



# Asymmetries in the Effects of Drivers of Brand Loyalty Between Early and Late Adopters and Across Technology Generations

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## Abstract

Mobile marketing activities are growing at a rapid pace. The success of mobile marketing hinges on consumers' adoption of mobile devices. However, consumers' mobile device adoption is not well understood at the brand (e.g., Apple, Nokia, Samsung) level. We propose a conceptual framework linking mobile device brand loyalty (repurchase intention) to its drivers including perceived value, brand satisfaction, brand attachment and trust, and develop hypotheses about the moderating roles of adopter type and mobile technology generation in some of these linkages. We test these hypotheses using structural equation modeling on a unique cross-sectional dataset of attitudes toward mobile phone brands spanning two technology generations, 2.5G and 3G. The results reveal important asymmetries between adopter types and between technology generations: early adopters of mobile devices emphasize perceived value, whereas late adopters rely on brand satisfaction in developing brand loyalty; and consumers depend more on trust and less on perceived value in developing loyalty for the new generation than for the existing generation. We outline how brand managers of mobile devices should adapt their marketing strategies to different adopter types and technology generations.

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## Introduction

Advances in mobile technology, marked by successive generations such as 2.5G, 3G, and 4G, have led to quantum leaps in data transfer speed, resulting in fast Internet access and enhanced data streaming. These improvements, together with the introduction of powerful mobile operating systems (e.g., iOS and Android), have enabled handheld mobile device (e.g., mobile phone, tablet) users to easily access or download online content, and have fueled the tremendous growth in mobile marketing activities, including mobile advertising, location-based marketing, mobile couponing, and mobile marketing apps (Bellman et al. 2011; Shankar and Balasubramanian 2009; Shankar et al. 2010; Swilley and Hofacker 2006).

A precondition of mobile marketing success is consumer adoption of mobile devices. While a few studies on mobile

device adoption (e.g., Lee, Trimi, and Kim 2013) shed light on the drivers of mobile device adoption at the category level, mobile device brand marketers (e.g., Apple, Nokia, Samsung) are also interested in adoption at the brand level. Because the mobile phone industry exhibits high levels of brand switching among consumers (Stremersch, Muller, and Peres 2010) and because customer loyalty is typically mismanaged (Reinartz and Kumar 2002), marketers of mobile devices are concerned about managing customer brand loyalty. However, there is sparse literature on customer loyalty toward mobile device brands (Petruzzellis 2010). Furthermore, prior research focuses on only one or two key drivers of mobile device brand loyalty (e.g., brand satisfaction or brand trust) in isolation rather than offering a comprehensive set of drivers in an integrated manner.

What drives mobile device brand loyalty? Prior studies examine selected antecedents of brand loyalty in general but not mobile devices in particular (e.g., Chaudhuri and Holbrook 2001; Mittal and Kamakura 2001; Sirdeshmukh, Singh, and Sabol 2002). Taken together, these studies suggest that perceived value, brand satisfaction, brand attachment and trust are key drivers of

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brand loyalty. However, there is a dearth of knowledge about the network of relationships among these drivers and how they impact brand loyalty, in particular, in mobile device markets.

These drivers may have specific effects on mobile device brand loyalty. For example, consumers have common concerns about privacy and security in using mobile devices, so trust in the marketer of the brand could be particularly important in mobile device brand loyalty. Furthermore, among the drivers of brand loyalty, brand attachment, the self-implicated emotion-laden bond between the consumer and a brand, is an important yet underexplored construct [Park et al. \(2010\)](#). Because consumers often carry their mobile devices and use them for important or personal purposes, consumers can become emotionally attached to mobile device brands. Unfortunately, research linking brand attachment to perceived value, brand satisfaction, brand trust and brand loyalty is sparse, in particular, in the mobile device context.

Importantly, not much is known about how the effects of mobile device brand loyalty drivers differ between adopter types such as early and late adopters. Differences likely exist because early and late adopters of mobile devices use different decision-making strategies (utility maximizing vs. satisficing—choosing an alternative that meets a threshold utility) or basis (objective product information vs. subjective experience) in making repurchase decisions. The potential differences in the drivers have important implications for managerial decisions on communication and loyalty development strategies for different adopter types.

Furthermore, we do not know much about how the effects of the drivers vary by mobile technology generation (e.g., 2.5G versus 3G). The effects may vary with technology generation because consumers perceive greater uncertainty and risk when adopting a new generation than an existing generation ([Kim, Han, and Srivastava 2002](#)). Knowing how these effects differ on technology generation can help mobile device brand marketers develop appropriate product design and marketing communication strategies across different technology generations for their brands.

We address these critical research issues by first developing a conceptual framework that delineates the relationships among mobile device brand loyalty and its drivers. We formulate hypotheses about the moderating roles of adopter type and technology generation for some of these relationships. We test the framework and the hypotheses using structural equation modeling on a unique dataset obtained from a sample of mobile phone users in a leading market for mobile phone adoption.

The results support most of our hypotheses and offer important implications for managers to enhance mobile device brand loyalty across adopter types and technology generations. Brand attachment partially mediates the effects on mobile device brand loyalty of brand satisfaction, and of trust toward the marketer of the brand. The findings also reveal important asymmetries between adopter types and between technology generations. The results show that perceived value (brand satisfaction) drives brand loyalty for early (late) adopters. Finally, the results show that the effect of perceived value

(trust) on mobile device brand loyalty is stronger (weaker) for the existing generation than the new generation.

Our findings suggest that brand managers of mobile devices should account for adopter types and technology generations when adapting their marketing strategies to fully leverage the differential effects of perceived value, brand satisfaction, and trust on brand loyalty. For example, given the particularly strong impact of perceived value on early adopters' brand loyalty, mobile device marketers should focus on usefulness, performance and quality in promoting their products to early adopters. Furthermore, because the effect of trust on brand loyalty is more positive for the new generation than the existing generation, mobile device marketers should emphasize customer care when marketing the new generation.

Besides contributing to the mobile device adoption literature, we extend the brand loyalty literature in important ways. First, we integrate the drivers of brand loyalty in a single framework, highlighting the role of brand attachment in brand loyalty formation. Second, we theoretically and empirically analyze the moderating role of adopter type in the relationships between brand loyalty drivers and brand loyalty, extending [Johnson, Herrmann, and Huber's \(2006\)](#) work on brand loyalty differences between two product life cycle stages. Third, to our knowledge, our research is the first to theoretically explain and empirically show the moderating role of technology generation in the relationships between brand loyalty and its drivers.

## Conceptual Framework and Hypotheses

Our conceptual framework depicts the antecedents of mobile device brand loyalty and the processes linking them to brand loyalty (see [Fig. 1](#)). It comprises the direct and indirect effects of perceived value and brand satisfaction on brand loyalty with trust and brand attachment as the mediators in the indirect effects. Consistent with prior research on brand loyalty ([Chaudhuri and Holbrook 2001](#); [Johnson, Herrmann, and Huber 2006](#)), we represent mobile device brand loyalty by consumer intention to repurchase the brand.<sup>1</sup> We first briefly define the key constructs and predict the main effects of the drivers on brand loyalty. Next, we develop hypotheses about the moderating roles of adopter type and technology generation in some of these relationships; these roles constitute the focus of our investigation.

### Key Constructs

#### Brand Loyalty

[Oliver \(1999\)](#) defines loyalty to a brand as a deeply held commitment to re-patronize or repurchase that brand consistently in the future, despite the potential of situational influences and

<sup>1</sup> We realize that intention to recommend the brand to others is another indicator of brand loyalty ([Lam et al., 2004](#)). However, the context of our research is the technology product market. Because of rapid advances in technology and shortening product life cycles, repurchase is a more immediate and important measure of brand loyalty than recommendation. Therefore, we focus on repurchase intention.

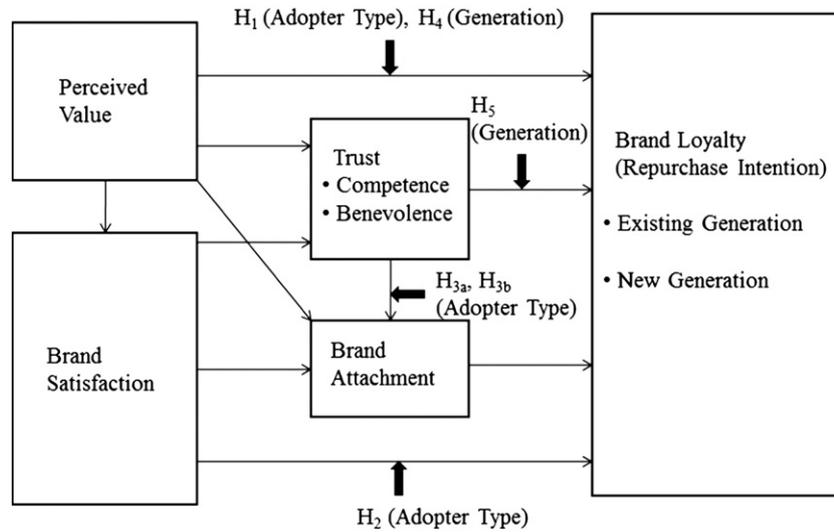


Fig. 1. Conceptual framework of drivers of mobile device brand loyalty. Note: The term in the parenthesis of each hypothesis denotes the moderator in that hypothesis.

marketing efforts to induce switching. We adopt this definition of brand loyalty in the context of consumer brand choice within an existing or a new technology generation of mobile device (e.g., 2.5G, 3G mobile phone). Consumer decision-making in technology product markets is typically a two-stage process in which the consumer first chooses a particular generation and then selects a brand within that generation (Hahn et al.). Therefore, we distinguish brand loyalty pertaining to an existing generation from that relating to a new generation by treating them as two separate constructs under “brand loyalty” (refer to Fig. 1).

