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Bricks or clicks? Understanding consumer usage of retail mobile apps

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Abstract

Purpose – Mobile apps represent an emergent self-service technology that has greatly contributed to the rise of mobile shopping. However, the existing services and marketing literature offer little insight on consumer app usage. Further, little is known about how this app usage might affect important outcomes such as consumers' intentions to use and recommend an app, their channel preferences (in-store vs app), or their purchasing behavior with the app. Thus, the purpose of this research is to examine if, and how, consumers' actual experiences using retailers' apps affected these outcomes.

Design/methodology/approach – Data were collected from a series of online surveys of adult consumers based on their prior experiences with retailers' apps. The hypothesized relationships were tested using regression analyses.

Findings – Results highlight perceived ease of use as a critical app attribute that fosters consumers' personal connections to apps. These connections in turn influence their purchase channel preferences (app vs in-store) and actual purchasing behavior with the app, as well as their future intentions to purchase with the app and recommend it to others. App usage frequency is shown to moderate these effects.

Research limitations/implications – The findings provide needed managerial insight into consumer usage of brick-and-click retailers' apps. Specifically, the results inform service providers' mobile commerce strategies – particularly with respect to app design, channel management and customer segmentation. Future opportunities exist to explore and compare consumer usage of other types of service providers' apps, such as "pure play" providers that do not have physical stores.

Originality/value – This research moves beyond initial app adoption to instead focus on consumers' actual app usage experiences and their implications. Of note, the findings suggest that firms may be paradoxically driving consumers away from their physical stores as they continue to devote considerable resources to creating and providing customers with easy-to-use mobile apps.

Keywords Self-service technology, Mobile phone, Mobile shopping, Mobile apps, Mobile commerce

Paper type Research paper

Introduction

Mobile shopping represents an important and emerging revolution in customer–service provider relationships. Mobile commerce sales increased 56 per cent to nearly \$50bn over the past year in the USA alone (Bensinger, 2016), and are projected to account for approximately 50 per cent of total retail sales by 2020 [National Retail Federation (NRF), 2015]. This change reflects consumers' growing desire to have convenient, portable touchpoints to carry out transactions that have been traditionally dependent on interactions with employees in physical store contexts.

A critical factor contributing to the rise of mobile commerce is consumers' growing use of self-service technologies (SSTs)—and in particular, their use of mobile applications[1]. SSTs enable consumers to self-generate benefits in the absence of a firm's employees (White *et al.*, 2012; Collier *et al.*, 2014; Robertson *et al.*, 2016). Mobile applications, or apps, represent a recent manifestation of SSTs that allow customers ownership of various aspects of

provider–customer relationships such as information seeking, price scanning and actual purchases (Hilton *et al.*, 2013; Collier *et al.*, 2014; Kaushik and Rahman, 2015). General app usage among US consumers grew 90 per cent from 2013 to 2015, and now accounts for 87 per cent of all mobile browsing (compared to mobile website usage) (comScore, 2015). Consumers devote nearly 25 per cent of their overall app usage time to retailers' apps, specifically, ranking above time spent on instant messenger, game, music, radio and news/information apps (comScore, 2014).

These trends provide retailers with opportunities to use mobile app strategies to regain or solidify competitive market positions amidst the looming threat of large online retailers (such as Amazon) (Gupta, 2013). However, they also present critical challenges with regard to service and channel management (e.g. apps vs in-store). Thus, "brick-and-click" retailers (i.e. providers that offer both in-store and mobile app purchasing options) afford a meaningful context in which to explore consumer app usage (Kaushik and Rahman, 2015) and will be the focus of the current research.

Our research is motivated by several key factors. First, enhancing value for customers across physical and digital touchpoints in a synergistic fashion is becoming an

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increasingly complex task for retailers (Hilton *et al.*, 2013; Wang *et al.*, 2015; Robertson *et al.*, 2016), and many apps are simply not meeting consumers' needs (Rigby, 2014; SmartBrief, 2016). However, the existing relevant academic literature provides managers with only very limited guidance on how to effectively create and implement mobile app strategies. For example, Groß (2015, p. 222) concluded in a recent review that "research in the field of m-shopping is still in its infancy", despite its growing popularity. Second, the existing services literature informs SST strategy in several contexts (e.g. automated phone service, self-checkout kiosks, mobile payment solutions), but consumers do not react uniformly to different forms of SST and not all types of SST are comparable (Cunningham *et al.*, 2009; Collier *et al.*, 2014; Schuster *et al.*, 2015). Further, the SST research on mobile apps is not as extensive as the literature on other mobile service contexts such as hospitality, gaming or social media.

Lastly, and perhaps most notably, the vast majority of the prior literature surrounding the intersection of consumers and technology (such as SST) has focused primarily on consumers' *initial acceptance or adoption* of the technology. For example, researchers have previously used established frameworks such as the Technology Acceptance Model (Davis, 1989) to identify what factors lead consumers to initially begin using a particular type of technology (Mallat *et al.*, 2009; Nysveen *et al.*, 2005). Most of the modest research on mobile apps, specifically, also centers around antecedents of consumers' initial app adoption (Peng *et al.*, 2014; Taylor and Levin, 2014; Verhoef *et al.*, 2015).

It is critical to note here, however, that many of today's modern consumers have already adopted – and are currently using – mobile apps (Taylor and Levin, 2014; comScore, 2015; Sanakulov and Karjaluoto, 2015). Therefore, we aim to differentiate our research from prior work, in part, by moving beyond drivers of initial app adoption. Our goal is to instead explore:

- consumers' *actual app usage*, as well as; and
- the *post-usage outcomes* that stem from these experiences (e.g. intentions to recommend the technology to others).

We believe this shift in inquiry will serve to update the existing literature and better reflect the constantly changing technological marketplace.

