to self-brand connections.

Moderating Role of Mobile App Type

We proposed that the structural relationships among innovation-related factors and mobile app engagement would not be equally pronounced for all mobile app types because the purpose of a mobile app is likely to affect how consumers engage with it. Mobile apps can be categorized as informational or experiential (Bellman et al., 2011). Informational mobile apps tend to deliver more goal-oriented and utilitarian benefits (e.g., information search and shopping tasks), while experiential mobile apps tend to deliver more social and hedonic benefits (e.g., social interaction with others and playing games). Along these lines, attitudes toward functional (hedonic) products have been shown to be influenced by utilitarian (hedonic) benefits (Batra & Ahtola, 1991).

Time convenience (e.g., immediate accessibility), compatibility (e.g., personalized product recommendations), and effort expectancy (e.g., ease of navigation) are regarded as cognitive evaluations of mobile apps that correspond to utilitarian benefits (expected utility and relevance). Their effects on mobile app engagement are likely to be stronger for informational apps than experiential apps. In contrast, the effect of interactivity on mobile app engagement is likely to be greater for experiential apps than informational apps. Because the primary usage goals of experiential apps are fun and pleasure, we expected that interactivity of mobile apps would make consumers feel more engaged and experience more enjoyment. Therefore, we proposed the following hypotheses:

H8: The effect of time convenience on mobile app engagement will be greater for informative mobile apps than experiential mobile apps.

H9: The effect of interactivity on mobile app engagement will be greater for experiential mobile apps than informative mobile apps.

H10: The effect of compatibility on mobile app engagement will be greater for informative mobile apps than experiential mobile apps.

H11: The effect of effort expectancy on mobile app engagement will be greater for informative mobile apps than experiential mobile apps.

Method

Participants and Procedures

Data were collected from an online consumer panel of U.S. smartphone users through the Qualtrics platform. Online consumer panels are made up of "individuals who are pre-recruited to participate on a more or less predictable basis in surveys over a period of time" (Dennis, 2001, p. 34). Data collection using online consumer samples has become increasingly popular in academic research (Duffy, Smith, Terhanian, & Bremer, 2005). Although some researchers have expressed concerns about sampling bias and the quality of panel data (Duffy et al., 2005; McWilliams & Nadkarni, 2005), online panel samples have been shown to be more demographically diverse and geographically dispersed than student samples, providing valid data (Dennis, 2001; Duffy et al., 2005). A total of 503 panel members participated in this survey. Upon clicking on the survey web link in the invitation email, they were directed to a page explaining the purpose of the study (i.e., examining consumer perceptions of mobile app usage). A screening question was used to select the appropriate segment ("Have you ever downloaded or used a mobile app on your smartphone?), leaving 503 panel members in the final sample (48.7%

male and 51.3% female). The average age of participants was 33.62 years (a range of 19 to 65). The ethnic groups included Anglo-Americans/Caucasians (75.9%), Asian Americans (6.8%), African Americans (6.4%), and Hispanics (5.2%).

Participants were first asked (a) to name a mobile app they frequently used, (b) to characterize the mobile app as being primarily for functional use or pleasure (1 = functional, 7 = pleasure), and (c) to report how often they used the self-identified mobile app. A total of 118 mobile apps were identified (e.g., Amazon, e-Bay, Google, Apple, Facebook, Snapchat, Starbucks, Bank of America, CNN, and Target). Of the total number of participants, 199 reported that they used the mobile app for a functional purpose (39.6%), while 304 reported that they used it for pleasure (60.4%). The largest group of participants used the self-identified mobile app about 2 to 4 times a week (30%), followed by several times a day (16.7%) and once a day (13.1%). Subsequently, they were asked to respond to a series of questions regarding time convenience, interactivity, compatibility, effort expectancy, mobile app engagement, relationship commitment, and self-brand connections.

