Research Article

Are the Poor Stuck in Voice? Conditions for Adoption of More-Than-Voice Mobile Services

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Abstract

Mobile phone access is widespread in Asia; voice connectivity has been achieved for the most part through intense competition, with prices being driven down to almost unsustainable levels. Against the backdrop of intense competition, new services and applications, such as price information alerts, news alerts, mobile money applications, and mobile Internet services, may provide new revenue sources, allowing operators to expand services. More important, from a development perspective, they also offer a way to get information and services with lower transaction costs to customers at the "bottom of the pyramid." This article examines the use of such "more-than-voice" services among telecom users at the bottom of the pyramid in emerging Asia. Through a logistical regression model, it attempts to understand what factors can predict their use in order to inform operators on how they can better serve these markets, and to educate policymakers on how they can assist with policies that will favor greater access.

Introduction

Globally, mobile phone connections overtook fixed phone connections in 2002. Recent research has shown that mobile phone access is widespread in the emerging Asian region. The ratio of mobile SIMs to fixed connections in India was 9.2:1 in 2008; this ratio was even as high as 19.9:1 in Pakistan and 33.2:1 in Bangladesh, two other significant markets within the region (ITU, 2010). Even among low-income earners within these markets, more than 90% of phone connections were mobile by late 2008 (LIRNE*asia,* 2009a).

New business models (Samarajiva, 2009) have evolved in these markets to survive the intense competition that is driving voice prices down to unprecedented levels (LIRNE*asia,* 2009b; Nokia, 2009), allowing many low-income earners from the bottom of the pyramid (BoP;[1] Prahalad, 2004) to get and stay connected.

Against the backdrop of intense competition, new services and applications beyond voice (and peer-to-peer SMS), such as price information services, news alerts, and mobile money applications (banking, payments, remittances, etc.), as well as mobile Internet, may provide new revenue

1. The authors acknowledge the debate surrounding the usage of the term bottom of the pyramid versus base or foundation of the pyramid, as well as the concept that the term embodies (see, for example, Karnani, 2007; Kuriyan & Toyama, 2008). However, for the purpose of this article and the study reported, the authors adopt the term, as it is widely understood to refer to the lower socioeconomic groups within society. In fact, this study moves away from Prahalad's income-based definition of the BoP to one that is based on socioeconomic factors, including education and occupation.

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areas for operators, enabling them to expand services and reduce churn (Calandro, Gillwald, Moyo, & Stark, 2010; Lokanathan & de Silva, 2010; Wishart, 2006). While profitability of private companies is not a direct concern of development practitioners, the sustainability of the companies responsible for innovations that have enabled millions of low-income earners to get connected should be of some interest; in cases like India, this connectivity was achieved without any help from the largely undisbursed universal service funds (Samarajiva, 2009). Furthermore, the mobile sector is often a significant contributor to national income (Calandro et al., 2010) and is positively associated with foreign direct investment (William, 2005). As a result, many developing country governments are pursuing ICT-led development strategies (Calandro et al., 2010). More generally, the socioeconomic benefits of the mobile phone—and more generally, ICT access—have been well documented over years of macro- and micro-level research with varying levels of sophistication.[2]

Recent research in some of Asia's developing countries has shown that mobile use largely consists of voice, SMS, and missed calls at the BoP. However, a small but significant share of mobile users in higher-penetration countries is already using more-than-voice services (Zainudeen, 2009). The term *more-than-voice* refers to services and applications accessible through mobile phones beyond voice and peer-to-peer SMS. Examples include mobile money services, government services, agricultural information services, social networking services, and so on. Such services are still relatively new and mostly positioned to serve higher-spending market segments (Ivatury & Mas, 2008).[3] But even if those at the BoP use them in small amounts, aggregated demand may be large, though little data are currently available to confirm this.

Across the developing world, many BoP consumers will have (or already have had) their first experience with the Internet (or elements of it, such as information retrieval and publication, payments, remote computing) through a mobile, rather than through a conventional desktop computer route (Nokia, 2010; Samarajiva, 2009).[4]

Research on such more-than-voice services and applications is thin. Bhatnagar (2009), Lokanathan and de Silva (2010), Sirasoontorn (2010), and Zainudeen, Samarajiva, and Sivapragasam (2010) have all conducted studies that *describe* some of the kinds of services available. These services range from services that facilitate rural pension payments, to those that provide agricultural price information, to those that provide real-time classified advertisements. These are provided through multiple platforms (voice, SMS, USSD, WAP, IVR, etc.). However, with the exception of a few studies (e.g., Chigona, Beukes, Valley, & Tanner, 2009; Gitau, Marsden, & Donner, 2010; Kreutzer, 2009), little is known about *how* more-than-voice services are used by users in these markets.

The key benefit of more-than-voice services is that they allow for a greater number of consumers to be reached with lower transaction costs, allowing for more affordable service for the consumer (Ivatury & Mas, 2008; McKay & Pickens, 2010; Wishart, 2006). These kinds of services can considerably reduce the relative cost of engaging in small-value transactions, a particular advantage for BoP consumers. Ivatury and Mas (2008) estimate the cost of providing branchless banking services to be 50% less than that of conventional service provision. Providing these services over mobile networks lowers the cost of rolling out services, and it also reduces the transaction costs of dealing with (many) low-value transactions, as third party agent networks and infrastructure are leveraged to provide the services. Similarly, McKay and Pickens (2010) estimate that "branchless banking" services are 19% cheaper than formal banking services, particularly for lower-value transactions.