Study 1 examines the influence of perceived app ease of use on customers' intentions to make purchases with the app and to recommend it to others. Importantly, we also provide a more comprehensive picture of consumer app usage by further investigating whether ease of use might also *negatively* impact customer intentions to make purchases at the corresponding retailer's *physical store* (i.e. are retailers inadvertently lowering their customers' intentions to shop at their physical locations by offering them user-friendly apps?). Study 2 then expands upon these findings by measuring customers' actual purchasing behavior with retailer apps. We also directly assess consumers' relative purchase intentions (app vs in-store) to facilitate more direct conclusions about the effects of app ease of use on purchase channel preferences.

Overall, we highlight perceived ease of use as a critical attribute of apps, and demonstrate that consumer–app

connection serves as a facilitating mechanism through which ease of use has impacts on the observed outcomes. We also identify app usage frequency as an important individual-difference variable that moderates these mediating effects. We next offer our conceptual rationale and hypotheses below.

Conceptual development and hypotheses

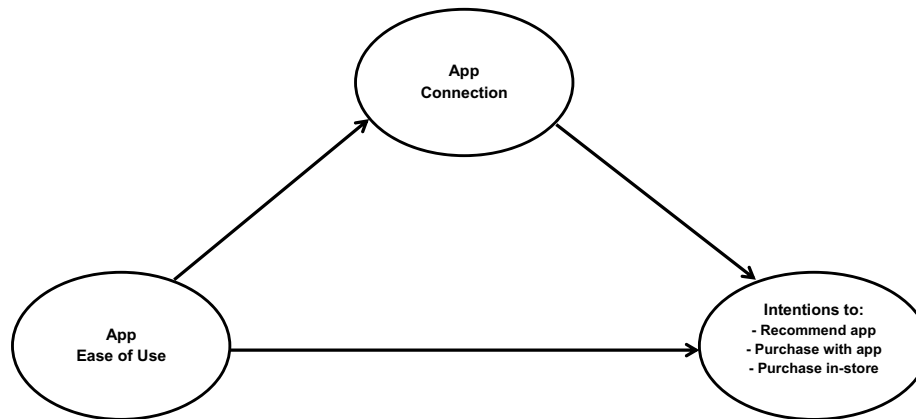
Perceived ease of use of mobile apps

Perceived ease of use, commonly referred to as "user-friendliness", is conceptualized as the degree to which an individual believes that using a particular technological system (e.g. a mobile app) is free of effort (Davis, 1989). We focus specifically on app ease of use for several reasons. First, consumers consistently note greater efficiency as a primary benefit of SST compared to traditional full service alternatives (Collier and Barnes, 2015). A user-friendly app interface affords this efficiency and generally commands universal demand by users, regardless of the type of goods or services offered. Second, apps should be more user-friendly than other forms of mobile media (e.g. mobile websites) since apps can much better respond to the specific abilities and limitations of different mobile devices (Johnson, 2010; Taylor and Levin, 2014). Consumers expect apps to offer distinct benefits, rather than to just serve as "repackaged" mobile websites across mobile devices of various shapes and sizes. However, consumers frequently cite a lack of user-friendliness as the single most important source of negative app user experiences [Hoehle and Venkatesh, 2015; National Retail Federation (NRF), 2015]. Finally, firms have considerable autonomy to design their own apps based on their customers' preferences (Taylor and Levin, 2014). Thus, the extent to which consumers perceive an app as "easy to use" is largely controllable by the provider[2].

Broader ease-of-use conceptualizations propose that consumers will evaluate technology favorably when it minimizes the effort required to obtain benefits of use (Davis, 1989; Lin, 2006). Thus, when the benefits of using mobile retail apps are greater than the costs, consumers should be more favorable toward continued use of the app (Maghnati and Ling, 2013). More specifically, research focused on mobile adoption and use diffusion suggests that perceived ease of use will serve as a key contributor to consumers' positive app evaluations, intentions to recommend apps and app usage (Shih and Venkatesh, 2004; Nysveen *et al.*, 2005; Tojib and Tsarenko, 2012). In line with this, we propose that ease of use is an important component of the app usage experience that drives consumers' intentions to make purchases with a retailer's app and to recommend it to others. More formally, we hypothesize the following (refer to Figure 1 for the Study 1 conceptual model related to *H1-H4*):

- H1.* There is a positive relationship between retailer app ease of use and consumers' intentions to: (a) make purchases with the app in the future, and (b) recommend the app to others in the future.

Figure 1 Study 1 conceptual model



Consumers' connections with mobile apps

Next, we propose that app ease of use will also positively affect users' personal connections with apps. Prior research has defined self-brand connection as "the extent to which individuals have incorporated brands into their self-concept" (Escalas and Bettman, 2003, p. 340). We similarly conceptualize self-app connection (or app connection) here as the extent to which users of an app incorporate it into their self-concept. Consumers often desire the option and means to shape their own identities as contributors in the retail experience (Grewal et al., 2009). The SST experience, and apps in particular, are well-suited for this task. Apps serve as meaningful points of access to retailers' services and goods that customers proactively establish and integrate into their lives in a variety of ways (Belk, 2013; Wang et al., 2015). For example, apps serve as highly accessible outlets for customers to interact with retailers and other customers, voice their personal opinions via online ratings and comments, indicate their personal shopping interests and preferences and even create customized "wish lists" of their favorite products and brands. Consumers can further personalize their app usage experiences by voluntarily providing and storing sensitive identifying information in apps, such as demographic, billing, credit card and personal contact information. Thus, consumers can transform these highly customizable apps into digital manifestations of their own personal preferences, desires and needs – nearly anytime, anywhere at the touch of a button (Belk, 2013).

