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Consumer Habits and Adoption of Multiple-Functions of Mobile Phones

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Abstract

Mobile phone applications are rapidly becoming an important channel of interaction between brands and consumers. Recent findings, however, suggest that only few brands succeed in attracting consumers to their mobile applications. Based on findings in the literature, we suggest that consumers with high use-variety, i.e., those who use their mobile phones for multiple functions, are likely to be more interested in mobile applications than others. There are, however, few insights regarding high use-variety consumers. This is the issue that we address in this research by developing and testing a theory, based on habits, that heavy users of the core functions of calling and texting will exhibit high use-variety. We empirically test the theory on two nationally representative samples of mobile phone users. Our results on both samples support the theory. We also discuss the managerial and future research implications of our findings.

Keywords

multi-function products, mobile phones, habits, Poisson mixtures, Bayesian

1. Introduction

The use of mobile phones has been growing rapidly over the last decade. The number in use worldwide will be about 7 billion and more than 95 percent of the global population is likely to use one by 2015 (International Telecommunications Union, 2014). While their core functions are calling and texting (Shankar et al., 2010), mobile phones also provide many additional functions that permit users to interact with each other and with businesses. Thus, for instance, the car rental firm Zipcar offers a mobile application that permits users not only to reserve a car but also to locate and use one rapidly (Google Mobile Playbook, 2012). Similarly, Domino's Pizza's mobile appis "appealing to Millennials" and "is its fastest-growing ordering vehicle, now at about 18% of sales" (USA Today, 2014). Mobile phones are therefore becoming the gateway for brands to communicate and transact with consumers who use the devices extensively not only for personal interactions but for many additional functions including purchases (Comscore, 2014).

While this growth of the mobile phone into a multi-function device for consumers is an opportunity for some businesses, it is also a threat for those that cannot enter the gateway, i.e., get their customers to use their mobile applications. In fact, more than 80% of the brands that offer mobile applications attract less than a thousand users (Deloitte, 2011). Thus, while the widespread adoption of mobile phones is an opportunity for brands like Zipcar and Domino's Pizza that are able to gain widespread acceptance and use of their mobile applications, it is a threat for firms that are unable to generate such interest among consumers. As noted by Varadarajan et al. (2010), therefore, the ability of consumers to connect with businesses "from anywhere and at anytime with the aid of interactive technology enabled mobile

devices, is both a threat and an opportunity". For instance, McDonald's introduced a mobile ordering and payment app but has not been successful in attracting consumers (Wall Street Journal, 2014a).

One approach that businesses can take to attract consumers to their mobile applications is to identify those who engage in multiple activities with their cell phones. For instance, Shih and Venkatesh (2004) find that the number of applications for which a consumer users a multi-function device like a computer, i.e., its *use-variety*, can be predictive of her interest in *use-innovativeness*, i.e., her adoption of new functions and applications for the device. Young consumers with high use-variety of mobile phones could therefore be use-innovators in terms of installing and using additional mobile applications. Further, similar to the traditional diffusion process for new products, once use-innovators adopt a brand's mobile application, its use may spread among other consumers as well since individuals are likely to follow and mimic trends in the use of mobile phones (Kjeldgaard & Askegaard, 2006, p. 233). Brands focusing on consumer should therefore initially target their high use-variety customers to gain more widespread use of their mobile applications.

There are, however, few insights regarding consumers with high use-variety of mobile phones. This is the issue that we address in this research. Specifically, we propose that, heavier users of the core functions of calling and texting of mobile phones are more likely to engage in higher use-variety as well. We base this proposition on the theory of habits (Aarts & Dijksterhuis, 2000; Khare & Inman, 2006; Liu & Tam, 2013; Neal et al., 2006; Wood et al., 2002; Wood, Tam, & Witt, 2005; Wood & Neal, 2007, 2009). Our key argument is that, since a mobile phone is an interaction device, heavier use of the core functions of texting and calling builds a habit of interacting with the device and using it for other functions. Heavy users of the core functions should therefore be more interested in adopting and using other applications for the phone.

We have several goals for this research. First, we formulate a theory regarding why heavier use of texting or calling should build a habit of using mobile phones for other functions. Second, we develop two hypotheses—one related to texting and another to calling—that can be used to test the theory. Three, we test the hypotheses empirically using a survey on a nationally representative sample of teen respondents regarding their extent of use of mobile phones for texting and calling and the number of additional applications for which they use the phones. Fourth, we replicate our test on a different sample of respondents of a similar survey to assess whether the theory holds. Fifth, we develop managerial implications for how brands can identify consumers who are more likely to adapt their mobile applications.

Methodologically, we assume that use-variety follows a Poisson distribution. To investigate the relationship between use-variety and heavy use of the core functions, we link the distribution's mean to the volume of texting and calling. Additionally, to account for observed differences between users, we include their demographic characteristics as well in the link. We also account for unobserved heterogeneity through a mixture of Poissons formulation (Winkelmann, 2008). Our results from both samples provide evidence that use-variety is positively related to texting and calling volumes.