#### Adopter Type

Consistent with prior empirical studies (e.g., Gatignon and Robertson 1985; Shankar, Carpenter, and Krishnamurthi 1999), we define early adopters as individuals who adopt a new product in the introductory and growth stages, and late adopters as people who adopt the product in the maturity and decline stages of product life cycle. The role of adopter type is significant in particular for mobile devices given their short product life cycles.

#### Technology Generation

A technology generation refers to a set of product models and items – of different brands – that are similar in customer-perceived functional characteristics. According to Stremersch, Muller, and Peres (2010), a new generation differs from an existing generation in the use of a novel technology (e.g., digital vs. analog color TV) or the novel performance of an existing technology (e.g., successive PC generations). The new technology generation typically offers significant performance improvements and new benefits over an existing generation. For example, the 3G technology offers a much faster data transfer speed than the 2.5G with multitasking and multimedia services such as high-quality

audio, video and graphics, Internet browsing, e-commerce, e-mail and bandwidth on demand (Xavier 2001).

#### Perceived Value

The perceived value of a brand refers to the consumer’s overall evaluation of what she receives (e.g., product quality) compared to what she gives up (e.g., price) for the brand relative to competition (Bolton and Drew 1991; Grewal, Monroe, and Krishnan 1998). For mobile devices, the “receive” component typically includes benefits such as texting and video, while the “give” component comprises the net paid price.

#### Brand Satisfaction

Consistent with prior research (Oliver 1999), we conceptualize brand satisfaction as a consumer’s summary judgment of whether a brand meets his/her performance expectations or fulfills usage needs.

#### Brand Attachment

Brand attachment refers to a self-implicated emotion-laden bond between the consumer and a brand (Park et al. 2010; Thomson, MacInnis, and Park 2005). A consumer develops an attachment to a brand when the brand becomes embedded inextricably within her psyche or resonates with her self-concept, or when the brand offers her a sense of security from a stressful, external environment (Thomson, MacInnis, and Park 2005). The self-brand connection could be formed over time if the customer continually uses the brand to achieve self-motivated goals, such as using the brand to express, reinforce or construct the consumer’s self-concept. Because a mobile device is a constant companion and is used on a continuous basis (Shankar and Balasubramanian 2009), consumers can become emotionally attached to their mobile brands.

### *Trust*

Consistent with prior studies (Bart et al. 2005; Doney and Cannon 1997; Ganesan 1994; Sirdeshmukh, Singh, and Sabol 2002), we view trust as comprising two basic dimensions: perceived competence (also referred to as perceived credibility) and perceived benevolence. Following prior research, we define perceived competence as the extent to which the consumer believes that the firm marketing a brand has the required expertise to create an offering (a mobile device) that performs its job effectively and reliably; and perceived benevolence as the extent to which the consumer believes that the firm is genuinely interested in the consumer's welfare and will not take unexpected actions adverse to the consumer. We treat perceived competence and benevolence as separate constructs because their relationships with the other constructs in our framework could be different. For a mobile device, perceived competence is important because it reflects device capabilities such as memory, geographic coverage and call quality. Similarly, perceived benevolence is also critical because it is related to consumer concern for privacy and safety associated with mobile devices.

### *Main Effects of Antecedents of Brand Loyalty*

We first discuss the main or direct effects of perceived value, brand satisfaction, brand attachment and trust on mobile device brand loyalty for a technology generation in our conceptual framework (Fig. 1). We focus on loyalty at a generation level because consumers may choose brands within a generation to simplify decision-making since differences between successive generations are typically greater than differences among brands within a particular generation. Because the capabilities and overall performance of mobile devices are much higher for 3G than 2.5G generation, the user experience differs considerably between the generations. As a result, when choosing a mobile phone, consumers typically consider the two generations of phones separately although some of them may be looking for specific functions.

### *Perceived Value*

Consumers use perceived value to infer how well a brand meets their needs, so perceived value affects brand satisfaction (Cronin, Brady, and Hult 2000). A mobile device offers both utilitarian and emotional benefits that comprise perceived value. A brand's perceived value could serve as a basis for a consumer's emotional attachment to a mobile device brand because it may relate to her needs, such as the need to communicate with important people. Moreover, a brand's perceived value may allow consumers to infer the competence and benevolence of the firm marketing the brand (Ganesan 1994). Finally, consumers also use perceived value to form expectations about the brand's performance when making a repurchase decision (Johnson, Herrmann, and Huber 2006; Lam et al. 2004). Therefore, we expect perceived value to have positive direct effects on mobile device brand satisfaction, brand attachment, perceived competence, perceived benevolence, and brand loyalty.

### *Brand Satisfaction*

Consumer satisfaction with a brand could evolve into attachment to the brand (Oliver 1999). Consumers use their mobile devices frequently, developing feelings about their brands. Therefore, we expect brand satisfaction to have a positive effect on brand attachment.

Satisfaction with past exchange outcomes indicates equity in the exchange (Ganesan 1994). Consumers may interpret such equitable outcomes as a sign that the firm marketing the brand possesses the ability to deliver on its promise, enhancing their perceptions about the firm's competence (Delgado-Ballester and Munuera-Aleman 2001; Ganesan 1994). Furthermore, equitable outcomes could strengthen consumers' beliefs that the firm marketing the brand is concerned about their welfare, enhancing its benevolent image (Ganesan 1994). Because consumers use mobile devices to perform important tasks, store and share personal information, they are particularly concerned whether the firm behind the mobile brand functions appropriately and protects their privacy. Therefore, we expect brand satisfaction to have a positive effect on competence and benevolence for mobile devices as well.

Consumers' intention to repurchase a brand depends on how satisfied they are with the brand based on prior experience (Bolton, Kannan, and Bramlett 2000). Because consumers use mobile devices frequently, their satisfaction with the brand is likely to affect their brand repurchase intentions.

### *Brand Attachment*

Emotional attachment to a brand encourages consumers to invest resources in and commit to the brand (Park et al. 2010; Thomson, MacInnis, and Park 2005). In the mobile device context, 84 percent of iPhone buyers surveyed by market research firm Gfk felt attached to this brand and indicated that they would choose iPhone again (Gfk 2011). Therefore, we posit that brand attachment is positively related to brand loyalty.

### *Trust*

Consumers generally perceive some degree of uncertainty in the performance of technological products (Parasuraman and Colby 2001). Trust in a brand reduces consumer uncertainty (Chaudhuri and Holbrook 2001). Mobile devices need to work effectively at all times, store and transmit the right information, so uncertainty in mobile device performance can be high. Consequently, we posit that consumers' trust in the firm behind the brand has positive effects on their loyalty toward a mobile device brand. Furthermore, based on prior research on trust and attachment (Sirdeshmukh, Singh, and Sabol 2002), we postulate that trust encourages brand attachment development. Attachment theory suggests that a person's emotional attachment to a particular object helps maintain feelings of security. We expect this relationship to be significant for mobile devices, which are characterized by emotional connection and concerns for privacy and safety.

In summary, we posit that consumer's perceptions of value and satisfaction with the brand, emotional bond with the brand, and trust beliefs about the firm marketing the brand have main

effects on mobile device brand loyalty. Moreover, some of these antecedents have direct effects on other constructs as well.

We do not consider customer loyalty to mobile service providers/network operators as it may not significantly affect mobile device brand. Typically, a telecommunication service provider sells various mobile device brands in its retail outlets. Likewise, a mobile device brand allows consumers choice from many service providers.

### *Moderating Effects*

We further postulate that adopter type and technology generation moderate some of the relationships in our framework. Overall, our hypotheses about the moderating effects of adopter type and technology generation are based on two premises. First, generally speaking, people who adopt mobile devices of a generation at different stages of the generation's product life cycle differ in their knowledge about mobile technology and in their motivation to process technical information. As a result, different drivers affect adopters at different stages in the development of brand loyalty and brand attachment. Second, compared to existing technology, new technology poses greater uncertainty and risks for the consumer. Consequently, the influence of the drivers of mobile device brand loyalty also depends on the technology generation for which consumers consider repurchase.

### *Adopter Type*

Based on the speed of innovation adoption, adopters fall under five categories: innovators, early adopters, early majority, late majority and laggards (Rogers 2003). However, in practice, it is difficult to separate adopters into exactly five categories and to distinguish among the behaviors of the five adopter categories. Therefore, the majority of previous studies examining adopters' behaviors treat innovators and early adopters as one group (early adopters) and compare this group with the rest of the adopters (late adopters) (Gatignon and Robertson 1985; Shankar, Carpenter, and Krishnamurthi 1999).