Firms often encourage consumer–app interactions in the hope that it will build and intensify customers' connections to their apps (Peng et al., 2014; Siwicki, 2015). It stands to reason that they should be able to foster these connections by ensuring that their apps are as easy to use as possible (i.e. ease of use should better facilitate users' incorporation of apps into their self-concepts). Such consumer–object connections have been identified as a key factor influencing customer behaviors (Escalas and Bettman, 2003; Cheng et al., 2012; Belk, 2013; Dwivedi, 2014), and have been shown to positively influence important customer outcomes in retail contexts (Cheng et al., 2012; Dwivedi, 2014; Thakur, 2016). Thus, we propose here that perceived app ease of use will strengthen consumers' self-app connections, which will in turn make them more likely to

recommend the app and make purchases with it. Said differently, we suggest that app connection is an important link to better understanding *why* app ease of use impacts critical behavioral outcomes. The hypotheses below detail our expectations:

- H2. There is a positive relationship between retailer app ease of use and consumers' connection to the app.
- H3. App connection mediates the effects of retailer app ease of use on consumers' intentions to: (a) make purchases with the app in the future, and (b) recommend the app to others in the future.

Lastly, we propose that a retailer's app can serve as either a *competitive* or *complementary* extension of its physical brick-and-mortar store with regard to consumers' purchasing channel preferences. A retailer's app serves as a competitive extension of its store when consumers use the app to make a given purchase (instead of making that same purchase in the physical store). By contrast, an app serves as a complementary extension of the store when consumers use it for any reason other than making a purchase (e.g. checking product reviews). While some overlap may exist between these channels with regard to consumers' *pre-purchase* behaviors (e.g. both are used for information searches) (Verhoef et al., 2015), a physical store and app are mutually exclusive in terms of which channel is ultimately used to make a purchase.

This viewpoint, coupled with the proposed positive influence of ease of use on app-related outcomes (e.g. app purchase intentions), poses a critical question for firms regarding consumers' channel preferences: Will ease of use strengthen consumers' connection to an app to the extent that it *negatively* affects their intentions to make purchases at the corresponding physical store? Collectively, the literature reviewed to this point suggests that app ease of use will enhance consumers' connection to a retailer's app, which will in turn lower their intentions to purchase items at the retailer's store. More formally we hypothesize:

- H4. App connection mediates the effects of retailer app ease of use on consumers' intentions to make purchases at the physical retail store in the future.

Study 1

Methods

The main purpose of Study 1 was to test *H1-H4* (Figure 1). We nationally recruited 354 adult participants to complete an online survey through Amazon's Mechanical Turk (mTurk). Respondents read that the objective of the survey was to assess consumers' past experiences with retailers' mobile apps. To recruit respondents that had previously used a brick-and-click retailer's app, we first provided potential respondents with a definition of a retailer for the study context ("a goods/services provider that has a physical location"), as well as a definition of a retailer's app ("a mobile application on a smartphone/tablet that is used for purchase or completion of some transaction [e.g. price checking, subscription renewal, product locator] that may result in a purchase"). We also defined smartphones and tablets as "mobile phones/devices with an operating system (e.g. Apple iOS, Android, Windows Mobile, Palm, or Blackberry) that offers internet connectivity and allows the user to install apps" (Taylor and Levin, 2014).

We then screened potential respondents for inclusion in the study using the following question: "Based on the definitions above, have you ever used a retailer's app?". Those who answered "no" were not allowed to take the survey. The qualifying respondents were then instructed to carefully think about the last time that they accessed a retailer's app and to provide the name of that specific retailer. They were then asked to answer all of the dependent measures based on that experience. By examining the name of the retailer that respondents provided, we were further able to ensure that:

- the retailer had a physical store; and
- a purchase could be made with the app if desired (this additional screening facilitated measurement of respondents' intentions to make purchases with the app and to make purchases at the store in the future).

Ultimately, we removed 77 respondents from the sample that did not meet both of these criteria, resulting in a final usable sample of 277 adult respondents. The median household income was \$40,000–\$49,999, approximately 56 per cent were female, and ages ranged from 18 to 75.

Assessment of the measures

Intentions to recommend the app were assessed by the items, "How likely are you to recommend use of this app to friends and family?; How likely are you to recommend use of this app to others?" with endpoints of very unlikely/very likely (modified from Sivadas and Baker-Prewitt, 2000). Intentions to purchase with the app in the future were assessed by the item, "How likely are you to purchase a product using this retailer's app in the future?" with endpoints of very unlikely/very likely and not probable/very probable. Intentions to purchase at the physical retail store in the future were assessed by the item, "How likely are you to purchase a product in person at this retailer in the future?" with endpoints of very unlikely/very likely and not probable/very probable (both measures modified from Newman *et al.*, 2014). App connection was assessed by the items, "To what extent is the app part of you and who you are?; To what extent do you feel personally connected to this app?" with endpoints of not at all/very much (modified from Park *et al.*, 2010). App ease of use was assessed by the items, "The

retailer's app offers a logical layout that is easy to follow; It is easy to find what I am looking for on the retailer's app" with endpoints of strongly disagree/strongly agree (modified from Davis, 1989). All variables were measured on seven-point scales so that higher values indicate more favorable responses. All scales exhibited acceptable reliabilities ($\alpha \geq 0.70$, Nunnally and Bernstein 1994).

We also conducted a confirmatory factor analysis (CFA) using Mplus version 7.4 to assess the composite reliability, unidimensionality, convergent validity and discriminant validity of the latent constructs. The results of the analysis suggest an acceptable fit of the model to the data ($\chi^2 = 108.99$; $df = 41$; $p = 0.001$; comparative fit index (CFI) = 0.99; Tucker Lewis index (TLI) = 0.98; root mean square error of approximation (RMSEA) = 0.07; standardized root mean square residual (SRMR) = 0.01) (Hu and Bentler, 1999). Table I presents a complete list of the CFA results, along with standardized loadings for construct measures. Further, the average variance extracted for each construct exceeded 0.50, while the shared variance between constructs did not exceed the average variance extracted per construct (Table II) (Fornell and Larcker, 1981). Due to the self-reported nature of the measures, common method bias represents a potential concern (Podsakoff *et al.*, 2012). Consequently, we used the Harman's single latent factor test to model all indicators onto one common construct, and then compared the chi-square with that of the multi-factor solution (Podsakoff *et al.*, 2012). Results show that the single-factor model provided a poor fit to the data, and that the change in chi-square from the original model was substantially worse ($\Delta\chi^2 = 3,403.36$). This suggests that common method bias is not a substantial concern.

