

**INNOVATIVENESS OF CONSUMERS IN THE ADOPTION OF MOBILE TECHNOLOGY IN
THE PHILIPPINES**

Amoroso, Donald L. 

Kennesaw State University, Kennesaw, United States

damoroso@kennesaw.edu

Lim, Ricardo

Asian Institute of Management, Lungsod ng Makati, Philippines

Abstract

Global mobile technology use has grown exponentially. A survey of Philippine consumers in particular showed that more than 83% cannot live without their mobile phone. We study factors such as ease of use and personal innovativeness in order to understand the consumer adoption of mobile technologies in the Philippines, in order to build on existing adoption theories for academics and make recommendations to practitioners based on our findings. The research questions that we attempted to address include: (1) what key factors drive adoption of mobile technologies by Filipino consumers? (2) Are Filipino mobile consumers more personally innovative in their use of mobile technologies? We surveyed 725 mobile Filipino consumers, and resulting linear regression models show a significant amount of variance explained for behavioral intention and attitude toward using. In both models personal innovation had statistical impact on both attitude toward using and behavioral intention to use. Innovativeness did load on both attitude and behavioral intention for mobile applications as originally hypothesized, but was strongly loaded for attitude toward using.

Keywords: Mobile applications, adoption, personal innovativeness, ease of use, satisfaction.

INTRODUCTION

Global mobile technology use has grown exponentially. A survey of Philippine consumers in particular showed that more than 83% cannot live without their mobile phone (Ipsos, 2013). In Japan, mobile phone use from 1995 to 2000 grew from 5% to 90% of the population and can be attributed to the introduction of “i-mode” by Japan’s largest mobile service provider NTT DoCoMo, which allows mobile devices to access the Internet (Akiyoshi & Ono, 2008). Some drivers of mobile phone adoption can be attributed to common themes: affordability, accessibility, compatibility, effort or ease of use, experience, perceived playfulness, perceived

usefulness, service quality, safety concerns, social influences and technical support. Each of these themes describes different adoption motivations, and appear in multiple studies examining the Internet and mobile technology research (Ipsos, 2013). In addition to the common drivers of mobile applications usage, several applications drive the success of mobile applications including mobile web surfing, mobile learning, gaming and entertainment, mobile banking or mobile reservations, not to mention making a phone call or texting (Wang, Wu, & Wang, 2009).

This research addressed two important research questions:

- What key factors drive the adoption of mobile technologies by the Filipino consumer?
- Are Filipino mobile consumers more innovative in the personal use of mobile technologies?

This research is a first step in understanding the adoption and use of mobile-based applications in the Philippines. From a technology perspective, it is important to understand how specific factors influence the use of mobile technologies, and ultimately the consumers' decisions and business planning resulting from such an analysis. From a consumer perspective, it is important to ascertain the specification of consumer factors related to adoption of mobile applications.

LITERATURE REVIEW

Personal Innovativeness

Lu, Yao, and Yu (2005) found that while perceived usefulness and perceived ease of use are strong variables in consumer willingness to adopt mobile technology, variables such as innovativeness and social influence must also be considered in determining consumer acceptance, showing a direct effect on ease of use and usefulness, which in turn impacted consumer intention to adopt wireless Internet services via mobile technology (WIMT). Jayasingh and Eze (2009) studied 781 respondents in Malaysia and verified that customer use of mobile coupons was directly related to perceived usefulness, perceived ease of use, compatibility, perceived credibility, and social influence. However, there was no direct connection between the consumer's innovativeness and behavioral intention to adopt mobile coupons. Hill and Troshani (2009) found that innovativeness and image were less supported than the other factors. However, perceived ease of use was not found to be a significant contributor towards adoption perception of personalization services.

H1a: Innovativeness is positively and significantly correlated to Perceived Ease of Use.

H1b: Innovativeness is positively and significantly correlated to Satisfaction.

H1c: Innovativeness is positively and significantly correlated to Behavioral Intention.

Perceived Ease of Use

In the Technology Acceptance Model, TAM (Davis, et al. 1989), the Adoption construct is composed of perceived ease of use, perceived usefulness and attitude toward using technologies. Perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort. Perceived ease of use deals with issues of application complexity, ability to understand the functionality of the technology.

H2a: Perceived Ease of Use is positively and significantly correlated to Satisfaction.

H2b: Perceived Ease of Use is positively and significantly correlated to Attitude.