Our research makes multiple contributions to the literature. One, we propose a theory to relate the adoption of mobile applications to the rate of use of the core functions of mobile phones. Two, our results provide cross-category validation for Shih and Venkatesh's (2004) finding that use-variety of computers is related to their use-innovativeness. Three, we provide managerial insights into how brands can gain early adopters and hence increase the likelihood of broader penetration of their mobile applications among consumers.

Next, we provide the theory for our research in greater detail and develop our hypotheses. We then describe our dataset and follow with a description of our model. Section 4 presents our empirical results. The final section presents the managerial implications and directions for additional research.

2. Theory

In this section, we provide the theoretical background for our research. Specifically, we begin with a discussion of the findings on habits from the psychology and marketing literatures and conclude by presenting our hypotheses.

2.1 Habits

Habits have been studied extensively in marketing (Chaudhuri & Holbrook, 2001; Desai & Raju, 2007; Jeuland, 1979; Khare & Inman, 2007; Klemperer, 1987; Liu & Tam, 2013; Murray & Haubl, 2007; Wood & Neal, 2009). They have also been investigated in the psychology literature since the late 19th century (James, 1890) and continue to be investigated today (Neal, Wood, & Drolet, 2013). In addition, other disciplines such as media (Diddi & LaRose, 2006) are also interested in the role of habits in viewers' patronization of various media and media outlets. Given the goals of our research, we briefly review the habit literature in marketing with a particular focus on research by Khare and Inman (2007). Our goal is to connect the relevant elements of the theory of habit to our research context.

2.2 Habits in Marketing

Marketing scholars have been interested in habits for many years (e.g., Jeuland, 1979). A primary interest of marketers is the set of substantive and operational differences between habit and loyalty in the choice of brands (Chaudhuri & Holbrook, 2001; Desai & Raju, 2007; Klemperer, 1987; Liu & Tam, 2013).

The role of habit in choice is also the focus of Khare and Inman (2007) who explore how habits affect the choices that consumers make across different meals. Specifically, they are interested in examining how habits influence "the consumption of food nutrients" (p. 567). Two types of habits are postulated in their study: a baseline habit which results in systematic differences in nutritional intake at different meals. For instance, individuals may always engage in greater intake of energy during dinner than at breakfast or lunch.

Carryover habit, on the other hand, represents the lagged effect of previous behaviors on current behavior. Thus, for instance, patterns of consumption may repeat across breakfasts over days and the same may be the case for patterns within lunch and within dinner. Patterns may carryover across meals as well with consumption at breakfast affecting what is consumed at lunch and dinner. Khare and Inman (2007) find evidence supporting baseline habits as well as within-meal and across-meal carryover of habits.

2.3 Implications of Habit Theory for Use of Mobile Phones

2.3.1 Habit of Calling

Khare and Inman's (2007) dichotomization of habit into baseline and carryover components is a particularly relevant theoretical template for our research since we, too, are interested in exploring the role of habitual behavior in the use of mobile phones across different functions. Specifically, we propose that the extensive use of mobile phones for calling develops a baseline habit of heavy use. This baseline habit of heavy use of the phone should then manifest in a propensity to use the phone for other types of functions. This leads us to our first hypothesis:

Hypothesis 1: Higher volume of calls on mobile phones will be positively related to use-variety.

2.3.2 Habit of Texting

Similar to how extensive use of the phone for calling builds a baseline habit, heavy use of texting also builds a baseline habit of extended use of the mobile phone. In addition, it habituates the individual to extended use of the phone's screen, keyboard, and other features. This results in a carryover habit of using the phone for any function, other than calling, that it can be used for. Any activity that the phone's screen or keyboard can be used for could then serve as a contextual cue (Wood & Neal, 2007) that triggers the habitual response of using the mobile phone for that activity. For instance, seeing an advertisement with an invitation to explore and purchase a product using the phone's screen could lead the habituated individual to respond. We therefore hypothesize as below:

Hypothesis 2: Higher volume of texting on mobile phones will be positively related to use-variety.

3. Research Setting and Variables

Our data is from a survey of cellphone usage of a nationally representative sample of 800 respondents between the ages of 12 and17 by the Pew Internet and American Life Project during 2009 (Pew, 2009). The survey included a number of questions that asked the respondents if and how they used the Internet and mobile phones. Of particular relevance for our research, were questions regarding (a) the number of calls made or received by the respondents per day (CALLS) (b) the number of text messages sent or received by the respondents per day (TEXTS) and (c) respondents' use of their mobile phones for other functions like watching videos or accessing the Internet (USE-VARIETY). In all, respondents were asked about their use of mobile phones for eleven functions other than calling or texting (Table 1). We used the responses to these questions to operationalize the USE-VARIETY variable as the number of other functions that the mobile phone is used for.

Table1. Functions of Cellphones Other than Calling and Texting Investigated in the Survey

Send or receive email	Send or receive a video
Take a picture	Play a game
Send or receive pictures	Use a social networking site
Play music	Use an application (or app)
Send or receive instant messages	Buy a product such as books, music or clothing
Record a video	

The survey also collected data on other consumer electronic devices owned by the respondents. Specifically, respondents were asked to indicate whether they owned a desktop computer, a laptop computer, a tablet computer like an iPad, an e-reader, a music device like an iPod and a game console. The number of consumer electronics devices used could be indicative of innate innovativeness (Hirschmann, 1980) in the consumer electronics domain and, hence, of respondents' comfort with and use of mobile phones for multiple functions. We therefore used the responses to these questions to construct a device-variety variable DVRTY representing the number of other consumer electronic devices owned by respondents.