Results

Effects of the perceived ease of use of a retailer app

Regression results revealed a significant positive relationship between perceived app ease of use and respondents' intentions to make future purchases with the app ($t = 8.89$, $b = 0.73$, $p < 0.001$). Similarly, app ease of use had a positive effect on respondents' intentions to recommend the app to others ($t = 8.27$, $b = 0.40$, $p < 0.001$). Thus, *H1a* and *H1b* are supported. Also, as expected, a positive relationship emerged between perceived app ease of use and app connection ($t = 2.78$, $b = 0.18$, $p < 0.01$), providing support for *H2*.

Mediating role of app connection

Next, we assessed whether app connection underlies the observed effects of app ease of use on respondents' intentions to purchase with the app and recommend the app (as proposed in *H3*). We used PROCESS Model 4 with 5,000 bootstrap samples and 95 per cent confidence intervals (CIs) (Hayes, 2013) to examine the indirect effect (IE) of app ease of use on each dependent measure through app connection. Mediation is established when the upper and lower levels of the CI associated with the IE of interest do not contain a value of zero (Hayes, 2013; Zhao *et al.*, 2010). Results revealed a significant positive IE through the "app ease of use \rightarrow app connection \rightarrow intentions to make purchase with app in future" mediational path (IE = 0.0627; CI [0.0266, 0.1094]) (i.e. the CI did not

Table I Confirmatory factor analysis results

Items	Study 1			Study 2		
	α	Standardized loadings*	SE	α	Standardized loadings*	SE
App ease of use (Likert)	0.88			0.87		
<i>The retailer's app offers a logical layout that is easy to follow.</i> ^a		0.89	0.022		0.81	0.062
<i>It is easy to find what I am looking for on the retailer's app</i>		0.89	0.022		0.95	0.067
App connection (semantic differential – not at all/very much)	0.93			0.94		
<i>To what extent is the app part of you and who you are?</i> ^a		0.92	0.012		0.94	0.041
<i>To what extent do you feel personally connected to this app?</i>		0.94	0.005		0.94	0.041
Intentions to purchase with app (semantic differential)	0.99			na	na	na
<i>How likely are you to purchase a product using this retailer's app in the future?</i>						
Very unlikely/very likely^a		0.99	0.008			
Not probable/very probable		0.99	0.008			
Intentions to recommend app (semantic differential – very unlikely/very likely)	0.98			na	na	na
<i>How likely are you to recommend use of this app to friends and family?</i> [*]		0.99	0.008			
<i>How likely are you to recommend use of this app to others?</i>		0.97	0.008			
Intentions to purchase in-store (semantic differential)	0.99			na	na	na
<i>How likely are you to purchase a product in person at this retailer in the future?</i>						
Very unlikely/very likely^a		0.99	0.001			
Not probably/very probable		0.99	0.001			
Intentions to purchase with app instead of in-store (semantic differential)	na	na	na	0.98		
<i>How likely are you to purchase a product with this retailer's app instead of at the store?</i>						
Very unlikely/very likely^a					0.99	0.005
Not probable/very probable					0.97	0.003
Model fit statistics					Model fit statistics	
$\chi^2 = 108.99$, $df = 41$, $p < 0.001$					$\chi^2 = 12.85$, $df = 7$, $p = 0.08$	
					CFI = 0.99, TLI = 0.99,	
					RMSEA = 0.06, SRMR = 0.02	
CFI = 0.99, TLI = 0.98, SRMR = 0.01, RMSEA = 0.07						
Notes: ^a Denotes a constrained relationship to 1 in order for identification; *all factor loadings have a p value of ≤ 0.001						

Table II Alphas, composite reliabilities, average variances extracted and correlations of constructs

Study	α	CR	Intercorrelation of constructs				
			1	2	3	4	5
Study 1							
1. App ease of use	0.88	0.88	(0.79)				
2. App connection	0.93	0.87	0.18**	(0.87)			
3. Intentions to purchase with app	0.99	0.99	0.48**	0.32**	(0.97)		
4. Intentions to recommend app	0.98	0.98	0.41**	0.28**	0.44	(0.95)	
5. Intentions to purchase in-store	0.99	0.99	−0.10	−0.007	−0.017**	0.04	(0.98)
Study 2							
1. App ease of use	0.87	0.87	(0.78)				
2. App connection	0.94	0.94	0.19**	(0.96)			
3. Intentions to purchase with app instead of in-store	0.98	0.98	0.34**	0.37**	(0.88)		
Note: ** $p < 0.001$							

contain zero). This indicates that app connection mediates the effect of ease of use on respondents' intentions to make purchases with the app. A significant positive IE on respondents' intentions to recommend the app also emerged through the same path (IE = 0.0295; CI [0.0115, 0.0580]). Thus, *H3a* and *H3b* are both supported.

Lastly, *H4* proposed a *negative* IE of app ease of use on respondents' intentions to make purchases at the physical retail store in the future. We had suggested that ease of use would strengthen consumers' app connection, which in turn, would lower their intentions to make purchases at the retailer's store. Results revealed a significant negative IE through the "app ease of use → intentions to make purchase at the physical store in future" mediational path (IE = -0.0288; CI [-0.0813, -0.0047]). There was no main effect of ease of use on respondents' intentions to make purchases at the store in the future ($p = 0.56$), suggesting that consumers must feel connected to an app in order for ease of use to negatively influence their intentions to purchase at the store. These results provide support for *H4*, and reinforce the importance of examining the mediating role of app connection (a notion that we explore further in Study 2).