Satisfaction

Thorbjornsen and Supphellen (2004) found that brand loyalty is a stronger determinant of website usage than Internet experience and type of motivation (information or entertainment purposes) for the visit. In our study, we determined brand loyalty to be related to both the handset manufacturer (Apple or Samsung), carrier (e.g. Philippine carriers like Globe, Smart, or Sun), and mobile application being used. Bauer et al. (2002) found that customers who trust a Web-based company feel more committed to it. They also found that customer satisfaction has the strongest influence on commitment. Kim and Xu (2004) investigated the impact of satisfaction on loyalty in the context of electronic commerce. They hypothesized that the higher the level of e-satisfaction, the higher the level of e-loyalty.

H3: Satisfaction is positively and significantly correlated to Attitude.

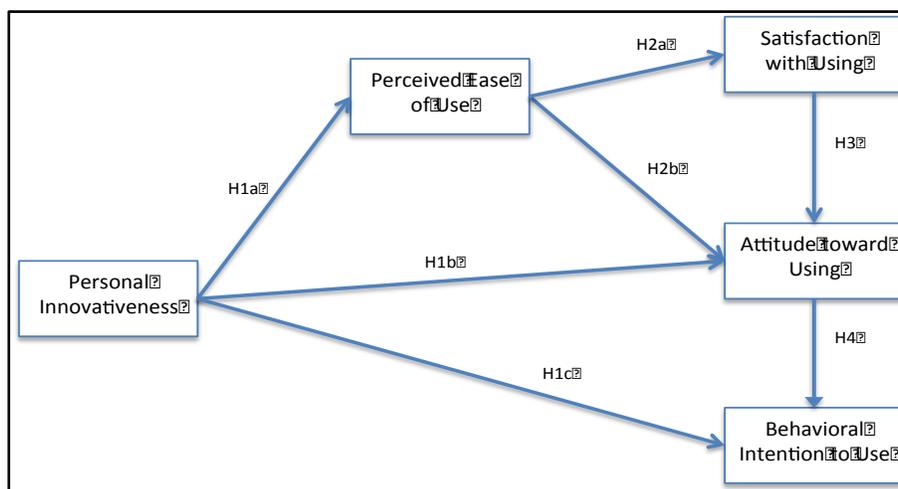
Attitude and Behavioral Intention

Attitude toward using is the user's evaluation of the desirability of his or her using the system. Attitude toward using is an individual's positive or negative feelings about performing the target behavior (Davis, Bagozzi, & Warshaw, 1989). Davis et al. (1989) found that users' attitudes significantly affected behavioral intention to adopt a technology. Chau and Hu (2001) reported perceived usefulness to be a significant determinant of attitude as well as behavioral intention. These findings show that users are likely to have a positive attitude if they believe that usage of a technology will increase their performance and productivity. Wu (2003) found that consumers who shop online have higher attitude scores, which are directly related to online purchase decisions. Athiyaman (2002) found that consumers may avoid online purchasing items such as airline tickets because of their attitudes concerning the security of the Internet. Black (2005) found that attitude toward using was found to have a strong impact on behavioral intention.

Behavioral intention measures the strength of one's intention to perform a specified behavior, such as use a mobile technology or application. Sun and Zhang (2003) reported that behavioral intention does well in predicting actual usage of a technology. Any factors that influence behavior act as indirect influences through behavioral intention. The results of a study of inexperienced and experienced users confirmed a stronger correlation between behavioral intention and behavior (usage) for experienced users, resulting in higher levels of satisfaction (Taylor & Todd, 1995).

H4: Attitude is positively and significantly correlated to Behavioral Intention.

Figure 1. Research Model for Investigation



METHODOLOGY

We developed a survey instrument to measure the adoption factors of mobile technologies by Filipino consumers. To ensure content validity of the scales we selected items that represented the construct about which generalizations are to be made. All items were previously identified in existing instruments and were categorized according to the various scales published in the literature (Amoroso and Ogawa, 2013). This generated an initial item pool for each construct. To keep the instrument length reasonable, we selected three to five scales for the measurement of each of the constructs, keeping the wording similar to the original studies. (Typical items in previous instruments tended to ask respondents to indicate degrees of agreement.) We reevaluated and eliminated redundant or ambiguous items, especially those that might load on more than one factor in subsequent research.

We operationalized theoretical constructs for the survey for Internet and mobile technologies by using validated items from prior research. Working from the previously published research of Amoroso and Ogawa (2013); we used common scales from that research (see articles for specific derivations of research constructs). We derived measures of attitude toward using

primarily from the Agarwal and Karahanna study (2000) which looked at fun and enjoyment interacting with the technology. We examined the behavioral intention to use the Internet as a combination of carrying out the task and planned utilization in the future.