Some individuals use more than one cell phone and are, therefore, likely to use their phones for more activities than those who have a single cell phone. They may thus have higher measures of USE-VARIETY. We therefore also include an indicator NCELLS which is set to 1 if the respondent uses more than one cell phone.

The survey also collected data on respondent demographics including gender (GDR) and age (AGE). Some of these demographic variables have been used as controls previously in the literature on consumer use of technology products (Dutton et al., 1985; Shih & Venkatesh, 2004; Venkatesh, 1996). Additionally, the survey also recorded the demographic characteristics of the adult who was contacted to obtain permission to interview the teenage respondent. These included age (ADULT-AGE), education (ADULT-EDU) and income (ADULT-INCOME). The contacted adults were also asked about the number of teenage children (NTEENS) living in the household. We include these demographic variables to control for the possible influence of household demographics on the number of activities for which the survey respondents use their cell phones.

Given our goal of investigating the relationship between the extent of calling and texting and use-variety, we used several criteria to select respondents to be included in our analysis: (1) the respondent should have a mobile phone (2) the mobile phone should be used to make or receive at least one call per day and send or receive at least one text per day (3) the respondent should have provided information on all the variables of interest, i.e., call and text volume, use variety, and demographics. This resulted in a sample of 483 respondents. Tables 2 and 3 provide descriptive summaries of the variables for the sample.

4. Model and Empirical Analysis

We operationalize USE-VARIETY as the number of functions other than calling and texting for which the mobile phone is used. We, therefore, assume that this variable follows a Poisson distribution and link the mean to respondent demographics, device variety, and the number of calls and texts per day. Additionally, to control for the role of household characteristics, we also include household demographics in the link.

Table 2. Summaries of Demographic Variables in the Selected Sample

Respondent's Gender			
	Number	Percent in Sample	
Male	256	53.0	
Female	227	47.0	
Respondent's Age			
Minimum	Maximum	Mean	Std. Dev
12	17	14.89	1.62
Number of Teenagers at Home			
Minimum	Maximum	Mean	Std. Dev
1	4	1.44	0.67
Adult's Income			
	Number	Percent in Sample	
Less than $10,000	21	4.3	
$10,000 to under $20,000	30	6.2	
$20,000 to under $30,000	33	6.8	

$30,000 to under $40,000	36	7.5	
$40,000 to under $50,000	44	9.1	
$50,000 to under $75,000	87	17.4	
$75,000 to under $100,000	84	18.0	
Over $100,000	148	30.6	
Adult's Education			
None	9	1.9	
High school incomplete (grades 9-11)	21	4.3	
High school graduate	113	23.4	
Vocational school after high school	14	2.9	
Some college, no 4-year degree	121	25.1	
College graduate	113	23.4	
Post-graduate	92	19.0	
Adult's Age			
Minimum	Maximum	Mean	Std. Dev
18	99	44.72	8.62

Thus, given an observation of K_i on the USE-VARIETY of respondent *i*, we model K_i as

$$P(USE-VARIETY = K_i) = \frac{e^{-\lambda_i}.\lambda_i{}^{K_i}}{K_i!} \quad (1)$$

$$\lambda_i = e^{(X_i'\beta)} \quad (2)$$

$$X_i'\beta = \beta_0 + \beta_1.GDR_i + \beta_2.AGE_i + \beta_3.NTEENS_i + \beta_4.NCELLS_i + \beta_5.ADULT-AGE_i + \beta_6.ADULT-EDU_i + \beta_7.ADULT-INC_i + \beta_8.DVRTY_i + \beta_9.Log(CALLS_i) + \beta_{10}.Log(TEXTS_i) \quad (3)$$

We use the logarithmic form of CALLS and TEXTS since their range is much larger than that of the other variables. The demographic variables are included to account for observed differences between the respondents. It is likely, however, that unobserved heterogeneity remains and affects the response parameters in (3) particularly because the sample is nationally representative and hence diverse. We account for this through two approaches. One, we specify our model in a Hierarchical Bayesian framework and assume that the response parameters are distributed randomly over the population. Two, we allow for random effects through a mixture of Poissons formulation. Specifically, we use a Gamma mixture (Winkelmann, 2008) where

Table 3. Summaries of Device and Use Variety and Volume of Calls and Texts by Teens

Variable	Minimum	Maximum	Mean	Standard Deviation
Number of Other Consumer Electronic Devices owned	1.00	5.00	3.98	.96
Number of functions other than texting or calling for which mobile phone is used	0	7	3.28	1.73
Volume of calls per day	1	500	11.24	35.56
Volume of texts per day	1	500	110.7	137.2

$$\lambda_i \sim g_i(\alpha, \delta) = \frac{\delta^{\alpha}}{\Gamma(\alpha)} {\lambda_i}^{(\alpha-1)} e^{-\delta\lambda_i} \quad (4)$$