Studies on technological innovations show that early adopters are more rational, more knowledgeable, and enjoy learning about a new technology more than late adopters (Dickerson and Gentry 1983; Parasuraman and Colby 2001). Technological knowledge helps consumers to understand product attribute information (Moreau, Lehmann, and Markman 2001; Rogers 2003). For example, knowledge about hardware and software deployed in mobile devices enables consumers to understand the technical specifications and hence the relative advantages of different mobile device models. In sum, because of their rational thinking, intrinsic motivation to evaluate technical information and ability to understand technical information, early adopters compare competitive offerings and discriminate among these offerings more than late adopters.

These differences between early and late adopters suggest that they use different strategies in their repurchase decision: maximizing versus satisficing. A utility maximizing strategy consists of objectively comparing different brands and choosing the brand that offers the highest utility. A satisficing strategy

comprises successively evaluating brands and choosing the first brand that meets a threshold level of satisfaction in product usage to cope with cognitive limitations associated with evaluating multiple brands (Simon 1956).

We argue that early adopters tend to be maximizers who focus on identifying the product that offers the best value among available alternatives because they are inclined to make extensive comparisons among product models. Early adopters treat perceived value as an important factor when making a repurchase decision. In contrast, late adopters typically lack the motivation and ability to make accurate value comparisons and are inclined to accept an alternative that meets their needs and expectations. In other words, late adopters are likely to be satisficers. Therefore, late adopters view brand satisfaction as a critical factor when making a repurchase decision.

Mobile devices contain several features and specifications, such as network (e.g., GSM vs. CDMA), processor speed (e.g., 1GHz, 1.5 GHz), and memory (e.g., 8 GB, 16 GB, 32 GB). When considering repurchase of a mobile device brand, early adopters are likely to compare brands along these specifications and use perceived value as the basis for their decision. In contrast, late adopters are likely to rely on satisfaction with the current mobile device brand. This reasoning is independent of the technology generation that a consumer considers in the repurchase decision. Accordingly, we put forth the following hypotheses.

**H1.** The effect of perceived value on mobile device brand loyalty is more positive for early adopters than for late adopters of mobile devices.

**H2.** The effect of brand satisfaction on mobile device brand loyalty is more positive for late adopters than for early adopters of mobile devices.

We also expect that trust in the firm marketing a brand contributes to brand attachment to a greater extent for late adopters than for early adopters of mobile devices. A consumer's trust in the firm marketing a brand becomes important in developing associations with the brand when he/she is unable to evaluate the brand risks (Bart et al. 2005). These brand associations may develop differently for early and late adopters.

Compared to early adopters, late adopters are less knowledgeable about the product and are less capable of evaluating and reducing product performance risks. Furthermore, late adopters are less willing to take risks, that is, are less venturesome, than early adopters (Gatignon and Robertson 1985; Rogers 2003). Consequently, late adopters rely more on trust for risk reduction in developing their attachment toward a brand. Relative to early adopters, late adopters develop a deeper identification with a brand if they perceive the firm to be capable of delivering a quality product that satisfies their needs. Similarly, late adopters are more likely than early adopters to form an emotional bond if they perceive the firm marketing the brand to be interested in their well-being. Because consumers constantly interact with their mobile devices, their perception of the competence and benevolence of the firm marketing the brand

critically determines their level of attachment to the brand. Therefore, we posit:

**H3a.** The effect of perceived competence on brand attachment is more positive for late adopters than for early adopters of mobile devices.

**H3b.** The effect of perceived benevolence on brand attachment is more positive for late adopters than for early adopters of mobile devices.

#### *Technology Generation*

Many mobile device brands (e.g., Samsung, Nokia, Sony) offer products in successive mobile generations such as 2.5G, 3G, and 4G. An interesting question is whether a consumer's value perception about the brand in the existing generation that he/she currently uses is relevant to his/her brand choice in the new generation.

We argue that perceived value is less relevant for the new generation than for the existing generation. Perceived value of the brand currently used is particularly relevant to a consumer's brand choice when he/she is considering repurchase in the existing technology generation (Johnson, Herrmann, and Huber 2006). This is because models of mobile devices in the same generation utilize the same mobile technology, offer similar features, and provide largely similar benefits to consumers. These similarities facilitate easy comparison of the costs and benefits associated with brands. The higher a consumer's perceived value of the brand in the existing generation, the higher will be her intention to repurchase the brand in the same generation. Thus, perceived value is an important determinant of consumer intention to repurchase the brand in the existing generation.

In contrast, mobile device models in a new generation provide new functionalities and benefits at different price points. These functionalities pose uncertainties in evaluation and require additional knowledge on the part of consumers. The benefits of some of the new functionalities are difficult to evaluate, making brand comparisons challenging. The perceived value of the existing generation cannot fully predict the perceived value of the new functionality and benefits of the new generation. Thus, the perceived value of the currently used brand is less relevant to value assessment when the consumer is considering whether to repurchase the same brand in the new generation than in the existing generation. Therefore, consumers cannot base their decision to repurchase the brand in the new generation on the perceived value of the brand in the existing generation. This reasoning applies to both early and late adopters of mobile devices. Consequently, we expect:

**H4.** The effect of perceived value on mobile device brand loyalty is more positive for the existing mobile technology generation than for the new generation.

The effect of perceived benevolence on mobile device brand loyalty could also differ across technology generations. For the existing mobile technology generation, consumer familiarity of

the features and applications grows higher through experience. This familiarity mitigates potential risks associated with using the current mobile device technology. Consequently, a consumer's intention to repurchase the same generation of mobile device brand depends less on the benevolence of the marketer of the brand.

In contrast, a new mobile technology generation involves new or improved features and applications of new technology. Because of the "newness" of these features, hidden hazards (e.g., radiation risks and usage problems with 3G mobile phones) may not have been identified and potential performance problems may still exist in the introductory or growth stage of the new mobile generation (Valentino-DeVries 2010). Therefore, consumers may perceive higher performance risks when adopting a new mobile generation than an existing generation that is already in the maturity stage (Johnson, Herrmann, and Huber 2006). When adopting a new mobile generation, consumers rely on the perceived benevolence of the firms marketing the brands under the new generation to mitigate potential performance hazards or problems because the benevolence implies caring for customer welfare and having the consumer's best interests at heart (Sirdeshmukh, Singh, and Sabol 2002). Therefore, we posit:

**H5.** The effect of perceived benevolence on mobile device brand loyalty is more positive for the new mobile technology generation than for the existing generation.

In contrast to perceived benevolence, perceived competence of the firm marketing the brand is equally relevant for both the technology generations in the repurchase decision. Users of a brand consider the firm's competence in offering quality products and services, regardless of the technology generation. Therefore, we do not propose a hypothesis for any differences in the effects of perceived competence between existing and new generations.

## **Method**

### *Research Context*

For our empirical context, we chose 2.5G as the existing generation and 3G as the new generation for comparison because at the time of our data collection, 2.5G mobile phones were mostly used in the country of study, Singapore, while 3G phones were about to be launched. Both 2.5G and 3G phones enable Web access and multi-media messaging (MMS). We define 2.5G phones as phones that could send multi-media messages (MMS) and had the General Packet Radio Service (GPRS) available. 3G phones differ from 2.5G phones primarily in the speed of data transfer. The much faster transfer speed enabled by the 3G technology allows consumers to access websites and emails conveniently, enjoy high-quality audio and images, carry out video conferences, and view live videos.

To test our hypotheses, we needed data from both early and late adopters of mobile phones. For our data collection, we

define the early and late adopters as the early and late adopters of 2.5G (the existing technology generation). We consider this operational definition valid for the following reasons. First, past-purchase patterns are good predictors of future purchase behavior (Schmittlein and Peterson 1994), in particular those of early adopters (Kamakura, Kossar, and Wedel 2004). Second, personal characteristics that predict early adoption (e.g., knowledge about technology, risk-taking attitude and education) are fairly stable over time and hence transcend technology generations. Therefore, we argue that the time of adopting a particular mobile generation (2.5G) can serve as a base for distinguishing early and late adopters of mobile phones in general. We did not consider 2G because the majority of people in Singapore had already switched to 2.5G when the data were collected. We used the median adoption time to distinguish between early adopters and late adopters of 2.5G phones because the median time corresponds to the time when 2.5G entered the maturity stage of its product life cycle in Singapore. We collected our data by interviewing

people who had already adopted 2.5G phones at the time of data collection. Data collection at different stages of 2.5G's product life cycle is burdensome because it typically takes years for a technological innovation to evolve from the introduction to the maturity stage. Therefore, we collected cross-sectional data.