Measures

All measures used in this study were adapted from previous studies to fit the mobile app context (i.e. modified wording). We used a 7-point Likert-type scale (1 = strongly disagree, 7 = strongly agree) for measurement items. Time convenience was measured using three items from previous studies (Dennis, Fuller, & Valacich, 2008; Kang, Mun, & Johnson, 2015); interactivity was measured using four items from Song and Zinkhan (2008); compatibility was measured using three items from previous studies (Srinivasan, Anderson, & Ponnavolu, 2002; Wu, 2016); effort expectancy was measured using three items from Venkatesh et al. (2003); mobile app engagement was measured using five items from Kilger and Romer (2007); relationship

commitment was measured using four items from Sung and Campbell (2009); and self-brand connections were measured using four items from previous studies (Dwivedi et al., 2016; Escalas & Bettman, 2003).

Results

Structural equation modeling (SEM) using AMOS 22 was employed to test the hypothesized relationships among each latent construct. Following the two-step process from Anderson and Gerbing (1988), we first conducted a confirmatory factor analysis (CFA) and then estimated the structural model.

Measurement Model

The maximum likelihood estimation method was used for CFA in the study, yielding satisfactory fit indices: χ^2 (253) = 707.46 ($p < .001$), comparative fit index (CFI) = .96, Tucker-Lewis index (TLI) = .95, normed fit index (NFI) = .94, root mean square error of approximation (RMSEA) = .046, and standardized root mean square residual (SRMR) = .05. Although the value of χ^2 was statistically significant, it can be sensitive to sample size, sometimes leading to rejection of the model (Hair, Anderson, Tatham, & Black, 1998). However, an χ^2/degree of freedom (*df*) ratio that does not exceed 5.0 can signify good model fit (Bentler & Bonnet, 1980). In this measurement model, the χ^2/df ratio was 2.80, and the other goodness-of-fit measures (i.e., CFI, TLI, NFI, RMSEA, and SRMR) met the recommended cutoff criteria (Hu & Bentler, 1999). Thus, we confirmed that the model was statistically stable and satisfactory despite the significant χ^2 value.

In addition to confirming overall fit of the measurement model, we further estimated construct reliability for each construct. The construct reliability values ranged from .82 to .95, which are statistically acceptable (Hair et al., 1998; time convenience = .82, interactivity = .90,

compatibility = .85, effort expectancy = .94, mobile app engagement = .89, relationship commitment = .92, and self-brand connections = .95).

Convergent validity was evaluated in two ways (Anderson & Gerbing, 1988). First, convergent validity is achieved when the *t*-values associated with each factor loading exceed a critical ratio of 1.96 ($p < .05$). We found that all standardized factor loadings for individual indicators, ranging from .72 to .95, were statistically significant ($p < .001$). Second, the average variance extracted (AVE) was calculated to examine convergent validity more accurately. Convergent validity is achieved when the AVE value is equal to or greater than .50 (Fornell & Larcker, 1981). Our findings reported that the AVE values ranged from .61 to .84, indicating satisfactory convergent validity. Table 1 summarizes the results of the standardized factor loadings, construct reliability, and AVE estimates.

Insert Table 1 about here

Discriminant validity was tested by comparing the square roots of AVE to the correlation coefficients among the constructs (Fornell & Larcker, 1981). As shown in Table 2, all of the square roots of AVE exceeded the correlations in the measurement model, showing good discriminant validity.

Insert Table 2 about here

Structural Model and Hypothesis Testing

We conducted the full structural model using the maximum likelihood estimation method. To determine whether the hypotheses were supported, each structural path coefficient was examined with the fit indices of the proposed model. The model exhibited good fit (χ^2 (260) =

800.57, $p < .001$, CFI = .95, TLI = .94, NFI = .93, RMSEA = .06, and SRMR = .076). As illustrated in Figure 1, time convenience had a positive effect on mobile app engagement ($\beta = .17$, $t = 2.38$, $p < .05$; supporting H1). Interactivity was also found to affect mobile app engagement positively ($\beta = .43$, $t = 5.74$, $p < .001$; supporting H2). Compatibility had a positive relationship with mobile app engagement ($\beta = .19$, $t = 3.35$, $p < .001$; supporting H3). However, effort expectancy was not significantly related to mobile app engagement ($\beta = .00$, $t = .07$, $p = .95$; rejecting H4). Furthermore, mobile app engagement was found to have a positive effect on relationship commitment ($\beta = .63$, $t = 13.51$, $p < .001$; supporting H5) and self-brand connections ($\beta = .67$, $t = 12.83$, $p < .001$; supporting H6). Finally, relationship commitment was found to have a positive effect on self-brand connections ($\beta = .15$, $t = 3.45$, $p < .05$; supporting H7). All path coefficients were statistically significant except for H4.