Discussion

The purpose of Study 1 was to examine the impact of app ease of use on consumers' app connection and future behavioral intentions. Findings confirmed that app ease of use has a positive impact on consumers' intentions to make purchases with the app and to recommend it to others. Subsequent mediation analyses suggest that app connection underlies these effects. As expected, results also revealed a positive (*negative*) IE of app ease of use through app connection on consumers' intentions to make purchases with the app (*in the store*).

These divergent IEs suggest that app ease of use may strengthen consumers' app connections to the extent that they intend to use the app as a substitute purchasing channel for the physical store. However, we cannot yet reach this conclusion based solely on the Study 1 results since we did not explicitly measure respondents' intentions to make purchases with the app *relative to* the store (i.e. we measured app and store purchase intentions independently). Thus, Study 2 expands upon these initial findings by specifically examining the IE of app ease of use on consumers' intentions to make purchases with the app *instead of* in the store.

Study 2 also addresses the need for additional research on consumers' actual purchasing behaviors in mobile shopping contexts (see Yang and Kim, 2012; Groß, 2015; Wang et al., 2015). We provided some initial insight into this understudied area in Study 1 by examining the impact of app ease of use on consumers' intentions to make purchases with retailers' apps. However, consistent with much of the prior work in this area, we did not measure respondents' purchasing behavior during the app usage experience. Thus another objective of Study 2 is to overcome this limitation by assessing if ease of use indirectly affects whether consumers make an actual purchase with an app or not (as the Study 1 mediation results would suggest).

Lastly, many service providers have now moved beyond the question of "How do we get customers to initially try our app?" to instead now "How do we get customers to use our app as

much as possible?" (Siwicki, 2015). This important managerial question motivates us to additionally assess the role of a potential key moderator in the app usage context: app usage frequency (i.e. how often an individual uses a particular app). We first examine whether app usage frequency moderates the effect of app ease of use on consumers' app connections (see *H5* below). We then further assess if the IEs of ease of use (through app connection) on the Study 2 outcomes vary based on whether an individual uses a retailer's app more or less often (see *H6*). We briefly offer the rationale for our predictions related to these two propositions below.

Drawing from prior related literature (Moe and Fader, 2004; Varadarajan et al., 2010; Neal et al., 2012; Reichhart, 2014; Wang et al., 2015), we expect that ease of use will have a strong positive impact on app connection among individuals that use an app with higher, but not lower, frequency. More specifically, ease of use should strengthen and reinforce consumers' app connections, as shown in Study 1, when they use the app more often (i.e. individuals are more likely to have stronger connections with an app when it is easy to use and they frequently interact with it). By contrast, ease of use should have little effect on app connection among lower frequency users due to their limited usage of the app in the first place. Said differently, low frequency usage limits opportunities for app ease of use to strengthen users' app connection. It also stands to reason then that the IE of app ease of use will emerge through app connection among higher frequency users of a retailer's app – but not among lower frequency users (Moe and Fader, 2004; Neal et al., 2012; Reichhart, 2014; Varadarajan et al., 2010; Wang et al., 2015). Below we formally hypothesize the proposed app ease of use × app usage frequency interaction on app connection (*H5*), as well as the accompanying moderated (i.e. conditional) mediation for the two new Study 2 dependent measures (*H6*) (see Figure 2 for the Study 2 conceptual model related to *H5* and *H6*):

H5. App usage frequency moderates the effect of retailer app ease of use on consumers' app connection such that ease of use has a positive effect on higher frequency users' connection to the app. However, ease of use has no significant effect on app connection when consumers only use the app with lower frequency.

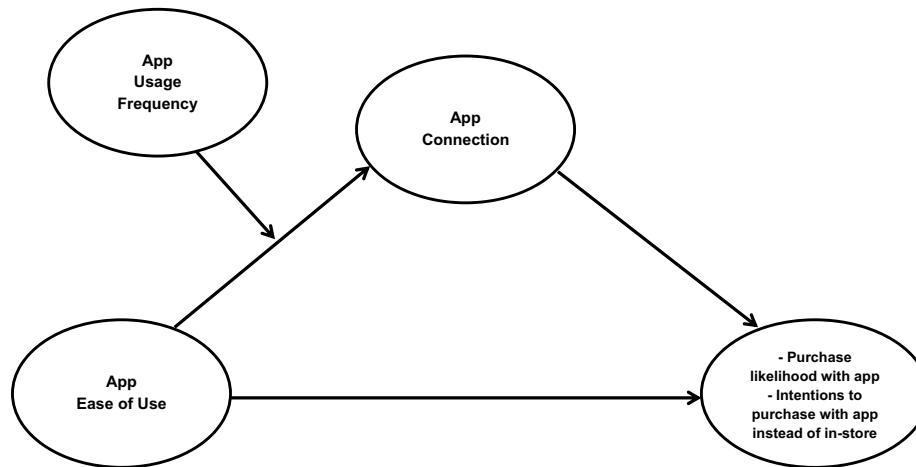
H6. Perceived retailer app ease of use has a positive IE through app connection on (a) the likelihood that an actual purchase was made with the app, and (b) intentions to make purchase with the app *instead of* at the physical retail store in the future among consumers that use the app with high frequency. However, these IEs do not emerge among low-frequency users.

Study 2

Methods

The primary purpose of Study 2 was to test *H5* and *H6*. Consistent with Study 1, we again nationally recruited adult participants to complete an online survey through mTurk. The same methods from Study 1 were again used to ensure that the retailer app most recently used by respondents was

Figure 2 Study 2 conceptual model



transactional in nature (i.e. they could use it to make a purchase if desired), and that the retailer also had a physical store where respondents could purchase products if desired. We removed 46 respondents that did not meet both of these criteria, resulting in a final sample of 212 adult respondents. The median household income of the sample was \$30,000–\$39,999, approximately 58 per cent were female, and ages ranged from 18 to 69. Respondents were given the same information and instructions that were provided to respondents in Study 1.