We also consider a Log-normal mixture (Winkelmann, 2008) with the mean specified as

$$\lambda_i = e^{(X_i^{'}\beta + \nu_i)} \quad (5)$$

$$\nu_i \sim N(\varrho, \sigma^2) \quad (6)$$

We also use a version of the model without a mixture as the baseline. Thus, in all, we have three specifications: (1) specification (1) with no respondent heterogeneity (2) a specification with a Gamma mixture and (3) a specification with a Log-Normal mixture. All models are calibrated using MCMC methods with highly diffuse priors for the response parameters in the link. Thus,

$$\beta_k \sim N(0.00001, 0.00001),\ k = 1,10 \quad (7)$$

We assumed diffuse Gamma priors for the parameters α and δ of the Gamma mixture in (4) and the precision parameter of the Normal distribution in (6). We also placed a highly diffuse Normal hyper prior on the mean of this distribution. For each model, we generated a chain of 100 thousand MCMC iterates to ensure convergence. We used the first 80,000 iterations as burn-in and sampled 1 out of every 10 of the remaining 20,000. The DIC's (Spiegelhalter et al., 2002) of the three versions of the model (Table 4) suggest that the Gamma mixture specification has the best fit to the data.

Table 4. Comparison of Model Specifications

Model Specification	DIC
Poisson with no mixture	1832
Poisson with Log-normal mixture	1838
Poisson with Gamma mixture	1759

The parameters of the texting and calling variables were significant and in the right direction for this specification thus supporting our two hypotheses. An examination of the posterior means of the parameters of the Gamma mixing distribution, however, suggested that the sample was not heterogeneous. Specifically, the posterior mean of the shape parameter, α, was extremely large (597.6)

thus indicating that most of the mass of the mixing distribution was concentrated in a very small region. This was further confirmed by a very large posterior mean of the precision parameter (335.2) in a separate calibration of the Log-normal mixing distribution as well. For our following discussion, therefore, we select the baseline specification which assumes homogeneity and does not include a mixing distribution.

5. Substantive Findings and Replication

5.1 Substantive Findings

Table 5. Posterior Summaries of the Gamma-Mixture Specification

Parameter	Posterior Summary		
	2.50%	**Mean**	**97.50%**
Constant	-0.437	0.311	0.986
GDR	-0.091	0.012	0.115
AGE	-0.041	-0.008	0.026
NTEENS	-0.072	0.002	0.077
NCELLS	-0.047	0.162	0.372
ADULT-AGE	-0.001	0.004	0.009
ADULT-EDU	-0.042	-0.008	0.027
ADULT-INC*	0.001	0.026	0.052
DVRTY	-0.007	0.045	0.099
Log(CALLS)*	0.104	0.150	0.196
Log(TEXTS)*	0.023	0.058	0.091

* 95% Posterior Interval does not include zero

Table 5 presents posterior summaries of the model parameters for the baseline specification. The parameters of Log (CALLS), Log (TEXTS) and ADULT-INC, have significant posterior means while those of the other variables are not significant. The estimated mean of the Log (CALLS) parameter is positive thus indicating that higher volume of calls on mobile phones is positively related to use-variety. The estimate therefore provides empirical support for H1. Similarly, the positive posterior mean of the parameter for Log (TEXTS) suggests that individuals with higher volumes of texting also engage in higher USE-VARIETY of mobile phones. This result therefore supports H2. Thus, as predicted, heavy use of the core functions of calling and texting of mobile phones is positively related to USE-VARIETY.

Turning to the role of demographics, since our theory is on the role of habits rather than of demographics, we do not provide a theoretical explanation for the estimated effects. Nonetheless, our results are consistent with previous findings regarding the role of demographic variables. For instance, income has been found to be positively related to the use of mobile phones (Pew, 2013). The estimated relationship between income and USE-VARIETY is consistent with this finding.

5.2 Replication

The results from our analysis of the survey of teens provide evidence that heavy calling and texting do build a carryover habit of using the phone for other types of communications and other functions. To be a reliable, however, these findings should be generalizable. Specifically, we should be able to replicate these findings among older users of mobile phones as well since our theory is independent of age.

Towards this end, we test hypotheses H1 and H2 using a different dataset related to the use of mobile phones by adult consumers.

The data for the replication is from a survey of cellphone usage of a nationally representative sample of 2277 adults by the Pew Internet and American Life Project during 2011 (Pew, 2011). As in the case of the survey of teens, this survey also included a number of questions that asked the respondents if and how they used the Internet and mobile phones. Specifically, respondents answered questions regarding (a) the number of calls made or received per day (CALLS-A) (b) the number of text messages sent or received per day (TEXTS-A) and (c) use of their mobile phones for other functions like watching videos or accessing the Internet (USE-VARIETY-A) (the "A" at the end of the variable names is included to indicate that they correspond to data from the survey of adults). In all, respondents were asked about their use of mobile phones for sixteen functions other than calling or texting (Table 6). We used the responses to these questions to operationalize the USE-VARIETY-A variable as the total number of other functions for which the mobile phone is used.

The survey also collected data on other consumer electronic devices owned by the respondents. Specifically, respondents were asked to indicate whether they owned a desktop computer, a laptop computer, a tablet computer like an iPad, an e-reader, a music device like an iPod and a game console. We used the responses to these questions to construct the device-variety variable DVRTY-A representing the number of other consumer electronic devices owned by respondents.