We also tested the significance of indirect effect of mobile app engagement by conducting the SEM bootstrapping procedure with 5,000 resamples. Because the bias-corrected 95% confidence interval (CI) does not contain zero (Preacher & Hayes, 2008), the indirect effect of mobile app engagement on self-brand connections through relationship commitment was statically significant ($\beta = .10$; 95% CI = .030 to .174; $p < .001$).

Insert Figure 1 about here

Multiple-Group Analyses

We examined whether mobile app type (i.e., informational vs. experiential) moderated the relationships between perceived innovative characteristics and mobile app engagement. Following the recommended procedure of Gelman and Park (2009), we performed a tercile split to select the top ($n = 176$) and bottom groups ($n = 178$), representing users who perceived their self-identified mobile app to be more informational ($M = 2.20$) or more experiential ($M = 5.74$),

respectively, while eliminating user groups (n = 149) near the median value. To test this moderating effect, we first divided the pooled data into separate covariance matrices for informational and experiential apps and then conducted a multi-group SEM (Hair et al., 1998). We generated the base model where all paths were free to vary between the two conditions. While the base model was run simultaneously, we tested individually for equivalency of all paths from exogenous variables to endogenous variables and all paths among the endogenous variables (Baek, Kim, & Yu, 2010; Hair et al., 1998).

Next, we conducted a chi-square difference test to examine the path coefficient differences between the informational and experiential mobile apps. When an χ^2 difference ($\Delta\chi^2$) with 1 degree of freedom (df) is greater than the critical value of ±3.84, then the moderating relationship is significant (Shanahan, Christopher, Carlson, & Raymond, 2012). As shown in Table 3, significant differences ($\Delta\chi^2$ (df =1) > 3.84) emerged in the following relationships; time convenience and mobile app engagement ($\Delta\chi^2 = 4.35$, $p < .05$; supporting H8); interactivity and mobile app engagement ($\Delta\chi^2 = 12.27$, $p < .001$; supporting H9); and compatibility and mobile app engagement ($\Delta\chi^2 = 3.97$, $p < .05$; supporting H10). However, mobile app type did not alter the magnitude of the effect of effort expectancy on mobile app engagement ($\Delta\chi^2 = .1$, p = n.s.; rejecting H11).

Insert Table 3 about here

Discussion

With the increasing popularity of mobile apps, marketing scholars and practitioners have recognized that mobile apps are effective digital communication and consumer engagement tools. To explore the role of consumer engagement in the mobile app context, the current study developed and empirically tested a model to examine how perceived innovative characteristics

might heighten mobile app engagement, in turn enhancing consumer connection with a sponsoring brand and purchase intention. We further evaluated the moderating role of mobile app type in altering the magnitude of the interrelationships among the determinants and consequences of mobile app engagement.

Our findings show that perceived interactivity was the strongest predictor of mobile app engagement. Consumers are highly engaged with mobile apps when they have reciprocal and interactive experiences with their preferred apps. Time convenience was found to influence mobile app engagement, confirming previous assertions about the importance of real-time communication that might result from the ubiquitous nature of mobile app services (Kim et al., 2016). Indeed, consumers are likely to be sensitive to time-related benefits in their busy lives when using mobile apps (Kleijnen, Ruyter, & Wetzels, 2007). Our results also indicate that compatibility heightened mobile app engagement. We suggest that compatibility pertains not to personality traits of the end user of mobile apps but to the situation in which authentic and customized content might fit user needs. However, effort expectancy was found to have no direct impact on mobile app engagement. One possible explanation for result is that consumers who have grown up in the digital age might be intimidated or comfortable using mobile apps. They might have already engaged and felt a personal connection with mobile app technology, regardless of ease of use. Similarly, perceived ease of use does not necessarily translate to behavioral intention to accept mobile commerce because the effect of perceived ease of use might subside over time (Wu & Wang, 2005).