More than 725 mobile consumers in the Philippines completed the online survey. Graduate students were asked to post the survey link on their Facebook account asking potential respondents to complete the survey completely. We identified undergraduate students at the Technological Institute of the Philippines (n=154) and graduate students at the Asian Institute of Management (n=574) for a total of 728 Filipino responses. Students posted the survey link on their Facebook account and also asked their friends to post with the objective to get 10+ responses per student. The data collection resulted in a greater age variance among the respondents. Data was downloaded initially as an Excel file from SurveyMonkey then exported to SPSS 22. All cases with “biased” responses and any cases with any missing responses were eliminated from yielding a final sample of 528 Filipino responses. Table 1 illustrates the demographics from the data collection. The sample shows that 51% of the respondents use Globe and over 40% use Smart/Sun. However we were surprised that over 30% of the respondents used another carrier. We also observe that an equal number of Filipino respondents used prepaid and postpaid mobile plans.

Table 1: Demographics			
Mobile Adoption		Filapinas Sample (n=528)	
Demographic	Item	Number	%
Gender	Women	231	43.8
	Men	297	56.3
Age	Under 18	31	5.9
	18-20	106	20.1
	21-25	175	33.1
	26-30	159	30.1
	31-35	37	7.0
	36-40	11	2.1
	Over 40	9	1.7
Carrier	Globe	270	51.1
	Smart	124	23.5
	Sun	85	16.1
	Other	167	31.6
Type of Plan	Postpaid	195	36.9
	Prepaid	214	40.5
	Missing		
Family Plan	Yes	24	4.5

ANALYSIS

We found strong support for construct validity and reliability by examining Cronbach coefficients and by principal component factor analysis. The measurement scales for this instrument showed strong psychometric properties. All measurement scales showed high Cronbach alpha coefficients (see Table 2) at $\alpha \geq 0.70$ for all the measures, with the exception of personal innovativeness, which was slightly below the lower bounds set for this study, near the $\alpha \geq 0.70$ (Moore & Benbasat, 1991). This pattern of high scale reliability is consistent with prior research dealing with the technology acceptance model.

Table 2: Measurement Model Statistics				
Mobile Adoption		Filapinas Sample (n=528)		
Latent Construct	Observed Indicators	Factor loadings	AVE	Cronbach alpha
Innovativeness	INN1	0.757	0.626	0.68
	INN2	0.884		
Ease of Use	EOU1	0.724	0.731	0.84
	EOU2	0.876		
	EOU3	0.809		
	EOU4	0.854		
Satisfaction	SAT1	0.768	0.659	0.90
	SAT2	0.804		
	SAT3	0.841		
	SAT4	0.840		
Attitude	ATT1	0.728	0.678	0.91
	ATT2	0.815		
	ATT3	0.849		
	ATT4	0.787		
	ATT5	0.806		
Behavioral Intention	BI1	0.742	0.617	0.89
	BI2	0.876		
	BI3	0.809		
	BI4	0.854		

We used factor analysis as an assessment of construct validity. Moore and Benbasat (1991) stated that, where possible, data analysis ought to be grounded in a strong a priori theory set. This research fits the approach where the constructs related to the acceptance of Internet technologies by consumers are based on a substantial body of prior research and where the scale development fits the construct's conceptual meaning as a method of ensuring construct validity. We conducted principal components analysis with Varimax rotation yielding a six-factor solution with eigen values greater than 1.0, explaining 72.2% of the variance in the data set. We examined the rotated factor matrix (see Table 3) for items that did not load strongly on any

factor (<0.40), that loaded on another factor greater than the intended component, or that loaded relatively equally on more than one factor. All of the items from the perceived usefulness construct loaded cleanly on a factor with all loadings > 0.683.