Assessment of the measures

To assess whether respondents made an actual purchase with the app, we asked, “Did you purchase any items when you used this retailer’s app?” with answers of yes/no. Drawing from the app and physical store purchase intentions measures used in Study 1, we directly assessed respondents’ *relative* future purchase intentions on a seven-point scale with the item, “How likely are you to purchase a product with this retailer’s app in the future instead of at the physical retail store?” with endpoints of very unlikely/very likely. Usage frequency of the retailer’s app was assessed on a seven-point scale by the item, “How often do you use this retailer’s app?” with endpoints of not at all often/very often (modified from Reichhart, 2014). Lastly, the same measures from Study 1 were again used to assess app ease of use and app connection. As in Study 1, the results of reliability and confirmatory factor analyses provide support for goodness of the measures (see Tables I and II). Additionally, results of the Harman’s single factor test again revealed that common method bias was not a substantial concern (Δ chi-square = 454.95).

Results

Moderating role of retailer app usage frequency

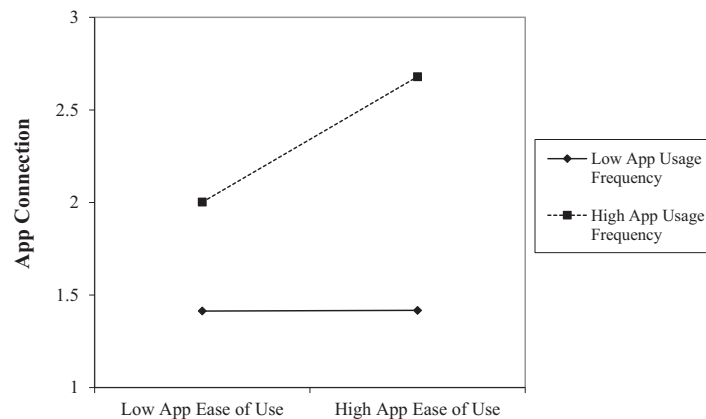
To avoid potential methodological issues associated with dichotomizing variables (Fitzsimons, 2008), we used both app ease of use and app usage frequency as continuous variables in all of the Study 2 analyses. We also mean-centered the predictor variables to avoid potential multicollinearity issues (Aiken and West, 1991). Regression results related to *H5* indicate a significant app ease of use X

app usage frequency interaction on respondents’ app connection ($t = 1.98$, $b = 0.09$, $p < 0.05$) (see Figure 3). We conducted spotlight analyses at one standard deviation (SD) above and below the mean for app usage frequency to examine the effect of app ease of use on higher and lower frequency users’ app connection, respectively (Aiken and West, 1991; Hayes, 2013). Referring to Figure 3, ease of use had a positive effect on higher frequency users’ connection with the app ($t = 2.24$, $p < 0.03$). By contrast, ease of use had no effect on lower frequency users’ app connection ($t = 0.01$, $p = 0.99$). This pattern of means offers full support for *H5*. It also offers some initial general support for our expectation that positive IEs of app ease of use will emerge on the dependent measures (through app connection) among higher, but not lower, frequency users.

Conditional mediation analyses

To formally test the moderated (i.e. conditional) mediation implied directly above (and outlined in *H6*), we used PROCESS Model 8 with 5,000 bootstrap samples and 95 per cent CIs (Hayes, 2013). The reported IEs are for values one SD above and below the mean for app usage frequency (indicating higher and lower frequency users, respectively) (Hayes, 2013). As expected, the IE associated with the app ease of use \times app usage frequency interaction through app connection was significant for the likelihood that respondents made a purchase with the app (IE = 0.0421; CI [0.0031, 0.1155]), as well as for their intentions to make a purchase with the app *instead of* at the physical store in the future (IE = 0.0307; CI [0.0025, 0.0672]). These findings formally indicate that the mediation is moderated by app usage frequency (Hayes, 2013).

More specifically, results revealed a significant positive IE of app ease of use on the likelihood that higher frequency users made a purchase with the app (IE = 0.1365; CI [0.0115, 0.3664]). By contrast, there was no significant IE through this same mediational path for the lower frequency users (IE = 0.0004; CI [−0.0660, 0.0635]) [3]. Next, a significant positive IE of app ease of use emerged on higher frequency users’ intentions to make a purchase with the app *instead of* at the store in the future (IE = 0.0995; CI [0.0110, 0.2103]). There was no

Figure 3 Study 2 effects of app ease of use and app usage frequency on app connection

Note: Both app ease of use and app usage frequency were used as continuous variables in the analyses and are plotted here as continuous variables

significant IE among lower frequency users (IE = 0.0003; CI [-0.0428, 0.0394]). These findings provide support to *H6a* and *H6b*[4].

Together, these results build upon Study 1 in several important ways. App ease of use was shown to influence both actual app purchasing behavior and relative purchase intentions (app vs in-store) via app connection. Further, app usage frequency was identified as a key moderator of these effects. We discuss the implications and contributions of this research next.

General discussion

Mobile apps present a number of growing opportunities – and obstacles – for firms seeking to balance contemporary customer needs with increasing points of traditional and SST interaction. Overall app usage among US consumers grew 76 per cent from 2013 to 2014, with the largest growth seen among shopping app usage – an astonishing 174 per cent increase (Khalaf, 2015). This highlights the need for service providers need to better understand the role that their own apps play alongside their brick-and-mortar stores (Aubrey and Judge, 2012). However, research on mobile shopping is still in its infancy (Groß, 2015; Verhoef *et al.*, 2015), and SST research on mobile apps is not as extensive as research in other mobile service contexts (e.g. hospitality, gaming). Further, the majority of existing modest literature surrounding apps has focused only on consumers' initial app adoption (Peng *et al.*, 2014; Taylor and Levin, 2014), and consequently very little is known about consumers' (post-adoption) app purchasing behavior or other important behavioral outcomes stemming from app usage (Yang and Kim, 2012; Sanakulov and Karjaluoto, 2015).