From a theoretical standpoint, the current study has important implications beyond the prevalent theoretical approaches to information technology (IT) adoption. Existing research has frequently utilized TAM, the uses and gratifications model, UTAUT, and the diffusion of

innovation theory to understand consumer motivations for adopting mobile apps (e.g., Alnawas & Aburub, 2016; Kang, Mun, & Johnson, 2015; Nicholas et al., 2015; Pantano & Priporas, 2016). Although previous studies have extensively documented various predictors of mobile app adoption, they have not fully explained why particular app features enhance consumer engagement. The findings of the current study provide new insights by integrating conceptual perspectives from innovation diffusion, consumer engagement, and relationship marketing literature.

Importantly, our research extends Kang, Mun, and Johnson (2015) by looking into consumer relationship patterns rather than mobile app downloading and usage intention. An important difference between our work and theirs is that we primarily explored consumer engagement as a process of relationship building through perceived innovation characteristics of mobile apps. We suggest that mobile app engagement plays a pivotal role in influencing relationship marketing outcomes. A better understanding of mobile app engagement can extend our knowledge of consumer IT retention behavior after mere adoption of new mobile app technology.

The current study also tested how mobile app engagement influenced key relationship marketing variables (e.g., relationship commitment and self-brand connections) that have been largely ignored in previous communication technology studies. Therefore, the findings contribute to our understanding of how relationship building occurs in mobile communication settings. Prior studies have focused primarily on the role of website interactivity in facilitating consumer perceptions of relationship management (Lee & Park, 2013) and relationship investment (Yoon, Choi, & Sohn, 2008). By comparison, our work suggests the importance of mobile app engagement as a powerful enabler of consumer-brand relationship building. As suggested by

Mollen and Wilson (2010), engagement could exist independently of interactivity because the former is characterized as a discrete experiential property. Consistent with previous findings that website interactivity is likely to draw user attention to web content and ultimately increase user engagement (Sundar, 2007), our results show that perceived interactivity positively influenced consumer engagement with mobile apps.

Our findings have important managerial implications for mobile marketers. The process of consumer engagement can be amplified by sensual elements that resonate with intrinsic interests or needs (O'Brien & Toms, 2008). To promote stronger mobile app engagement and trigger self-brand connections, mobile marketers can add aesthetic design cues to their in-app brand content that fits consumer lifestyles and self-concepts. As a means of expressing a significant aspect of self, brand personification (e.g., anthropomorphic images or aesthetic characters) leads to strong self-brand connections (Connell, 2013). Thus, mobile marketers can benefit from featuring a personified/humanized character on their mobile app in a way that facilitates self-brand connections.

Furthermore, the results of our multi-group comparison analyses suggest that mobile marketers need to implement more customized in-app content on informational apps to fulfill consumer needs for time-utility and relevance. To illustrate, Starbucks has recently rolled out a new app feature that allows consumers to order drinks with voice commands or by messaging a virtual barista (Kahn, 2017). They are also using an artificial intelligence (AI)-based personalization engine within the Starbucks mobile app that can generate one-to-one offers tailored to each individual consumer. For experiential mobile apps, marketers could tweak in-app referral features and user interfaces that enable social sharing to boost mobile app engagement.

Finally, our findings suggest a solution for mobile marketers who have struggled to survive in a hyper-competitive mobile app market. Although countless new apps are released every day, only a few are frequently used by mobile consumers (Furner et al., 2016). Mobile marketers should be mindful of the importance of consumer engagement in cultivating and retaining loyal customers while attracting new ones. A recent study revealed that despite increasing time spent in native apps, smartphone users spend most of their time (84%) using only the top five apps (i.e., Facebook, Google, Amazon, Apple, and Yahoo) (Perez, 2015). This result likely reflects that giant online companies have provided cross-platform support for Apple iOS, Android, and Windows phones in diverse ways to connect with loyal customers. They have also diversified their app offerings (e.g., Google Search, Google Maps, and Facebook Messenger), which expands the app marketplace. However, the reason a handful of companies are dominating app engagement is beyond the scope of our study. Although our survey participants identified these top five apps frequently, their heavy reliance on these apps does not necessarily explain the varying degrees of mobile app engagement described in our proposed model. Instead, our findings are based on wider selection of heterogeneous apps (e.g., participants self-selected a total of 118 apps), demonstrating more variation in mobile app engagement.