Table 3: Rotated Components Matrix
Mobile Adoption

Component	1	2	3	4	5	6
3.3M	0.139	0.202	0.753	0.099	0.109	0.017
3.4M	0.174	0.096	0.795	0.055	0.081	0.172
3.5M	0.152	0.151	0.797	0.101	0.007	0.108
3.6M	0.197	0.286	0.734	0.141	0.093	-0.002
4.1M	0.770	0.157	0.226	0.224	0.095	0.095
4.2M	0.811	0.138	0.191	0.218	0.032	0.162
4.3M	0.754	0.133	0.119	0.298	0.130	0.072
4.4M	0.771	0.131	0.151	0.230	0.001	0.216
4.5M	0.765	0.188	0.167	0.295	0.033	0.105
5.1M	0.334	0.116	0.134	0.735	0.032	0.167
5.2M	0.449	0.185	0.218	0.675	0.063	0.213
5.3M	0.395	0.160	0.074	0.711	0.138	0.184
5.4M	0.451	0.175	0.123	0.702	0.164	0.152
6.3M	0.217	0.038	0.104	0.177	0.051	0.847
6.4M	0.228	0.071	0.146	0.265	0.084	0.805
7.5M	0.040	0.124	0.115	0.142	0.800	-0.093
7.6M	0.149	0.443	0.085	0.092	0.697	0.019
7.7M	0.035	0.207	0.054	0.005	0.683	0.307
8.1M	0.199	0.720	0.221	0.159	0.208	0.039
8.3M	0.254	0.781	0.172	0.040	0.218	0.008
8.5M	0.095	0.835	0.186	0.180	0.124	0.046
8.6M	0.109	0.829	0.201	0.112	0.157	0.093

We used the construct correlations to examine the relationships between the main constructs in the model. This provides an initial test for how well the hypotheses were supported. We investigated only those correlations > 0.251 for the sample size (n=528). We found strong support for all of the construct inter-correlations. Tables 4 and 5 show the regression analysis for the dependent variables. For the attitude toward using construct loading (see Table 4), the variance explained in this model was R²=.372. The construct loading of personal innovativeness, ease of use, and satisfaction are all significant (p<.000), sustaining hypotheses H1b (personal innovativeness), H2b (ease of use), and H3 (satisfaction).

Table 4: Regression Analysis - Attitude Toward Using Mobile Adoption - Philippines

	Sig-F-Chg	Sig-F-Chg	R-Square
Model Summary	102.81	0.000	0.372
	Coefficient	t-Value	p-value
Intercept	0.188		
Innovativeness	0.410	9.087	0.000
Ease of Use	0.540	6.273	0.000
Satisfaction	0.510	6.294	0.000

For the behavioral intention model (see Table 5), a fairly significant amount of variance is explained ($R^2=.621$). The construct loadings of personal innovativeness, ease of use, and attitude toward using are significant ($p<.000$), sustaining hypotheses H1c and H4. We also found that satisfaction was an important construct loading on behavioral intention to use. However, we should note that attitude toward using was the most important construct determining behavioral intention. However, we are surprised that ease of use was not important in explaining the variance in behavioral intention. We predicted in our model that perceived ease of use would be more related to attitude toward using (which we found in our last regression model).

Table 5: Regression Analysis - Behavioral Intention Mobile Adoption - Philippines

	Sig-F-Chg	Sig-F-Chg	R-Square
Model Summary	213.03	0.000	0.621
	Coefficient	t-Value	p-value
Intercept	0.150		
Innovativeness	0.182	6.057	0.000 **
Ease of Use	0.017	0.053	0.601
Satisfaction	0.126	3.935	0.000 **
Attitude	0.617	18.123	0.000 **

DISCUSSION

Based upon existing theory and the findings from those studies, we developed a model to explain the factors influencing the behavior of Philippine mobile consumers. We analyzed the constructs and their underlying theory including relevant findings as well as relationships between these constructs as related to the Internet- and mobile-based applications. We validated many of the originally hypothesized relationships related to personal innovativeness,

ease of use, satisfaction, attitude toward using, and behavioral intention to use. This research purported a set of hypotheses resulting from established theory. The development process also helped to clarify and refine some of the definitions used by a variety of researchers using the technology acceptance model.

Significant Findings

The linear regression models show a significant variance explained for behavioral intention ($R^2=.621$) and attitude toward using ($R^2=.372$). In both models personal innovation had statistical impact on both attitude toward using ($p<.000$) and behavioral intention to use ($p<.000$). Attitude toward using, the loadings of innovativeness, ease of use, and satisfaction were all important and equally strong with the coefficient loadings of >0.410 .

The model on behavioral intention to use had two significant findings: first, the relationship of the attitude toward using construct was strong, compared with personal innovativeness and satisfaction. Second, we thought that ease of use would have some impact on behavioral intention. We found no support for this theory in the model, but we believe that this construct was related only to attitude toward using and through satisfaction. More importantly, however, was the strength of innovativeness in both models in predicting attitude toward using and behavioral intention.