#### Measures and Questionnaire Design

Table 1 lists the key constructs' measures we use in our study together with their sources. These measures pertain to the brand of the mobile phone that the respondents were using or the company that made the phone. In developing these measures, we draw from previous studies as shown in Table 1. Therefore, we have two sets of measures for brand loyalty (repurchase intention), one for each of two scenarios in which phone models of different technology generations were considered. Specifically, for brand loyalty under the existing generation (2.5G), we asked the respondent to imagine that they intended to buy a 2.5G mobile phone model and about their intention of

Table 1  
Key Construct Measures and their Sources.<sup>a</sup>

Measures	Sources
Perceived value	Grewal, Monroe, and Krishnan (1998); Johnson, Herrmann, and Huber (2006)
My current brand of mobile phone offers better value for money than other brands of similar mobile phones. I consider my current brand of mobile phone to be a better buy than other brands of similar mobile phones. For the price I paid, my current brand of mobile phone is a better deal than other brands of similar mobile phones.	
Brand satisfaction	Lam et al. (2004); Mano and Oliver (1993)
I am satisfied with the brand of this mobile phone. This brand of mobile phone meets my expectations. This brand of mobile phone fits my needs/wants.	
Trust (perceived competence)	Chaudhuri and Holbrook (2001)
The company that makes the brand of my current phone is competent in making mobile phones. The company that makes this brand provides credible quality assurance. The company offers me a mobile phone with a consistent quality level.	
Trust (perceived benevolence)	Delgado-Ballester and Munuera-Aleman (2001)
The company does not withhold any information from me that I am concerned about. <sup>b</sup> The company is interested in my satisfaction with this brand of mobile phone. The company is interested in solving any problems I have or could have with this brand of mobile phone. The company offers me recommendations and advice on how to get the most of this brand of mobile phone.	
Brand attachment	This paper (2013) <sup>c</sup>
I feel emotionally attached to the brand that I am currently using. This brand means a lot to me personally. Even if it were to my advantage to switch to another brand, I would not feel good about switching to that brand. I identify myself with this brand. I feel a special bond between myself and this brand.	
Brand loyalty (existing generation)	Johnson, Herrmann, and Huber (2006)
If I intend to buy a 2.5G model of mobile phone in the future, I will consider the brand of my current phone as my first choice. If I decide to buy a 2.5G model of mobile phone in the future, I will buy the brand of my current phone.	
Brand loyalty (new generation)	Johnson, Herrmann, and Huber (2006)
If I intend to buy a 3G model of mobile phone in the future, I will consider the brand of my current phone as my first choice. If I decide to buy a 3G model of mobile phone in the future, I will buy the brand of my current phone.	

<sup>a</sup> The scales of all constructs follow a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

<sup>b</sup> Dropped after initial confirmatory factor analysis.

<sup>c</sup> Our measure is comparable to the brand attachment measure of Park et al. (2010).

buying the brand of his/her current phone under this scenario. Similarly, for brand loyalty under the new generation (3G), we asked the respondent to imagine that he/she intended to buy a 3G mobile phone model and about their brand loyalty intention under this scenario.

For the brand attachment construct, there was no published measurement scale when we designed the questionnaire for our study. To create a measure of this construct, we undertook a focus group discussion to verify what brand attachment means to consumers. The discussion participants, undergraduate students using mobile phones, generally expressed an emotional tie or psychological attachment to a brand. Subsequently, we generated the items measuring brand attachment based on the construct's definition and the insights from the focus group discussions. These items are comparable to the brand attachment measures of Park et al. (2010). Apart from the loyalty measures, we also modified existing scales of perceived value to explicitly incorporate a comparative view. In addition, two scholars in brand loyalty and satisfaction research examined the face validity of our measures. Following their advice, we refined some measures to improve their validity. To further refine our measures, we conducted a pretest of the questionnaire on 35 undergraduate students using the concurrent and retrospective think-aloud interview method (Bolton 1993). Following the respondents' comments, we refined the wording of some items.

To avoid item priming effects, we presented items measuring closely-related constructs on different pages of the questionnaire. Item priming effects refer to the fact that the positioning of the predictor (or criterion) variable on the questionnaire can make that variable more salient to the respondent and imply a causal relationship with other variables (Podsakoff et al. 2003). The separation of the criterion variables (e.g., brand loyalty measures) and the predictor variables on different pages reduces the respondent's ability and/or motivation to use previous answers to respond to subsequent measures (Podsakoff et al. 2003). Moreover, since there are two sets of brand loyalty questions for the 2.5G and 3G models, we created two versions of the questionnaire to avoid any possible order bias. In one version, we placed the 2.5G model questions before the 3G model questions. In another version, we reversed the order. We randomly assigned the two versions to respondents in our survey to control for any order bias.

#### *Data Collection and Sample*

We selected Singapore for conducting our survey because it is one of the lead markets in mobile phone adoption, as indicated by very high mobile phone penetration rate — 99.8% in 2005 and 131% in 2008 (Infocomm Development of Singapore 2009). Our interviews with managers of major phone brands indicated that they consider people between 18 and 35 years old to be their target customers, so we chose our sample from people in this age group who used 2.5G phones.

To obtain a reasonably representative sample of our target population in a pragmatic manner, we used the quota sampling method. To prepare the quotas for our interviewers, we assigned sub-quotas to each group on the basis of 2.5G phone

users' age and gender. Specifically, we divided the target age group (18–35 years old) into three categories, 18–23, 24–29 and 30–35, and set up sub-quotas for these categories in proportion to the number of people in the corresponding categories in the target population. Similarly, we set up sub-quotas in proportion to the number of males and females in the target population. All these sub-quotas were divided equally among the interviewers so that each interviewer was given the same set of sub-quotas to attain. We asked interviewers to conduct mock interviews with each other in our presence to ensure that they followed the same procedure. To ensure a reasonably representative sample, we asked our interviewers to conduct interviews both during and after office hours in various parts of Singapore.

The interview was carried out as follows. An interviewer first asked a potential respondent a few screening questions to determine his/her eligibility for the interview (e.g., questions that checked whether his/her mobile phone was a 2.5G phone based on the MMS capability and GPRS availability). If the respondent was eligible, then the interviewer explained the key differences between the 2.5G and 3G phones. The respondent was then asked to complete the questionnaire on a self-administered mode in the presence of the interviewer. At the end of the interview, the interviewer gave the respondent \$2.30 as a token of appreciation. Each interview lasted an average of 10 min.

We collected 579 responses. We excluded from our analysis responses with missing values and unreliable responses (e.g., same answers for every question of a section), resulting in a usable sample of 514 responses. The usable sample matches the target population closely in the percentages of different age groups and genders, as indicated in Table 2. Consistent with the literature on innovation adoption, the early adopter group in our sample contains more males and younger people than the late adopter group. We tested whether demographic variables including age and gender could be used to identify early and late adopters. We estimated a logistic regression with adopter type (early vs. late adopters) as the dependent variable, and age and gender as independent variables. We found that age did not have a significant effect on early adoption ( $p > .10$ ), whereas gender did ( $b = .34$ ,  $p < .10$ ). Because we treated female as the reference category for gender, the positive sign of the coefficient estimate for gender confirmed the notion that males tended to adopt 2.5G phones earlier than females. We also added income to the logit model as another independent variable but found that it did not have a significant impact on adopter type ( $p > .10$ ). In sum, we conclude that gender information could be used to predict mobile technology adoption.

Furthermore, we found evidence corroborating our premise that early adopters have better knowledge about mobile technologies than late adopters. In our survey, we asked respondents two questions about their knowledge of mobile technologies and mobile phone functions. The first question concerns whether they consider themselves informed about the different technologies of mobile phones. The second question is about whether they consider themselves knowledgeable about the functions of mobile

Table 2  
Sample and target population characteristics.

a. Cross-tabulation of the sample by adopter type, age and gender					
Age	Early adopters		Late adopters		Total
	Male	Female	Male	Female	
18–23	51 (19.7%)	38 (14.7%)	39 (15.3%)	47 (18.4%)	175 (34.0%)
24–29	50 (19.3%)	38 (14.7%)	33 (12.9%)	41 (16.1%)	162 (31.5%)
30–35	43 (16.6%)	39 (15.1%)	48 (18.8%)	47 (18.4%)	177 (34.4%)
Total	144 (55.6%)	115 (44.4%)	120 (47.1%)	135 (52.9%)	514 (100%)

b. Sample representativeness: comparison between sample and target population			
Demographics	Sample		Target population <sup>a</sup> (%)
	Early adopters (%)	Late adopters (%)	
<b>Age</b>			
18–23	34.4	33.9	28.9
24–29	34.0	29.2	32.0
30–35	31.7	37.0	39.1
	Total: 100	Total: 100	Total: 100
<b>Gender</b>			
Male	55.6	47.1	48.9
Female	44.4	52.9	51.1
	Total: 100	Total: 100	Total: 100
<b>Income<sup>b</sup></b>			
Less than \$500	23.6	20.9	Not available
\$500–below \$1000	10.0	9.8	
\$1000–below \$2000	19.6	24.2	
\$2000–below \$3000	26.0	25.8	
\$3000–below \$5000	16.4	13.9	
\$5000–below \$7000	2.8	3.3	
\$7000–below \$9000	.8	1.2	
\$9,000 and above	.8	.8	
	Total: 100	Total: 100	

<sup>a</sup> Based on statistics published by Singapore Statistics on its website (<http://www.singstat.gov.sg/keystats/people.html#demo>).