Therefore, we attempted to differentiate our research from prior work, in part, by moving beyond initial app adoption to instead examine consumers' *actual app usage experiences* and *post-usage outcomes*. Specifically, we examined how consumers' experiences using retailer apps (i.e. how easy or difficult they

were to use) affected their purchase-related decisions and future behavioral intentions (e.g. intentions to recommend the app to others). Study 1 findings identified perceived ease of use as a critically important feature of the app usage experience affecting consumers' intentions to make purchases with a retailer's app and to recommend the app to others. We then showed that consumers' self-app connection underlies these effects. However, we also uncovered an important caveat to the positive effects surrounding app ease of use by demonstrating that ease of use strengthens consumers' connections with a retailer's app, which in turn *lowers* their intentions to make purchases at the retailer's physical store.

Study 2 expanded on our initial findings by examining consumers' actual purchasing behavior with retailer apps and their intentions to make purchases with the retailer's app instead of at its store in the future. We also assessed the potential moderating role of app usage frequency. Findings demonstrated that app ease of use strengthens consumers' connection to a retailer's app when they use the app with higher, but not lower, frequency. Results also indicated that app usage frequency moderates the mediating effect of app connection such that the positive IEs of app ease of use on all of the Study 1 and Study 2 dependent measures emerge among higher – but not lower – frequency users.

Theoretical contributions

The current research makes several important theoretical contributions to the growing bodies of literature surrounding mobile apps, mobile shopping and the broader SST literature. First, the focus of the current research extended beyond antecedents of mobile app adoption to examine the actual *usage* experience, itself. Specifically, we showed that the perceived ease of use of a retailer's app is an important experiential perception that influences a critical outcome during the usage of the app (i.e. the likelihood that consumers make a purchase with the app). We then documented other downstream effects of app ease of use on consumers' post-usage behavioral

intentions (e.g. intentions to make purchases with the app instead of at the retail store in the future, intentions to recommend this SST to others).

Next, we provided insight on *why* the observed effects occur by identifying consumers' connection with apps as a mediating mechanism. We showed that app ease of use strengthens consumers' app connection, which in turn has a positive impact on all of the dependent measures tested here with one exception: intentions to make future purchases at the retail store. Results revealed a significant *negative* IE of ease of use on this outcome. This key finding adds a nuanced complement to the largely positive effects of ease of use documented here and elsewhere in the existing literature. We then expanded upon this finding later in Study 2 by demonstrating that app ease of use indirectly affects consumers' *relative* purchase channel preferences through app connection (app vs in-store). By identifying one's felt connection to an app as a key factor in his/her app usage experience, we contribute to the existing literature surrounding the role that emotion plays when consumers process information in SST contexts.

Lastly, we identified app usage frequency as an important moderator of the effects of app ease of use. This finding highlights how usage frequency can increase consumers' app connections when ease of use is high, and helps further explain consumer engagement in online retail contexts. It also addresses the expressed need to distinguish between consumers who are more or less likely to make mobile purchases (Agrebi and Jallais, 2015), and answers calls for more research on the role that consumer characteristics play in mobile shopping contexts (Groß, 2015; Verhoef *et al.*, 2015). Finally, this finding establishes an important boundary condition to the observed effects, and supports the notion that customer usage variables can serve as useful segmentation tools for managers (Li *et al.*, 2015).

Managerial implications

The relatively new body of SST literature on mobile shopping, and retailer apps in particular, currently provides organizations with limited guidance on effective mobile app strategies. The present studies respond to recent calls for more granular SST research (Collier *et al.*, 2014; Robertson *et al.*, 2016), and offer additional insights informing retailers:

- app design objectives;
- channel management initiatives; and
- customer segmentation strategies.

With regard to app design, our results suggest that ease of use is a critical attribute of apps that drives key behavioral outcomes. Given that most service providers have the autonomy to create their own unique apps (Taylor and Levin, 2014), they can design and test their apps for user-friendliness before offering them to their customers. Our findings to this point, however, do not reveal which particular aspects of a mobile app make it generally "easy to use".

Therefore, we conducted a follow-up, supplementary online survey of 100 adult retailer app users on mTurk to provide managers and app designers with more actionable insight on this important issue. Drawing from their own prior experience using retailer apps, respondents identified the following attributes as the top 5 most important features of apps that

enhance ease of use: layout (identified by 92 per cent of respondents), ability to save personal information for future use (74 per cent), fewer login requirements (72 per cent), ability to customize preferences (62 per cent) and more interactivity (52 per cent). Retailers seeking to develop high-frequency app users should ensure that their apps reflect these characteristics. Our results suggest that doing so will likely strengthen app connections among users, and can ultimately lead to the positive outcomes observed here.

The current research also has important implications for channel management initiatives. Firms continually strive to make their apps as user-friendly as possible to encourage consumer-app interaction in ways that meet both customer needs and organizational objectives (Peng *et al.*, 2014; Siwicki, 2015). However, our findings demonstrate that it is important for managers to understand that providing customers with easy-to-use apps (and encouraging app connections) may shift their purchasing channel preferences and alter dynamics of the customer-provider relationship. For example, we illustrate that a retailer's app may serve as a competitive, rather than complementary, extension of its physical store with respect to consumers' purchase channel preferences. This can cause a retailer to lose valuable face-to-face interaction with customers who choose to make purchases with its app rather than at its store. Similarly, efforts to develop a high frequency app user segment may shift resources away from customers who prefer human interaction with employees or other in-store SSTs such as kiosks. This may result in feelings of marginalization and negative evaluations among those customers (White *et al.*, 2012; Robertson *et al.*, 2016). Providers also face additional barriers to service recovery and upselling when their customers begin limiting their in-store purchases in favor of mobile shopping. Accordingly, providers should explore new ways to upsell on mobile apps, such as using algorithms to offer complementary items or highlighting related merchandise in product descriptions. More specific research on these strategies and others is certainly warranted.