Limitations and Directions for Future Research

Although our findings enhance understanding of underlying factors that enhance user engagement with mobile apps, the limitations of this study open pathways to future research. First, the one-shot correlational nature of our survey data limits our ability to make causal inferences about perceived innovative characteristics and mobile app engagement. Therefore, our conceptual model needs further testing in an experimental setting the degree and types of time convenience, interactivity, and compatibility can be manipulated. Another drawback is that we

could not measure the effect of social influence on mobile app engagement. Given the importance of social motivation (e.g., family and peer feedback) in determining mobile app engagement intention (Kim et al., 2013), the extent to which a user's socialization agents and processes might influence mobile app engagement remains a potentially fruitful line of inquiry.

Finally, our proposed model was derived from a well-established framework in relevant IT literature. However, it might not capture all important determinants in the engagement building process. For instance, one missing factor might be brand experience, often evoked by brand-related stimuli (Brakus, Schmitt, & Zarantonello, 2009) because previous experiences with brands can enrich consumer engagement with mobile apps in other unique ways. Researchers should attempt to capture the role of brand experience in relationship building via mobile apps.

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Table 1. Measurement model statistics

Measurement construct	CR	AVE	Factor loading
Time convenience	.82	.61	
1. I obtain the information from this mobile app in a timely manner.			.81
2. This mobile app is very fast in responding to my feedback.			.79
3. This mobile app processes my input very quickly.			.74
Interactivity	.90	.70	
1. This mobile app facilitates two-way communication.			.73
2. This mobile app gives me the opportunity to talk back.			.80
3. This mobile app makes me feel it wants to listen to its mobile users.			.91
4. This mobile app is effective in gathering mobile users' feedback.			.90
Compatibility	.85	.66	
1. This mobile app makes purchase recommendations that match my needs.			.84
2. This mobile app enables me to order products/services that are tailor-made for me.			.87
3. This mobile app fits well with my needs.			.72
Effort expectancy	.94	.84	
1. This mobile app is easy to use.			.93
2. Learning the functions of this mobile app is easy for me.			.94
3. Using this mobile app is understandable.			.88
M-app engagement	.89	.67	
1. I am inspired by this mobile app.			.81
2. I have an emotional connection to this mobile app.			.86
3. I am always learning about new things from this mobile app that would help me make better decision in my life.			.78
4. This mobile app constantly provides fodder for conversation that I have with friends and family.			.76
5. This mobile app is special to me because the time I spend with this media element is enjoyable and considered "time just for me."			.82
Relationship commitment	.92	.75	
1. I am committed to maintaining my relationship with this mobile app.			.87
2. I intend to maintain my relationship with this mobile app.			.85
3. I am oriented toward the long-term future of my relationship with this mobile app.			.91
4. I imagine having a relationship with this mobile app several years from now.			.83
Self-brand connections	.95	.82	
1. I have a special bond with this brand.			.85
2. I consider this brand to be part of myself.			.95
3. I often feel a personal connection between this brand and me.			.95
4. This brand is an important indication of who I am.			.87

Notes: CR = construct reliability; AVE = average variance extracted; Factor loading is based on standardized estimates.

Table 2. Correlation matrix

Construct	1	2	3	4	5	6	7
1. Time convenience	**.78**						
2. Interactivity	.58	**.84**					
3. Compatibility	.40	.65	**.81**				
4. Effort expectancy	.56	.11	.19	**.92**			
5. M-app engagement	.47	.64	.53	.16	**.82**		
6. Relationship commitment	.60	.50	.42	.44	.61	**.87**	
7. Self-brand connections	.39	.49	.41	.12	.76	.57	**.91**