Respondents were also surveyed on a variety of demographics including gender (GDR-A), age (AGE-A), education (EDU-A), employment (EMPL-A), income (INC-A) and whether they had children under 18 years of age living with them (CHILD-A). Additionally, respondents indicated the type of community that they lived in, i.e., whether it was urban (URB-A), suburban (SUB-A) or rural (RUR-A). Recent findings suggest significant differences by age, education, and income in the use of mobile phones (Pew, 2013). For instance, over 80 percent of 18-29 year olds and 67 percent of 24-34 year olds in the country use a smartphone while just 45 percent of 50-64 year olds and only 18 percent of senior citizens do. There are also significant geographic differences in the use of smartphones. Almost 60 percent of urban and suburban residents use them while only about forty percent of rural residents do (Pew, 2013). We therefore include these demographic and geographic variables as controls in the analysis.

Table 6. Functions of Cellphones Other than Calling and Texting Investigated in the Survey of Adults

Send or receive email	Send a photo or video to someone
Take a picture	Post a photo or video online
Play music	Access a social networking site like MySpace, Facebook or LinkedIn.com
Download a software application or "app"	Access Twitter
Record a video	Check your bank account balance or do any online banking
Play a game	Participate in a video call or video chat
Access the internet	Use a service such as Foursquare or Gowalla to "check in" to certain locations or share your location with friends
Watch a video	Get directions, recommendations, or other information related to your present location

As in the case of the teen survey, we used the following criteria to select respondents to be included in the analysis: (1) the respondent should have a mobile phone (2) the mobile phone should be used to make or receive at least one call per day and send or receive at least one text per day (3) the respondent should have provided information on all the variables of interest, i.e., call and text volume, use variety, and demographics. This resulted in a sample of 840 respondents. Tables 7 and 8 provide descriptive summaries of the variables for this sample.

For the empirical analysis, we followed our approach for the teen survey and assumed that USE-VARIETY-A follows a Poisson distribution with a mean that is linked to respondent demographics, device variety, and the number of calls and texts per day. Additionally, we also include the demographic and geographic characteristics of the respondents. Thus, given an observation K_i on the USE-VARIETY-A of respondent *i*, we model K_i as

$$P(USE-VARIETY-A = K_i) = \frac{e^{-\lambda_i}.\lambda_i{}^{K_i}}{K_i!} \quad (8)$$

$$\lambda_i = e^{(X_i'\beta)} \quad (9)$$

Table 7. Summaries of Demographic Variables in the Selected Sample of Adults

	Number	Percent in Sample
Gender		
Male	377	44.9
Female	463	55.1
Parental Status		
Children at home	329	39.2
No children at home	511	60.8
Education		
None	12	1.4
High school incomplete (grades 9-11)	41	4.9
High school graduate	218	26.0
Vocational school after high school	16	1.9
Some college, no 4-year degree	224	26.7
College graduate	189	22.5
Post-graduate	140	16.7
Community		
Rural	154	18.3
Suburban	416	49.5
Urban	270	32.2
Employment		
Employed full-time	453	53.9
Employed part-time	117	13.9

Retired	65	7.7	
Not employed for pay	160	19.0	
Other	45	5.4	
Income			
Less than $10,000	69	8.2	
$10,000 to under $20,000	72	8.6	
$20,000 to under $30,000	96	11.4	
$30,000 to under $40,000	99	11.8	
$40,000 to under $50,000	70	8.3	
$50,000 to under $75,000	151	18.0	
$75,000 to under $100,000	117	13.9	
$100,000 to under $150,000	99	11.8	
$150,000 or more	67	8.0	
Age			
Minimum	Maximum	Mean	Std. Dev
18	81	40.8	14.64

$$X_i'\beta = \beta_0 + \beta_1.GDR - A_i + \beta_2.AGE - A_i + \beta_3.EDU - A_i + \beta_4.EMPL - A_i + \beta_5.INC - A_i + \beta_6.CHILD - A_i + \beta_7.SUB - A_i + \beta_8.RUR - A_i + \beta_9.DVRTY - A_i + \beta_{10}.\text{Log}\,(CALLS - A_i) + \beta_{11}.\text{Log}\,(TEXTS - A_i) \quad (10)$$

Similar to our specification in the analysis of the teen survey, we account for respondent heterogeneity by assuming that the response parameters are distributed randomly over the population and by also allowing for random effects through a Gamma or a Log-Normal mixture. We again calibrate (1) a baseline version of the model without a mixture (2) a Gamma mixture specification and (3) a Log-Normal mixture specification using MCMC methods. We use highly diffuse priors for the response parameters in the link, i.e.,

$$\beta_k \sim N(0.00001, 0.00001),\ k = 1,11 \quad (11)$$

Table 8. Summaries of Device and Use Variety and Volume of Calls and Texts by Adults

Variable	Minimum	Maximum	Mean	Standard Deviation
Number of Other Consumer Electronic Devices owned	0	6	2.93	1.36
Number of functions other than texting or calling for which mobile phone is used	0	16	6.43	4.38
Volume of calls per day	1	500	14.80	31.13
Volume of texts per day	1	500	31.38	81.92

As earlier, we assume diffuse Gamma priors for the parameters of the Gamma mixture and the precision parameter of the Normal distribution for the Log-Normal mixture. Again, we placed a highly diffuse Normal hyper prior on the mean of this distribution. We ran the MCMC chain for 100 thousand draws for each model to ensure convergence. We discarded the first 80,000 draws as burn-in and obtained the posterior summaries by sampling 1 out of every 10 of the remaining 20,000 draws. The DIC's of the three versions of the model (Table 9) suggest that the Log-Normal mixture specification has the best fit to the data. We next discuss the results from this specification.