<sup>b</sup> Monthly income in Singapore dollars, including wages, bonuses, and allowances.

phones. We collected their response on a five-point scale anchored by the phrases “not at all informed” and “highly informed” for the first question, and “know nothing” and “know a great deal” for the second. We represented respondents’ knowledge of mobile technologies by the average of respondents’ answers to these two questions and confirmed the average score to be reliable (Cronbach’s  $\alpha = .84$ ). We then performed a t-test on the difference in the score between early and late adopters. We found that early adopters had better knowledge than late adopters about mobile technologies ( $t[510] = 3.15$ ;  $M_{\text{early adopters}} = 3.42$  vs.  $M_{\text{late adopters}} = 3.20$ ).

### Empirical Model

To validate our conceptual framework and research hypotheses, we formulate a structural equation model (SEM) comprising measurement and structural parts. The structural part comprises relationships among key constructs in our framework (see Fig. 2).

In addition to the proposed drivers of brand loyalty, we also include several control variables. Prior research suggests that demographic variables such as gender, age and income may affect brand attachment and brand loyalty (Lambert-Pandraud

and Laurent 2010). Our initial analysis indicates that age does not have any significant effect on brand attachment or brand loyalty. This lack of effect may be due to the restricted range of age covered in our survey (18–35 years old). Consequently, we include only gender and income as control variables in our final. We represent gender as a dummy variable (1 if female). In addition, loyalty proneness, a personality trait that refers to the consumer’s general tendency to buy the same brands over time rather than switching to other brands, may have a positive influence on her emotional attachment to the current brand and brand loyalty (Raju 1980). Therefore, we also include this variable as a correlate of brand attachment and brand loyalty. Furthermore, to capture any remaining influences (e.g., effects of promotional activity) of the brands not represented by the key relationships in our model (Fig. 2), we incorporate a group of dummy variables, Brand<sub>1</sub> to Brand<sub>7</sub>, as control variables. These variables represent the major brands with other brands being the reference or base category. For example, Brand<sub>1</sub>, which represents Nokia, is set to one if the respondent uses Nokia, and zero if she does not. At the time of the data collection, the major brands used by consumers in Singapore included Nokia, Samsung, Panasonic, Sony-Ericsson, LG, Siemens and Motorola.

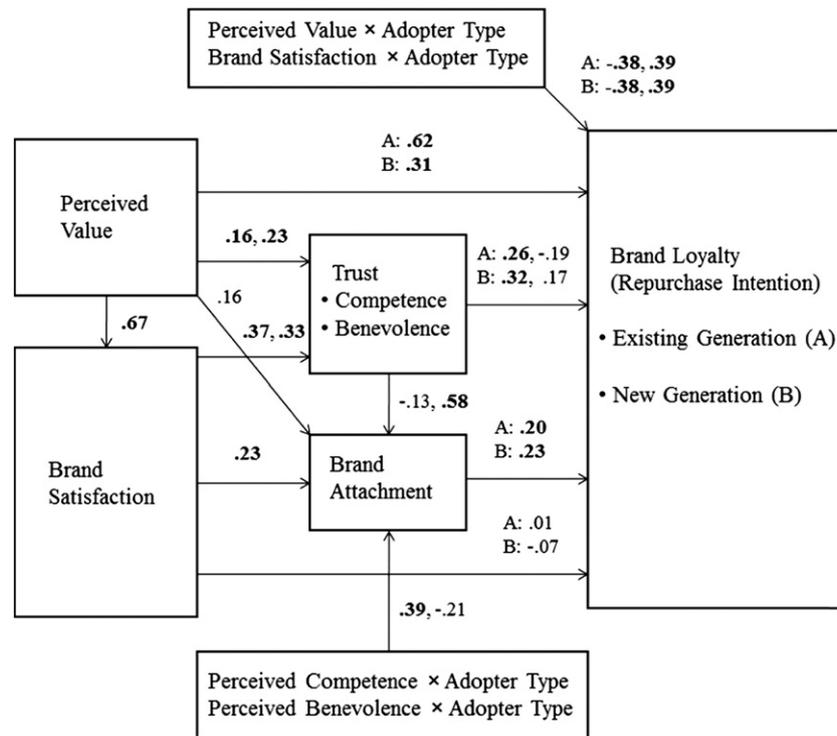


Fig. 2. Unstandardized coefficient estimates of the empirical model (structural part). Notes: The coefficient estimates are based on Model 2 (the constrained version of our empirical model). For simplicity, the control variables (gender, income and brands) and the adopter type variable are not included. “A” represents the existing generation and “B” the new generation. Estimates significant at the .10 level are in bold. Certain paths represent multiple relationships. For example, trust consists of two dimensions, competence and benevolence, which have separate effects on brand loyalty. The estimates of the effects involving these dimensions are represented in the same row.

To test the moderating effects of adopter type ( $H_1$ ,  $H_2$ ,  $H_{3a}$  and  $H_{3b}$ ), we incorporate a dummy variable representing adopter type (0 = early adopter, 1 = late adopter) and interaction terms representing the respective moderating effects into the SEM (see Fig. 2). For example, the inclusion of (perceived value  $\times$  adopter type) captures the moderating role of adopter type in the effect of perceived value on brand loyalty ( $H_1$ ). The coefficient of the product term represents the moderating effect of the adopter type in the relationship between perceived value and brand loyalty. Therefore, we can test  $H_1$  using the coefficient estimate and its standard error. For testing the moderating role of technology generation ( $H_4$  and  $H_5$ ), we performed contrast tests ( $\chi^2$  difference tests) on the differences between the relevant coefficients. These tests are based on a change in  $\chi^2$  when the coefficients are constrained to be equal. For example, for  $H_4$ , which states that the effect of perceived value on brand loyalty under the existing generation is greater than the corresponding effect under the new generation, we conducted a contrast test by examining the significance of a change in  $\chi^2$  when the coefficients representing these two effects were set to be equal.

## Analysis and Results

We first examine the reliability and discriminant validity of our multi-item measures. To perform the reliability and validity tests, we conduct two-group confirmatory factor analysis (CFA)

using Mplus 6.12 (Muthén and Muthén 2004). The two groups comprise early and late adopters of 2.5G phone users. After confirming the reliability and discriminant validity of the constructs, we perform a structural equation modeling (SEM) analysis on our empirical model using Mplus 6.12. We test our hypotheses by examining relevant coefficient estimates and performing contrast tests between the two groups on some of these estimates.

### Confirmatory Factor Analysis (CFA)

We conducted confirmatory factor analyses (CFAs) iteratively to purify our measures. An item measuring benevolence, “The company does not withhold any information from me that I am concerned about,” had weak standardized factor loadings of .46 and .39 for early and late adopter groups, respectively. Therefore, we drop it from our final analysis.

We also tested the invariance of the measurement model for the refined measures across the early and the late adopter groups by constraining the unstandardized factor loadings and the variances of the factors to be the same across the groups. The increase in the  $\chi^2$  fit statistic when the constraints were introduced was not significant at the .05 level ( $\chi^2[25] = 6.49, p > .10$ ). Therefore, the factor structure of the measures was stable across the groups. In addition, consistent Bagozzi and Yi’s (2012) criteria, the measurement-invariant model with the constraints had acceptable fit statistics:  $\chi^2(536) = 858, p < .001$ ; root mean square error of approximation (RMSEA) = .048; standardized root mean square

Table 3  
Correlation and covariance matrixes of the key constructs and control variables.<sup>a</sup>

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	BRANDLOY <sub>exist</sub>	.71	.43	.26	.26	.29	.20	.12	.07	-.01	-.01	-.03	.08	-.01	-.02	-.03	-.00	-.01	-.03
2.	BRANDLOY <sub>new</sub>	.61	.71	.21	.24	.32	.19	.18	.09	.03	-.03	-.04	.12	-.02	-.02	-.04	.00	-.01	-.02
3.	VALUE	.50	.40	.37	.24	.22	.16	.18	.00	.00	-.01	.02	-.03	-.01	-.01	.00	-.00	-.01	-.01
4.	SATISFACTION	.49	.45	.63	.39	.23	.20	.18	.00	.00	-.01	.02	.04	-.00	-.01	-.01	-.00	-.00	-.01
5.	ATTACHMENT	.42	.47	.44	.46	.65	.15	.23	.16	.02	.02	.17	.07	-.03	-.01	-.03	.00	-.00	-.01
6.	COMPETENCE	.44	.44	.50	.62	.36	.28	.11	.00	-.00	-.01	.02	.06	-.02	-.01	-.03	-.01	.00	-.00
7.	BENEVOLENCE	.25	.38	.52	.49	.49	.36	.33	.00	.00	-.01	.02	.03	-.01	-.00	-.02	-.00	.00	.00
8.	LOYPRONE	.12	.17	.00	.00	.32	.00	.00	.40	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9.	ADOPTER	-.01	.05	.00	.00	.05	-.00	.01	.00	.30	.01	.10	.01	-.01	.01	-.01	.00	-.00	-.01
10.	GENDER	-.02	-.06	-.03	-.02	.06	-.05	-.04	.00	.02	.25	-.05	-.04	.04	.01	-.00	.00	-.01	-.00
11.	INCOME	-.02	-.03	.02	.01	.13	.02	.02	.00	.11	-.06	2.62	.06	-.03	-.02	-.05	-.01	.01	.01
12.	BRAND <sub>1</sub>	.20	.28	.09	.12	.18	.23	.11	.00	.03	-.15	.07	.25	-.08	-.02	-.09	-.01	-.01	-.03
13.	BRAND <sub>2</sub>	-.03	-.07	-.05	-.01	-.09	-.08	-.07	.00	-.04	.24	-.06	-.43	.13	-.01	-.03	-.00	-.00	-.01
14.	BRAND <sub>3</sub>	-.11	-.12	-.11	-.10	-.08	-.10	-.03	.00	.07	.08	-.05	-.19	-.09	.04	-.01	-.00	-.00	-.00
15.	BRAND <sub>4</sub>	-.08	-.13	.00	-.05	-.08	-.12	-.09	.00	-.05	-.01	-.08	-.48	-.21	-.10	.16	-.00	-.00	-.01
16.	BRAND <sub>5</sub>	-.01	.00	-.02	-.01	.04	-.09	-.05	.00	.05	.07	-.04	-.12	-.06	-.03	-.06	.02	.00	-.00
17.	BRAND <sub>6</sub>	-.09	-.06	-.08	-.02	-.01	.01	.04	.00	-.01	-.09	.03	-.12	-.06	-.03	-.06	-.02	.02	-.00
18.	BRAND <sub>7</sub>	-.16	-.13	-.07	-.09	-.07	-.02	.00	.00	-.04	-.01	.01	-.23	-.10	-.05	-.12	-.03	-.03	.05