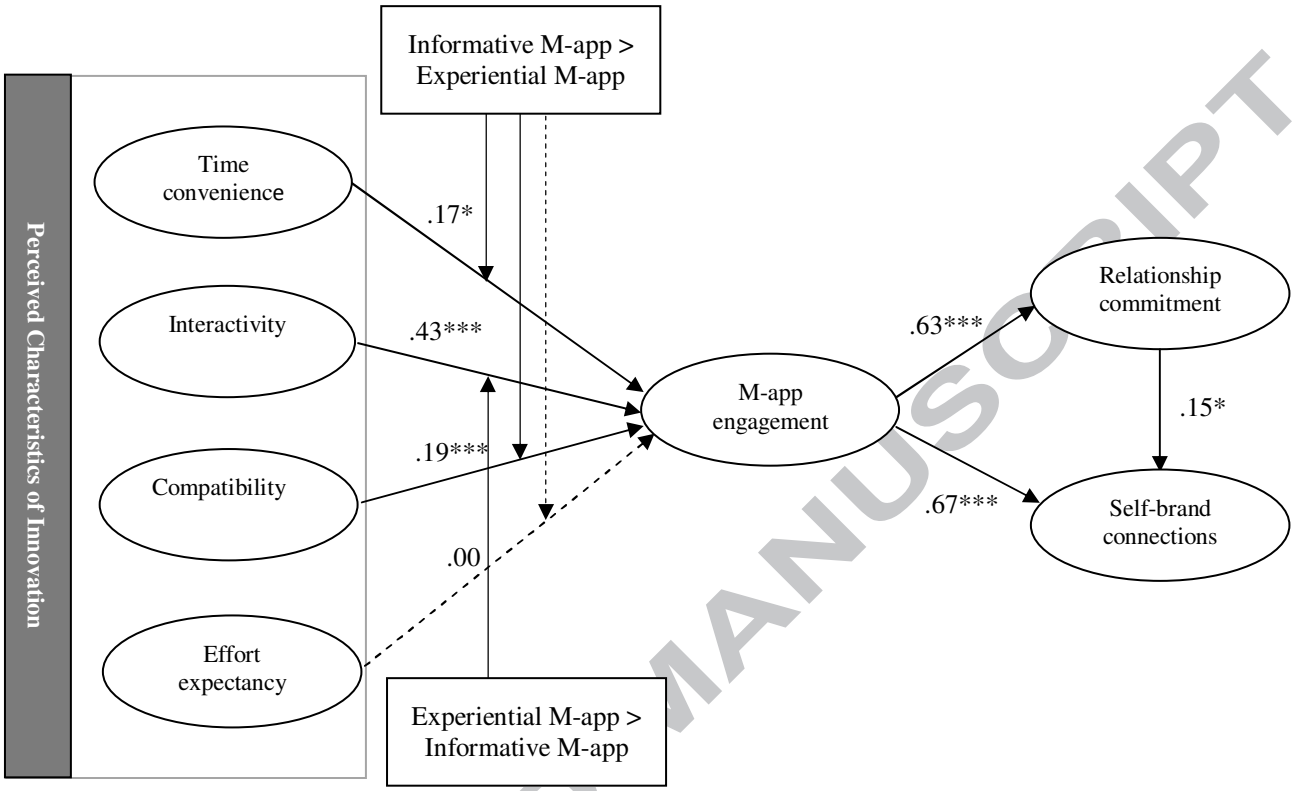
Note: Diagonal numbers in boldface refer to the square root of AVE (average variance extracted) values; Off-diagonal numbers are the correlation coefficient between latent constructs.

Table 3. Results of the multi-group analysis

Path	$\Delta\chi^2$	Path coefficient (β)	
		Informational M-app	Experiential M-app
Time convenience → M-app engagement	4.35*	.36***	-.02
Interactivity → M-app engagement	12.27***	.28*	.70***
Compatibility → M-app engagement	3.97*	.35***	.05
Effort expectancy → M-app engagement	0.1	.01	.03

Notes: $\Delta\chi^2$ = Chi-square difference; *$p < .05$, **$p < .01$, ***$p < .001$

Figure 1. Results of structural model



Notes: (χ^2 (260) = 800.57, $p < .001$, CFI = .95, TLI = .94, NFI = .93, RMSEA = .06, and SRMR = .076; Standardized path estimates that are not statistically significant ($p > .05$) are indicated with dashed lines; *$p < .05$, **$p < .01$, ***$p < .001$.

Highlights

- Time convenience, interactivity, and compatibility positively influenced mobile app engagement, in turn leading to strong relationship commitment and self-brand connections.
- Effort expectancy had no direct impact on mobile app engagement.
- Informational and experiential mobile apps moderated the effects of time convenience, interactivity, and compatibility on mobile app engagement.