Table 9. Comparison of Model Specifications for the Adult Sample

Model Specification	DIC
Poisson with no mixture	4826
Poisson with Gamma mixture	4457
Poisson with Log-Normal mixture	4278

5.3 Empirical Results from the Replication

Table 10. Posterior Summaries of the Log-Normal Mixture Specification

Parameter	Posterior Summary		
	2.50%	**Mean**	**97.50%**
Constant*	0.550	0.944	1.179
GDR-A*	-0.203	-0.126	-0.058
AGE-A*	-0.012	-0.008	-0.005
EDU-A*	0.005	0.035	0.065
EMPL-A	-0.052	-0.021	0.010
INC-A*	0.003	0.024	0.044
CHILD-A*	-0.200	-0.102	-0.013
SUB-A	-0.186	-0.092	0.009
RUR-A*	-0.378	-0.246	-0.115
DVRTY-A*	0.073	0.105	0.140
Log(CALLS-A)*	0.020	0.064	0.106
Log(TEXTS-A)*	0.117	0.157	0.191
Parameters of the Mixing Distribution			
Mean	0.085	0.439	1.01
Precision	3.79	4.629	5.7

* 95% Posterior Interval does not include zero

Table 10 presents the posterior means of the Log-Normal mixture specification of the model. The means of the log (CALLS-A) and log (TEXTS-A) parameters are both positive and significantly different from zero. The results therefore provide evidence supporting H1 and H2 in the case of this sample as well. Specifically, as hypothesized, heavy use of the core functions of calling and texting of mobile phones is positively related to USE-VARIETY-A. The replication of this finding thus provides additional evidence for how the use of core functions affects the use-variety of mobile phones.

The positive estimate of the DVRTY-A parameter also suggests that an increase in the number of consumer electronics devices that are used is positively related to the use-variety of mobile phones. Turning to the role of demographics, our results in this sample as well are consistent with previous findings in the literature regarding the relationships between demographic and geographic variables and the use of mobile phones. For instance, age is negatively related to the use of mobile phones (Pew, 2013). We should, therefore, expect this relationship to be reflected in the case of USE-VARIETY-A as well which we do. Similarly, income and education have been found to be positively related to the use of mobile phones while residents of rural areas are less likely to use them (Pew, 2013). Our results regarding the relationships between these variables and USE-VARIETY-A echo these findings. As in the case of our investigation of the teen survey data, the logical consistency of the relationships between the included demographic and geographic variables and USE-VARIETY-A with previous findings indicates that these variables functioned well as controls in our empirical analysis.

5.4 Managerial Implications

Our final research goal is to develop managerial implications of our findings for how brands can identify their customers who are more likely to adopt their mobile applications. Our results confirm that heavy users of the core functions of texting and calling of mobile phones are more likely to expand their use-variety and, hence, may be more interested in trying new applications. Brands that are attempting to gain acceptance of their mobile apps should therefore promote their mobile applications to consumers with high volumes of texting and calling. Reaching such consumers can be based on one or both of two approaches. One, promotions for the applications can be targeted to individuals who are likely to be heavy callers or texters. For instance, some findings suggest that Hispanics use the text function significantly more than other ethnic groups (Pew, 2012). Data on additional demographics and geographics of heavy users of calling and texting can be obtained from commercial suppliers of research data such as A. C. Nielsen and Comscoreor from mobile service providers.

Even heavy users of the core functions will only be interested in brands that are relevant to them. Thus, targeted promotions as in the above approach may also not be very efficient although they may be more effective than promotions that are broader in scope. Therefore, the second approach that we suggest is that brands should further target the promotions for their applications to heavy users of the core functions of mobile phones who are also heavy users of their products. For instance, a brand like Abercrombie and Fitch which targets the teenage consumer segment should target heavy users of calling or texting who are also regular buyers of its products. Similarly, a retailer like Underarmour which produces athletic wear and shoes for teenagers and young consumers should target heavy users of the core mobile phone functions who are also athletes and avid buyers of its products. Overall, therefore, as with any targeting exercise, overlaying additional data on the demographic, psychographic, and geographic characteristics, and product preferences, of heavy callers and texters should help brands in more precisely targeting individuals interested in their mobile applications.

Brands can also use a third approach. Specifically, they can reverse the second approach and target customers who are loyal or spend substantively on their products, and are also heavy users of texting or calling on mobile phones, with promotions of their mobile applications. Again, as in the case of the second approach, brands will have to augment their internal data on loyal customers and heavy buyers of their products with additional data on their texting and calling patterns. The resulting narrower targeting will increase the likelihood of reaching customers who are more likely to install the promoted applications.