<sup>a</sup> The covariance matrix is shown in the upper triangle, and the correlation matrix in the lower triangle of the table. The variances are shown in the diagonal and are italicized. BRANDLOY<sub>exist</sub> = brand loyalty (existing generation), BRANDLOY<sub>new</sub> = brand loyalty (new generation), VALUE = perceived value, SATISFACTION = brand satisfaction, ATTACHMENT = brand attachment, COMPETENCE = perceived competence, BENEVOLENCE = perceived benevolence, LOYPRONE = loyalty proneness, ADOPTER = adopter type (0 = early adopter, 1 = late adopter), GENDER = gender (0 = male, 1 = female), INCOME = personal monthly income, BRAND<sub>1</sub> = Nokia (0 = others, 1 = Nokia), BRAND<sub>2</sub> = Samsung (0 = others, 1 = Samsung), BRAND<sub>3</sub> = Panasonic (0 = others, 1 = Nokia), BRAND<sub>4</sub> = Sony-Ericsson (0 = others, 1 = Sony-Ericsson), BRAND<sub>5</sub> = LG (0 = others, 1 = LG), BRAND<sub>6</sub> = Siemens (0 = others, 1 = Siemens), BRAND<sub>7</sub> = Motorola (0 = others, 1 = Motorola).

residual (SRMR) = .058; CFI = .96; TLI = .96. Furthermore, the CFA included statistical tests on the differences in means of the observed variables between the two groups. The test results showed that early adopters had significantly higher values than late adopters of perceived competence, comparative value and brand satisfaction with differences of .115 ( $p < .05$ ), .184 ( $p < .01$ ) and .152 ( $p < .01$ ), respectively.

Based on the measurement-invariant model, we examined the reliability and construct validity of our measures. The composite reliabilities of all constructs exceed .6, the cut-off value recommended by Bagozzi and Yi (1988). We assessed convergent validity by examining the standardized factor loadings. All are significant at the .001 level and all but one have loadings higher than the .5 cut-off value suggested by Bagozzi and Yi (1988), providing strong evidence of convergent validity. To assess discriminant validity, we compared the average variance extracted from each construct and the variance that each construct shares with other constructs (Fornell and Larcker 1981). The average variance extracted was greater than the shared variance for all constructs, indicating high discriminant validity. In sum, the CFA analyses suggest that our refined measures have sound psychometric properties.

*Structural Equation Model (SEM) Analysis*

We estimate the measurement and structural components of our empirical model simultaneously. To estimate our model, we use the Latent Moderated Structural Equations (LMS) approach advocated by Klein and Moosbrugger (2000) as it offers several advantages over other approaches (e.g., the summed indicator

method proposed by Ping 1995) that allow interactions. Specifically, it allows for non-normal distributions of endogenous variables and their indicators in models with interactions in the form of product terms. In these models, the endogenous variables are expressed as a combination of other variables and their products (interactions). Because the product terms are not normally distributed, the frequency distributions of the endogenous variables and their indicators are not normal (Klein and Moosbrugger 2000). The LMS approach takes the non-normal distribution of product terms explicitly into account through an analysis of the multivariate density function of the indicator variables. The result of the density analysis yields a representation of the distribution of the joint indicator vector as a finite mixture of normal distributions. Because the mixture distribution cannot be maximized directly for the model parameters, LMS uses the EM (Expectation–Maximization) algorithm iteratively to generate maximum likelihood estimates of the model parameters. These estimates are consistent, unbiased and efficient. In addition to this advantage, LMS also permits simultaneous estimation of the measurement and structural parts of the model.

Because our CFA results show significant differences between early and late adopters on perceived value, brand satisfaction and perceived competence, we incorporated adopter type as a predictor of these three constructs into our model to see whether they have any significant effect on these constructs in the presence of other predictors. We found that adopter type had no significant effect on brand satisfaction and perceived competence ( $p > .10$ ), but had a significant effect on perceived value ( $b = -.14, p < .05$ ). Since early adopters were treated as the

Table 4  
Unstandardized parameter estimates (SEM analysis).<sup>a</sup>

Relationship	Model 1	Model 2 <sup>b</sup>
<b>Brand loyalty (existing generation)</b>		
Perceived value → Brand loyalty	.62*** <sup>c</sup>	.61***
Brand satisfaction → Brand loyalty	-.03	.01
Brand attachment → Brand loyalty	.20*	.20**
Perceived competence → Brand loyalty	.26!	.26!
Perceived benevolence → Brand loyalty	-.18	-.18
Adopter type <sup>d</sup> → Brand loyalty	-.11	-.11
(Perceived value × Adopter type) → Brand loyalty	-.40!	-.38*
(Brand satisfaction × Adopter type) → Brand loyalty	.45*	.40**
Loyalty proneness → Brand loyalty	.08	.08
Gender <sup>d</sup> → Brand loyalty	-.04	-.04
Income → Brand loyalty	-.03	-.03
Brand <sub>i</sub> <sup>c</sup> (i = 1 to 7) → Brand loyalty	-.02, -.11, -.27, -.19, -.23, -.44, -.48	-.03, -.12, -.28, -.21, -.23, -.45, -.49
<b>Brand loyalty (new generation)</b>		
Perceived value → Brand loyalty	.30*	.31*
Brand satisfaction → Brand loyalty	-.04	-.07
Brand attachment → Brand loyalty	.23**	.23**
Perceived competence → Brand loyalty	.33*	.33*
Perceived benevolence → Brand loyalty	.17	.18!
Adopter type → Brand loyalty	-.01	-.13!
(Perceived value × Adopter type) → Brand loyalty	-.37!	-.38*
(Brand satisfaction × Adopter type) → Brand loyalty	.34*	.40**
Loyalty proneness → Brand loyalty	.12	.12
Gender → Brand loyalty	-.10	-.10
Income → Brand loyalty	-.04!	-.04!
Brand <sub>i</sub> (i = 1 to 7) → Brand loyalty	.27, .10, -.19, -.02, .13, -.22, -.19	.28, .10, -.18, -.00, .13, -.21, -.18
<b>Brand attachment</b>		
Perceived value → Brand attachment	.16!	.16
Brand satisfaction → Brand attachment	.23*	.23*
Perceived competence → Brand attachment	-.13	-.13
Perceived benevolence → Brand attachment	.58***	.58***
Adopter type → Brand attachment	-.02	-.03
(Perceived competence × Adopter type) → Brand attachment	.39!	.39!
(Perceived benevolence × Adopter type) → Brand attachment	-.21	-.21
Loyalty proneness → Brand attachment	.41***	.41***
Gender → Brand attachment	.18*	.18*
Income → Brand attachment	.06*	.06**
Brand <sub>i</sub> (i = 1 to 7) → Brand attachment	.14, -.09, -.13, .03, .40, .04, -.12	.14, -.09, -.13, .03, .40, .04, -.12
<b>Brand satisfaction</b>		
Perceived value → Brand satisfaction	.68***	.68***
Brand <sub>i</sub> (i = 1 to 7) → Brand satisfaction	.19, .17, .05, .09, .19, .30, .03	.19, .17, .05, .09, .19, .30, .03
<b>Perceived competence</b>		
Perceived value → Perceived competence	.16*	.16*
Brand satisfaction → Perceived competence	.37***	.37***
Brand <sub>i</sub> (i = 1 to 7) → Perceived competence	.24, .09, .09, .06, -.13, .31, .24	.24, .09, .09, .06, -.13, .31, .24
<b>Perceived benevolence</b>		
Perceived value → Perceived benevolence	.23**	.23**
Brand satisfaction → Perceived benevolence	.33***	.33***
Brand <sub>i</sub> (i = 1 to 7) → Perceived benevolence	-.02, -.10, .04, -.13, -.22, .25, .07	-.02, -.10, .04, -.13, -.22, .25, .07

(continued on next page)

Table 4 (continued)

Relationship	Model 1	Model 2 <sup>b</sup>
Comparative value		
Adopter type → Comparative value	-.15*	-.15*
Brand <sub>i</sub> (i = 1 to 7) → Comparative value	-.28, -.40!, -.62*, -.34, -.41, -.71, -.53*	-.28, -.40!, -.62*, -.34, -.41, -.68, -.53*

<sup>a</sup> R<sup>2</sup> estimates are not available in the Mplus output for model estimation using the Klein and Moosbrugger approach.