Support for Hypotheses

Table 6 breaks down each of the hypotheses and the results of each based on the regression analyses for the Internet and mobile research models. In general, all the hypotheses were supported by variables related to mobile phone usage with the Philippine consumer sample. We found strong support for the hypothesized relationships for consumers using mobile technologies. We found that innovativeness did load on both attitude and behavioral intention for mobile applications as originally hypothesized, but was strongly loaded for attitude toward using.

Table 6: Hypotheses Support	
Mobile Adoption in Philippines	
H1a: Innovativeness will positively effect on perceived ease of use	Support
H1b: Innovativeness will positively effect on consumer attitude toward using	Support
H1c: Innovativeness will positively effect on behavioral intention to use	Support
H2a: Perceived ease of use will positively effect on satisfaction	Support
H2b: Perceived ease of use will positively effect on consumer attitude toward using	Support
H3: Satisfaction will positively effect on consumer attitude toward using	Support
H4: Consumer attitudes will positively effect on behavioral intention to use	Support

CONCLUSION

This research looks at the adoption of mobile technologies in the Philippines. It is the intent of this exploratory study to examine factors of adoption that are utilized by Philippine consumers. We derived a research model and tested related hypotheses with data collected from consumers. We used financial mobile applications as the common application.

This research is a first step in understanding the adoption of mobile applications by Philippine consumers. Although we initially hypothesized that consumer behavior towards mobile applications would involve constructs of innovativeness, ease of use, and satisfaction, we found that ease of use was not significant in understanding behavioral intention to use mobile technologies.

In fact, personal innovativeness was more critical in explaining satisfaction with mobile application attitudes and behavioral intention. This factor is important for online retailers who count on repeat sales as a major part of their revenue, e.g. that applications availability, complexity of features, and encouragement to consumers to self-innovate may sell better than ease of use and simplicity. Likewise, being able to shape consumer attitudes is important in order to build behavioral intention to use. Online retailers may likewise build factors that encourage consumer innovation, such as product co-creation through user participation in forums. This study provides managers with a framework for mobile applications which areas they need to focus upon when launching new online products, such as shaping and/or changing their consumers' attitude toward using the Internet, making their Website (though not the product itself) easier to use, and enhancing the perceived usefulness of the technologies that allow consumers to access their products online.

The model in this paper also serves as an important first step toward subsequent predictive modeling with critical marketing variables. The value of our study is to move beyond the standard technology acceptance model (TAM). Older, established technologies (Internet) have radically different qualities than newer technologies (Mobile). New technology factors such as dominant or universal platforms (IOS, Android), social networking (Facebook, Twitter), and push technologies, P2P sharing (Bluetooth), have overturned more monolithic concepts since TAM's inception in 1989. We might surmise that because of the highly personalized nature of mobile technology use—as opposed to the more technology enterprise settings in TAM—users seem to be more influenced by personal innovativeness than other factors such as ease of use. Those consumers who are willing to “try out” newer applications (personal innovativeness) without understanding how they will work also have difficulty to applying the usefulness of those technologies.

We did not examine other possible individual and environmental factors that influence a consumer's cognitive and emotional responses to purchasing through the Internet or mobile

phone, such as physical stimuli (Koufaris, 2002). Neither did our study compare the specific variables in each of the models to address differences in consumer responses related to Internet and mobile phone applications. The purchasing patterns of the consumers might also be significantly different, based on demographics such as socio-economic status and age.

We also did not account for the mobile application types, product prices, and consumers' own research. Different product types might lead the online consumer to use alternative technologies. Such choices might also depend on the degree of product research conduct by the consumers themselves. Internet access fees can also limit use of mobile devices for emerging applications. In the Philippines, many people do not work, and therefore have different usage of technologies.

FUTURE RESEARCH DIRECTIONS

Future researchers may want to examine the mobile usage characteristics of other age groups and/or look at mobile purchasing in countries outside the Philippines. One might hypothesize that younger consumers or male consumers might have more innovativeness to use the new technology in trial and error, even increases in attitude toward using. Consumers might typically be non-technical persons, who are unfamiliar with new technology capabilities. Some people do not have the time to learn about newer technology features or functions. We need to consider collecting data in different age groups.

Expanding the number of constructs measured, and expanding sample size may provide researchers with new insights on consumers' usage of e-commerce sites. Adding other variables could increase the predictive power of the model. Researchers could also look at the correlation between the type of product purchased and the type of mobile technology used to buy it.

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