As summarized in Figure 1, both approaches two and three would eventually target individuals who are more likely to install a brand's mobile applications. They, however, differ in how they arrive at the target. In approach two, the brand starts from a larger universe of potential targets who are heavy users or calling and texting on mobile phones and reaches those who are more likely to install by targeting those who are loyal customers. In the third approach, on the other hand, the universe of potential targets the brands start with is smaller and is further reduced through elimination of customers who are not heavy users of calling and texting with mobile phones. This approach would therefore be more efficient than approach two.

6. Summary and Future Research Directions

6.1 Summary

With the rapidly increasing use of mobile phones, brands need to use them to transact, communicate and interact with customers. This is particularly important in the case of brands targeting young consumers who are no longer as persuaded by names, images, or logos and are more interested in how brands interact with them, understand their needs, and relate to them (Wall Street Journal, 2014b). For instance, Abercrombie and Fitch recently decided to drop its logo from its clothing products in the North American market because its customers are more interested in brands that can help them "to put together their own individual styles" than its logo (Wall Street Journal, 2014b). The mobile phone channel, clearly, offers an opportunity to brands for engaging in such interactions but it also requires customers to be interested in installing their mobile applications. Recent findings (Deloitte, 2011), however, suggest that few brands succeed in attracting customers' interest in their mobile applications.

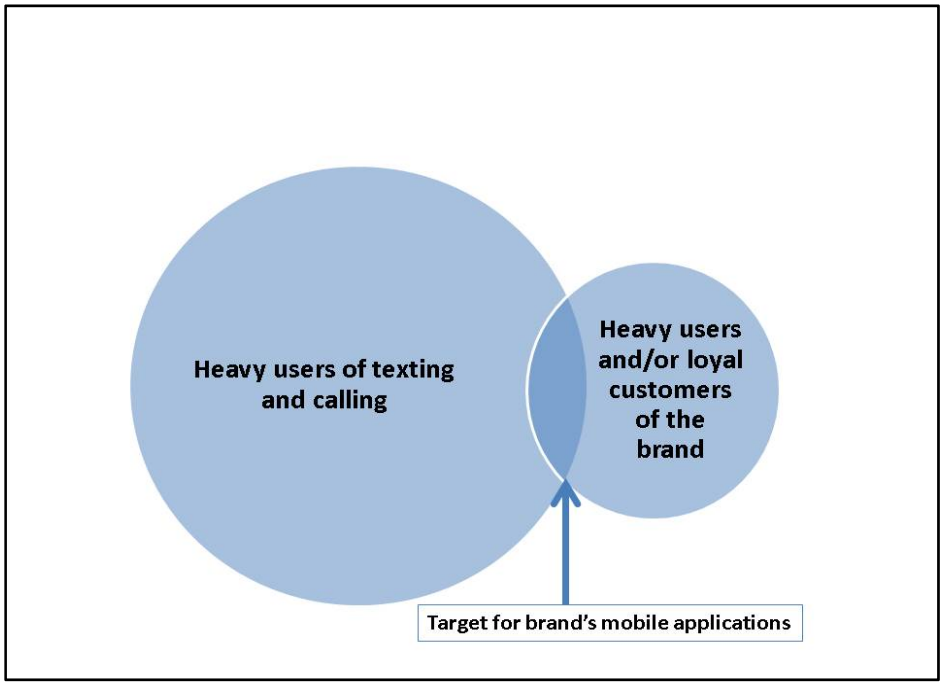

Figure 1. Targeting High Use-Variety Customers for Brands' Mobile Applications

We suggest that brands, therefore, need to target customers who use their mobile phones for multiple functions, i.e., customers with high use-variety of their phones. We base this on findings in the literature (e.g., Shih & Venkatesh, 2004) that suggest that such individuals are also likely to be

interested in additional functions for their phones. The literature, however, offers few insights into how high use-variety individuals may be identified. We, therefore, draw on the literature on habits (Khare & Inman, 2007) and propose that heavy users of the core functions of calling and texting of mobile phones are also likely to be high use-variety individuals.

Based on our theory, we develop two testable hypotheses that relate calling and texting volumes to use variety. Specifically, we hypothesize that heavy use of either of the core functions will be positively related to high use-variety. We test the hypotheses empirically on a nationally representative sample of teenage respondents and replicate the tests on a similar sample of adults. Our results from both samples support our hypotheses and indicate that the use-variety of mobile-phones is positively related to the volumes of calling and texting.

6.2 Future Research Directions

Our focus in this research is on testing our theory of the relationship between the use of calling and texting and use-variety of mobile phones. Empirical results from two samples—one of teens and another of adults—support hypotheses derived from our theory and demonstrate its validity. These results, however, do not parse out the effects of the use of calling and texting on consumer interest in specific types of additional functions and, in turn, the effect of the additional functions on consumers' interest in acquiring other applications. Extensive use of mobile phones for calling, for instance, may be related to also using them to listen to music. Further, the use of mobile phones for listening to music may lead to a desire for using them for other forms of entertainment such as watching videos or playing games. Apps targeted to such users should therefore be designed to be entertaining. In contrast, extensive use of the texting function may result in an interest in services like Twitter where the user interacts with the service through text. This, in turn, may increase the interest in following promotional messages posted on the service by brands thus increasing the likelihood of acquiring mobile applications from those brands. In this case, it is therefore preferable to promote brands' apps through services like Twitter rather than trying to reach targets directly. Future research of such relationships is therefore welcome and helpful in better understanding the relative roles of different functions of mobile phones in increasing consumer interest in mobile applications from brands and how to target prospective users of their applications.