<sup>b</sup> Model 2 was derived from Model 1 by constraining the coefficients of the interactions, Perceived value × Adopter type and Brand satisfaction × Adopter type, to be the same across the existing and the new generations.

<sup>c</sup> !:  $p < .10$  \*:  $p < .05$  \*\*:  $p < .01$  \*\*\*:  $p < .001$ .

<sup>d</sup> The reference category of adopter type is the early adopter group, and that of gender is male.

<sup>e</sup> Brand<sub>i</sub> (i = 1 to 7): These are seven dummy variables representing seven major brands (e.g., Nokia, Samsung) respondents currently use. The reference category comprises the lesser-known brands.

reference category in our model, the negative sign of the coefficient estimate for this effect suggests that early adopters perceived higher perceived value than late adopters for the brand that they were using, supporting our premise that early adopters are more capable of differentiating different brands in brand value.

Some of our hypotheses (H<sub>4</sub> and H<sub>5</sub>) relate to variation of certain effects on brand loyalty across mobile generations. These hypotheses presume measurement invariance of brand loyalty across the existing and the new generations. To test this assumption, we examined the change in  $\chi^2$  between a model that allowed the factor loadings of brand loyalty to vary across the generations and another that did not. The change in  $\chi^2$  is not significant:  $\chi^2(1) = .20, p > .10$ . Therefore, the invariance of factor loadings is supported. Consequently, we adopt the model with the loadings constrained to be the same across the two generations.

The LMS estimation approach does not provide model fit indices for our proposed model that includes the interactions because means, variances, and covariances are no longer sufficient statistics for model estimation under this approach. However, we can obtain the fit indices of a reduced model that is derived from the proposed model by removing the interactions. Therefore, to get a rough idea of the fit of our proposed model, we resorted to inspecting the fit indices of the reduced model. The fit indices of the reduced model show acceptable fit:  $\chi^2(444) = 824$ , CFI = .96, TLI = .95, RMSEA = .041, SRMR = .078. Furthermore, we also assessed the model fit based on the significance of the coefficient estimates. The majority of the key relationships in our model are significant ( $p < .10$  or better), suggesting that our model fits the data well.

Table 3 shows the correlation and covariance matrices of the key constructs and control variables. The correlations between the key constructs are moderate, falling between .25 and .63. Because our hypotheses, H<sub>1</sub> and H<sub>2</sub>, suggest that the interactive effects of (perceived value × adopter type) and (brand satisfaction × adopter type) on brand loyalty are invariant across technology generations, and this invariance has implications for our model specification, we proceeded to test this invariance. To carry out this test, we constrained the coefficients of (perceived value × adopter type) and (brand satisfaction × adopter type) to be equal across the two equations with brand loyalty for the existing generation and

brand loyalty for the new generation as dependent variables, respectively, and then calculated the change in  $\chi^2$  with these two constraints applied. The change in  $\chi^2$  is not significant:  $\chi^2(2) = .66, p > .10$ . We also tested the change in  $\chi^2$  when only one of these constraints was applied. Again, the results show non-significance for each of these constraints ( $p > .10$ ). Therefore, we conclude that the two interactive effects do not vary across the two generations. Consequently, for parsimony, we adopt the model with the two constraints (Model 2) instead of the version without the constraints (Model 1) (refer to Table 4), and base our hypothesis testing on the estimation of Model 2.

H<sub>1</sub> posits that the effect of perceived value on mobile device brand loyalty is more positive for early than late adopters of mobile devices. As Table 4 shows, the corresponding interaction, (perceived value × adopter type), is negative and significant ( $b = -.38, p < .05$ ), suggesting that the effect of perceived value is more positive for early adopters than late adopters, supporting H<sub>1</sub>. Furthermore, the coefficient of (brand satisfaction × adopter type) is positive and significant ( $b = .40, p < .01$ ), supporting H<sub>2</sub>. Thus, the effect of brand satisfaction on mobile device brand loyalty is more positive for late than early adopters.

H<sub>3a</sub> and H<sub>3b</sub> relate to the moderating roles of the adopter type in the effects on brand attachment of perceived competence and benevolence, respectively. To test these hypotheses, we refer to the corresponding interactions, (perceived competence × adopter type) and (perceived benevolence × adopter type), under the caption “Brand attachment” in Table 4. The coefficient estimate of (perceived competence × adopter type) is positive and significant ( $b = .39, p < .10$ ). Therefore, H<sub>3a</sub> is supported. In contrast, the estimate of (perceived benevolence × adopter type) is not significant ( $p > .10$ ). Therefore, H<sub>3b</sub> is not supported.

H<sub>4</sub> states that the effect of perceived value on mobile device brand loyalty is more positive for the existing generation than the new generation. The effect of perceived value on mobile device brand loyalty reported in Table 4 is the effect under the reference category of adopter type, i.e., early adopters (refer to the rows just below the captions “Brand loyalty [Existing Generation]” and “Brand loyalty [New Generation]” in Table 4). To test H<sub>4</sub>, we set the coefficient of this effect to be the same across the two generations. The change in  $\chi^2$  with this constraint is significant:  $\chi^2(1) = 7.17, p < .01$ . Furthermore, since the

Table 5  
Results of hypothesis testing and implications.

Number	Hypothesis	Results	Implications
<i>Moderating effects of adopter type</i>			
1	The effect of perceived value on mobile device brand loyalty is more positive for early adopters than for late adopters, regardless of the mobile technology generation under consideration.	Supported	Communicate value based offers for early adopters — e.g., by promoting products' high performance and quality.
2	The effect of brand satisfaction on mobile device brand loyalty is more positive for late adopters than for early adopters, regardless of the mobile technology generation under consideration.	Supported	To encourage brand repurchase by late adopters, leverage satisfaction — e.g., by showing how products' functions can help meet consumer needs.
3a	The effect of perceived competence on brand attachment is more positive for late than early adopters of mobile devices.	Supported	To create a closer association with “self,” emphasize a firm's competence for late adopters — e.g., by highlighting the application of state-of-the art technology in their products.
3b	The effect of perceived benevolence on brand attachment is more positive for late than early adopters of mobile devices.	Not supported	
<i>Moderating effects of technology generation</i>			
4	The effect of perceived value on mobile device brand loyalty is more positive for the existing mobile technology generation than for the new generation.	Supported	To induce brand repurchase under the existing generation, communicate value-based offers — e.g., by promoting products' high performance and quality.
5	The effect of perceived benevolence on mobile device brand loyalty is more positive for the new mobile technology generation than for the old generation.	Supported	To induce brand purchase under the new generation, emphasize benevolence in marketing communications — e.g., by highlighting a firm's customer care.

coefficient indicated in Table 4 is more positive for the existing generation than the new generation (.61 vs. .31), we conclude that  $H_4$  is supported for early adopters. In addition, because we have confirmed that the difference in the effects of perceived value on mobile device brand loyalty between early and late adopters is invariant across technology generations, support for  $H_4$  in regard to early adopters also implies support for  $H_4$  in regard to late adopters. In sum,  $H_4$  is supported regardless of the adopter type.

$H_5$  states that the effect of perceived benevolence on mobile device brand loyalty is more positive for the new generation than for the existing generation. We performed a contrast test for  $H_5$  by constraining the effect of perceived benevolence to be the same across the two generations. The change in  $\chi^2$  with this constraint applied is significant:  $\chi^2(1) = 10.13, p < .01$ . Moreover, the coefficient for the effect of perceived benevolence is more positive for the new generation than the existing generation (.18 vs. -.18). Therefore,  $H_5$  is also supported.

We summarize the hypothesis test results in Table 5. Most of the moderator hypotheses for adopter type and technology generation are supported. Overall, the results show that perceived value (brand satisfaction) drives brand loyalty for early (late) adopters. The results also reveal that perceived competence influences brand attachment more for late than early adopters. Furthermore, consumers rely more on perceived benevolence and less on perceived value in forming mobile device brand loyalty for the new generation than for the existing generation.

## Discussion

### *Theoretical Implications and Contributions*

Our results largely support the multi-process view of mobile device brand loyalty formation that we advance. We also show

that brand attachment plays an important mediating role in some of these processes. Importantly, our results show that some of the relationships underlying these processes vary with adopter type and mobile technology generation.