Lastly, our research provides insight on customer segmentation strategies for service providers. The outcomes observed here were shown to be more likely to occur among high-frequency users of a retailer's app than low-frequency users. Thus, a retailer seeking to drive app purchases should ensure that its app is easy to use and encourage customers to use it more often. For example, retailers wishing to promote app usage frequency can provide incentives to customers for performing certain tasks with the app (e.g. reviewing products), or could send push notifications to customers through their apps. Doing so might strengthen customers' connections with the app and promote app purchasing behavior – goals that may be particularly important for retailers given the negative experiences consumers often have when interacting with difficult-to-use apps (Hoehle and Venkatesh, 2015; National Retail Federation [NRF], 2015). The negative emotions stemming from these experiences may further lead consumers to adapt behaviors to avoid such negative events in the future (e.g. unwillingness to use the app again; switching to a competitor) (Leone *et al.*, 2005).

However, increased app usage may also lead consumers to prefer the app over the physical store – a preference that may become more pronounced over the course of the customer–

provider relationship as their usage frequency increases. In response, providers seeking to maintain or drive in-store traffic can offer special “in-store only” promotions and discounts or implement exclusive in-store loyalty programs to encourage store visits. Employees can also offer to look up products and information online for shoppers as a way to supplement their in-store experience. Lastly, retailers may elect to provide consumers with the option to visit the store to pick up and/or return items that they purchased with the app.

Limitations and future research

Given calls for research that finely focuses on specific SST implementation (Robertson *et al.*, 2016), the current research informs the understudied areas of consumer mobile purchases and use of retailer apps (Groß, 2015; Yang and Kim, 2012), and answers prior calls for generalizable research on the intersection between physical retail stores and mobile apps (Aubrey and Judge, 2012; Taylor and Levin, 2014). We also overcame several measurement limitations seen in prior research by assessing consumers’ app purchasing behavior (instead of only purchase intentions), and ease of use perceptions based on their *actual* app usage experience (rather than on expectations of how easy it might be to use). However, the present studies have several limitations that offer potentially fruitful opportunities for future exploration in this evolving area.

For example, we only examined apps of brick-and-click retailers. Future research could assess consumer usage of other types of service providers’ apps (e.g. virtual retailers such as Amazon; digital streaming services such as Netflix). Also, while we assessed if respondents made a purchase with the app, we did not examine whether app ease of use and connection influenced the number of items purchased or the total purchase amount. We also used a self-reported measure of app usage frequency, but future research may consider other objective measures (e.g. number of uses per month) and different moderating variables. Additionally, more research is also needed to determine which attributes of apps make them easier to use and, in particular, which are most likely to foster app connections. Specifically, additional research on the role that emotions play in consumers’ app usage, and in particular their connections to apps, is needed. This would help address the need for more insight on how providers can potentially capitalize on fostered app connections to better facilitate activities such as service recovery and upselling among app users. App-related factors other than ease of use (such as perceived usefulness of an app) should also be explored. Lastly, valuable opportunities exist to explore how consumers use apps when inside physical stores. This would allow for an assessment of whether their app experience and subsequent behavioral outcomes change under these overlapping experiences.

Notes

- 1 An “app” is defined here as a mobile application on a smartphone/tablet that is used for purchase or completion of some transaction that may result in a purchase (e.g. price checking, product locator). In contrast to mobile websites (which are in most cases simply mobile-friendly

versions of traditional websites), apps allow service providers to move e-commerce off the Web and into an environment that they design and self-maintain. Thus, consumers can access a provider’s content without an internet connection by downloading and installing its unique app on their mobile device. This affords a provider with prime “real estate” on consumers’ mobile devices, and allows customers to quickly and directly access its content. Overall, apps are designed to be more user friendly (but less content rich) than mobile websites (see Johnson, 2010; Taylor and Levin, 2014)

- 2 Though outside the scope of the present research, we fully acknowledge the merit of exploring other factors – such as perceived usefulness – that might also affect consumers’ app usage experiences and related behaviors. However, we believe that the app usage statistics provided in this article strongly reflect the notion that many consumers already find apps to be useful. Our current inquiry therefore more directly aligns with determining whether consumers’ perceptions about how easy these (useful) apps are to use change their intentions and behaviors.
- 3 We reran the same conditional mediation analysis with PROCESS Model 8 (for the likelihood that a purchase was made with the app) and controlled for whether or not respondents had already planned to make a purchase before using the app. Consistent with the results reported in Study 2, there was still a significant positive IE of ease of use on the likelihood that *higher* frequency users made a purchase with the app (IE = 0.1266 [0.0051, 0.3540]). Again there was no significant IE through the same mediational path among *lower* frequency users (IE = –0.0064, [–0.0896, 0.0544]). Thus, all conclusions about the tested hypothesis remain the same. This speaks to the robustness of our findings.
- 4 Though not formally hypothesized or expanded upon for the sake of brevity, we conducted the same conditional mediation analyses with PROCESS Model 8 for the Study 1 dependent measures. Findings show a pattern of results consistent with those reported in Study 2: there were significant *positive* IEs of ease of use on higher frequency users’ intentions to purchase with the app (IE = 0.1297 [0.0047, 0.2672]) and to recommend the app (IE = 0.0534 [0.0065, 0.1261]), as well as a *negative* IE on their intentions to make purchases at the store (IE = –0.0382 [–0.1000, –0.0054]). There were no significant IEs at all on any of these measures among lower frequency users. These findings provide additional general support for our overall conceptual framework.

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