A second avenue for future research is an investigation of the differences between different categories in how use-variety influences the acquisition and use of mobile applications by brands in the categories. Findings from such investigations can helps in gaining a better understanding of which categories would benefit the most (or least) from use variety and help managers assess the benefits of targeting high use-variety customers with their mobile applications. Similarly, an examination of how brands differ in whether and to what extent their high use-variety customers would be interested in acquiring their mobile applications can help brand managers to gain insights regarding better targeting of promotions for their mobile applications.

References

Aarts, H., & ApDijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, *78*, 53-63.

Chaudhuri, A., & Morris, B. H. (2001). The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty. *Journal of Marketing*, *65* (2), 81-93.

Deloitte. (2011). *Killer Apps? Appearance isn't Everything*. UK: Deloitte MCS.

Desai, K., & Sekar, R. (2007). Adverse Influence of Brand Commitment on Consideration of and Preference for Competing Brands. *Psychology & Marketing*, *24* (7), 595-614.

Diddi, A., & Robert, L. R. (2006). Getting hooked on news: Uses and gratifications and the formation of news habits among college students in an Internet environment. *Journal of Broadcasting & Electronic Media*, *50*, 193-210.

Dutton, W. H., Peter, K., & Charles, S. (1985). Computing in the Home: A Research Paradigm. *Computers and the Social Sciences*, *1*(1), 5-18.

Google Playbook. (2012). *The Mobile Playbook: The Busy Executive's Guide to Winning With Mobile*. Published by Google Inc.

Hirschmann, E. C. (1980). Innovativeness, Novelty Seeking, and Consumer Creativity. *Journal of Consumer Research*, *7*(3), 283-295.

International Telecommunications Union. (2014). *ITU World Telecommunication/ICT Indicators database.*

Jeuland, A. P. (1979). Brand Choice Inertia as One Aspect of the Notion of Brand Loyalty. *Management Science*, *25*(7), 671-682.

Khare, A., & Jeffrey, J. I. (2006). Habitual Behavior in American Eating Patterns: The Role of Meal Occasions. *Journal of Consumer Research*, *32*, 567-575.

Klemperer, P. (1987). Markets with Consumer Switching Costs. *Quarterly Journal of Economics*, *102*(2), 375-394.

Liu, Y. T., & Leona, T. (2013). Not All Repeat Customers Are the Same: Designing Effective Cross-Selling Promotion on the Basis of Attitudinal Loyalty and Habit. *Journal of Marketing*, *77*, 21-36.

Pew Internet, & American Life Project. (2009). *Parent-Teen Cell Phone Survey*.

Pew Internet, & American Life Project. (2011). *Spring Change Assessment Survey*.

Pew Internet, & American Life Project. (2012). *Digital Differences*. Research Report.

Pew Internet, & American Life Project. (2013). *Pew Internet: Mobile*. Research Report.

Shankar, V., Alladi, V., Charles, H., & Prasad, N. (2010). Mobile Marketing in the Retailing Environment: Current Insights and Future Research Avenues. *Journal of Interactive Marketing*, *24*, 111-120.

Shih, C. F., & Alladi, V. (2004). Beyond Adoption: Development and Application of a Use-Diffusion Model. *Journal of Marketing*, *68*(1), 59-72.

Spiegelhalter, D., Abrams, K., & Myles, J. (2002). Bayesian Measures of Model Complexity and Fit (With Discussion). *Journal of the Royal Statistical Society*, *64*, 583-639.

The Wall Street Journal. (2014a). *McDonald's Faces "Millennial" Challenge*.

The Wall Street Journal. (2014b). *Time to Lose the Logos, Abercrombie Decides*.

USA Today. (2014). *Domino's App Lets You Voice-Order Pizza*.

Varadarajan, R., Raji, S., Gautham, G. V., Manjit, S. Y., Paul, A. P., Sandeep, K., & Tom, K. (2010). Interactive Technologies and Retailing Strategy: A Review, Conceptual Framework and Future Research Directions. *Journal of Interactive Marketing*, *24*, 96-110.

Venkatesh, A. (1996). Computers and Other Interactive Technologies for the Home. *Communications of the ACM*, *39*(12), 47-54.

Winkelmann, R. (2008). *Econometric Analysis of Count Data*. Springer-Verlag, Berlin.

Wood, W., & David, T. N. (2007). A New Look at Habits and the Habit—Goal Interface. *Psychological Review*, *114*(4), 843-863.

Wood, W., & David, T. N. (2009). The Habitual Consumer. *Journal of Consumer Psychology*, *19*(4), 579-592.

Wood, W., Jeffrey, M. Q., & Deborah, A. K. (2002). Habits in everyday life: Thought, emotion, and action. *Journal of Personality and Social Psychology*, *83*, 1281-1297.

Wood, W., Leona, T., & Witt, M. G. (2005). Changing circumstances, Disrupting Habits. *Journal of Personality and Social Psychology*, *88*, 918-933.