While perceived value and brand satisfaction are viewed as general drivers of mobile device brand loyalty, our research suggests that their roles in loyalty intention formation differ by adopter types. Consistent with our expectation, early adopters of mobile devices are more influenced by perceived value than are late adopters in their intention to repurchase the brand. This result is consistent with our argument that early adopters of mobile devices tend to be rational, comparing products and maximizing their utility. In contrast, late adopters rely on satisfaction with the brand, supporting the argument that they follow satisficing strategies.

In addition, this study enhances our understanding of the moderating role of mobile technology generation in repurchase intention formation. Our results show that perceived value has a stronger effect on mobile device brand loyalty for the existing generation than for the new generation. This finding suggests that the consumer regards the current brand value judgment as less relevant when making inferences about a new generation. Furthermore, the effects of perceived benevolence on brand loyalty for the different generations are intriguing. First, for the existing generation, the effect is negative but this effect may represent a spurious result. Consumers seldom visit customer care centers of mobile phones unless they experience problems with their phones. Thus, a benevolent perception toward the customer care staff may be positively correlated with the incidence of such problems. Because such problems negatively affect brand loyalty, the negative effect of perceived benevolence on brand loyalty may reflect the negative effect of the incidence of such problems. Second, the effect of perceived benevolence turns positive when the repurchase decision concerns a new

generation. This finding suggests that when evaluating the new mobile generation, which involves greater uncertainty in product performance and service hazards, consumers pay greater attention to the benevolence of the firm behind the brand.

Our results also provide evidence that adopter type moderates relationships among the brand loyalty drivers. Perceived competence affects brand attachment more strongly for late adopters than for early adopters. Because brand satisfaction is related to perceived competence and brand attachment to mobile device brand loyalty, there are therefore more pathways (direct and indirect effects) linking brand satisfaction to mobile device brand loyalty for late adopters than for early adopters.

Additionally, our results help distinguish the roles that perceived competence and perceived benevolence play in the processes leading to mobile device brand loyalty. On the one hand, perceived competence has a stronger direct effect on mobile device brand loyalty than perceived benevolence. On the other hand, perceived benevolence has a stronger effect on brand attachment for late adopters. Because brand attachment is significantly related to mobile device brand loyalty, perceived benevolence affects loyalty intention mainly through its impact on brand attachment.

### *Managerial Implications*

Although our empirical investigation focused on the mobile phone market, the implications of our data analysis are potentially applicable to other mobile devices (e.g., tablets) for two reasons. First, mobile phones share mobile devices' key characteristics and benefits to consumers, namely, portability and small size, enabling the user to access the Internet on the go. Although consumers may use different forms of devices for different activity (e.g., using mobile phones to check Facebook updates versus using tablets to read online newspapers), these key characteristics and benefits generally hold regardless of product forms. Second, the constructs in our conceptual framework (e.g., brand satisfaction, perceived value) are conceptualized at an abstract, higher-order level and are applicable to all forms of mobile devices. Similarly, the theoretical arguments we invoked in formulating our conceptual framework and hypotheses transcend product forms.

A related question is whether we could generalize our results to other technological products as well besides mobile devices. We believe the generalizability largely depends on whether the constructs in our framework and the reasoning of our hypothesized relationships hold for these products. Constructs such as perceived value holds for a variety of technological products as the consumer generally compares the costs and benefits associated with the usage of these products. In contrast, the construct, brand attachment, may not apply to certain products which primarily serve utilitarian functions not closely connected with self-related goals, or are not used as frequently as mobile devices. For example, portable hard drives help the consumer store information but he/she may not develop intimate feelings about them over time. Also, the frequency of using these drives is generally not as high as that of using mobile phones. Likewise, whether our findings are potentially applicable to other mobile generations

(e.g., 4G) largely depends on whether our assumptions about generational differences also hold for other generations. For example, according to [Wikipedia \(2013\)](#), 4G uses a different technology and offers substantial improvement in performance and capabilities of mobile devices in comparison to 3G. Therefore, 4G poses greater uncertainty, risks and benefits for the consumer who consider 4G and 3G phones separately when buying mobile phones. Therefore, our findings are likely to be generalizable to 4G.

Overall, our findings suggest that early and late adopters of mobile devices differ in their decision-making style and respond differently to marketing efforts. Accordingly, mobile device marketers can treat these customers as two different segments. They can readily distinguish early and late adopters using the date of purchase of their products and their associated characteristics. One source of the date of purchase is the warranty registration by customers for the phone models that they have just purchased. Moreover, the innovation adoption literature describes a number of characteristics that distinguish early adopters from late adopters ([Gatignon and Robertson 1985](#)). It suggests that early adopters are younger, have higher income, higher education, greater social mobility, and a more favorable attitude toward risk than late adopters. Managers can use these characteristics to identify early and late adopters. Furthermore, our data show that early adopters of mobile phones have better knowledge about mobile technologies than late adopters, and males tend to adopt mobile technologies earlier than females. Such information about technical knowledge level and gender could help distinguish early and late adopters.

To build brand loyalty, mobile device marketers need to adapt their marketing efforts to different types of adopters. Because perceived value has a particularly strong impact on early adopters' brand loyalty for the existing technology generation, marketers should promote their products' usefulness, high performance and high quality when marketing the existing generation to early adopters. Since early adopters are eager and willing to process product attribute information and compare products, marketers can make such information easily accessible for different models by providing product comparison charts. They can also highlight the brand's differentiation in their marketing communications for early adopters.

In contrast to early adopters, late adopters are more influenced by brand satisfaction in their brand loyalty formation. Therefore, in their marketing communications towards late adopters, mobile device marketers should emphasize their brands' ability to meet consumer needs. To attain a high level of brand satisfaction, these marketers should strive to set realistic expectations for their brands through marketing communications and ensure that consumers know how to meet their needs and wants through the products' functions. For example, recent advertisements of Apple and Samsung highlight how the photo-editing function of their mobile phones satisfy the creative needs of consumers.

Our results show that perceived competence has a significant effect on mobile device brand loyalty. Mobile device marketers should focus on late adopters' perception of competence because it also significantly affects late adopters' brand attachment. To

enhance consumers' perception of competence, these marketers could highlight breakthroughs in technology and the application of state-of-the-art technology in their products, signaling expertise in high-quality reliable products. Furthermore, marketers could invoke institution-based trust to enhance consumers' perception about their competence (Pavlou and Gefen 2004). For example, they could highlight product design awards received from independent organizations. Samsung's website lists awards and accolades that its phone models have received from professional associations.

Although the direct effect of perceived benevolence on brand loyalty is insignificant, that of perceived benevolence on brand attachment is significant and strong. To enhance the perception of benevolence, mobile device marketers could strengthen customer care and highlight customer focus before and after sales. They could also provide customers with an extended warranty to signal their benevolent intentions.

The results about the moderating effects of mobile technology generation have important implications for managing new products. Our findings suggest that perceived value has a strong effect on mobile device brand loyalty for the existing generation. Although the effect of perceived value diminishes for the new generation, this effect is still significant. Therefore, emphasizing the value of a brand is a viable marketing communication strategy for both the generations. Although the effect of perceived benevolence on brand loyalty is weak, this effect is more positive for the new generation than the existing generation. Therefore, mobile device brand marketers may consider emphasizing customer care as well as the value of the offering when marketing the new generation.

### Limitations, Future Research, and Conclusion

Our research has some limitations that future research could address. First, the length of usage experience may be a moderator of the relationships in the model as suggested by Johnson, Herrmann, and Huber (2006). Future research could examine this issue by adopting a longitudinal research design which permits the researcher to include early and late adopters with the same length of usage experience in data collection. Second, our research could be extended to cover other life cycle stages of a mobile technology generation (e.g., decline stage). Third, we do not examine the drivers of upgrade decision within a technology generation or from one generation to another although we consider the two-stage decision-making process in our research. Bolton, Lemon, and Verhoef (2008) examine the determinants of such a decision for service contracts in the business-to-business context. An examination of the differences in the determinants of mobile device upgrade decision between the adopter types would be a useful extension. Fourth, future research may uncover moderators or boundary conditions for the relationship between brand attachment and brand loyalty. For example, adolescents and young adults may be more susceptible than senior citizens to emotional connections with a brand as they strive to construct their social identity. With data from a wider age range of respondents, the potential moderating role of age in the framework could be explored.

In conclusion, we developed a conceptual framework linking mobile device brand loyalty to drivers of brand loyalty such as brand satisfaction, perceived value, brand attachment and trust. We formulated and tested hypotheses regarding the moderating effects of adopter type (early vs. late) and mobile technology generation (existing vs. new) on the relationships between brand loyalty drivers and brand loyalty. Overall, the results reveal important asymmetries between adopter types and between technology generations. The findings show that early adopters emphasize perceived value, whereas late adopters rely on brand satisfaction in forming mobile device brand loyalty. Furthermore, our counterintuitive results reveal that early adopters rely more on trust and less on perceived value when forming brand loyalty for the new generation than for the existing generation. These findings are potentially applicable to a variety of technological products. The findings suggest that brand managers of mobile devices should account for adopter types and technology generations when adapting their marketing strategies to fully leverage the differential effects of brand satisfaction, trust and perceived value on brand loyalty.

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