2. Some research looks at the macro-level benefits of ICT access in terms of national income (e.g,, Hardy, 1980; Kathuria, Uppal, & Mamta, 2009; Waverman, Meschi, & Fuss, 2005), while others explore the relationship at a more micro-level, in terms of perceived social and economic benefits, small business profits, and community benefits, among others (Abraham, 2007; Aker, 2008; Bayes et al., 1999; de Silva & Ratnadiwakara, 2008; de Silva & Zainudeen, 2007; Donner, 2006; Frost & Sullivan, 2006; Goodman, 2005; Jensen, 2007; Kyem & LeMaire, 2006; Souter et al., 2005).
3. With exceptions such as CellBazaar in Bangladesh (Zainudeen et al., 2010) and BuzzCity's myGamma in Singapore, India, and Thailand (Sirasoontorn, 2010).
4. Indeed, by 2010, India was second only to the United States in mobile Internet use, according to a study reported by Nokia (2010).

In addition to reduced service costs, consumers also benefit from convenience and savings in both money and time when accessing the services (Ivatury & Mas, 2008). In some cases, they also offer more transparent ways to provide services to the rural poor, e.g., overcoming bribery and fraud problems in providing government services (Bhatnagar, 2009).

As many more-than-voice services are still in their nascent stages, there is not a lot of empirical evidence of their impacts in developing countries. Nevertheless, some positive evidence is starting to emerge, mostly in relation to mobile money and agricultural information services. Goodman and Walia (2006), through a nationally representative survey of 700 balance transfer users (and 300 non-users) in Egypt, detail the resulting socioeconomic benefits of using the service, such as increased access to mobile services (by allowing users to access free and paid-for airtime), increased commercial opportunities for resellers and microentrepreneurs, and improved social relations (also suggested by Morawczynski [2008] in relation to mobile remittance service use in Kenya), among others. Mittal, Gandhi, and Tripathi (2010) find that mobile-enabled agricultural services are contributing to agricultural productivity among the Indian farmers they studied, although they note that constraints in other related factors (access to support infrastructure, inputs, etc.) need to be loosened to realize the full benefits. In a study of 55 small farmers in Sri Lanka, Lokanathan and de Silva (2011) show that farmers who received real-time crop price information via a mobile application received a 6.4% premium on average market prices after two seasons compared to those who did not (and who, in fact, received below-average market prices). This was in addition to improved social and human assets, improved abilities to make strategic decisions, and reduced vulnerabilities.

This article investigates awareness and use of such more-than-voice services among BoP mobile phone users, specifically among those who belong to socioeconomic classification (SEC) groups D and E, corresponding roughly to those earning less than US$2 per day (see Zainudeen, 2009, p. 4). It draws from a data set of 9,540 BoP telecom users in six emerging Asian countries: Bangladesh, India, Pakistan, the Philippines, Sri Lanka, and Thailand. Through logistic regression, this article models the adoption of such services among mobile users to understand what affects these users, and it provides empirical evidence on the factors influencing more-than-voice use among BoP mobile owners. It also looks at the barriers to service uptake, based on further qualitative research conducted in the same countries. The findings are used to understand and draw recommendations on how operators can better serve these markets, and on how policymakers can facilitate greater access.

Theoretical Background

Much of the literature on technology adoption can be divided into three "schools" (Pedersen & Ling, 2002): diffusion, adoption, and domestication.

Diffusion research broadly describes the "S-shaped function" (Rogers, 1962), the pattern by which technologies are typically adopted by a group of people over time. According to diffusion theory, different categories of adopters can be identified, including innovators, early adopters, early majority, late majority, and laggards.

Adoption research focuses on the decision to adopt and tries to explain the factors that influence that decision at an individual level. Several models have evolved, which are briefly discussed.

Domestication research typically tries to understand how ICTs are "domesticated" when brought into the home (Silverstone et al., 1992).

This article draws on the adoption school to analyze the adoption of more-than-voice mobile services at the BoP. The widely applied technology adoption models have mostly evolved from the Theory of Reasoned Action (TRA), originally postulated by Fishbein and Ajzen (1975). The TRA explains adoption decisions (or more specifically, behavioral intentions) as being influenced by attitudes and social norms. Several applications have led to the extension of the TRA to include additional factors that have been seen to influence the adoption decision.

The theory of planned behavior (TPB) is one such extension into which perceived behavioral control is factored (Ajzen, 1985). The technology acceptance model (TAM) goes another step further and includes the perceived usefulness and perceived ease of use of the technology as determinants of technology adoption (Davis, 1989). The unified theory of acceptance and use of technology (UTAUT) factors in social influences, as well as mediating factors such as gender, age, and so forth (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT combines elements from the most widely used models.

Pedersen and Ling (2002) distinguish between studies on the adoption of mobile terminals versus the actual services, noting that little attention has been paid to the latter. They add that, nevertheless, lessons from the former can inform the latter, an argument that this article also supports. Furthermore, within service-oriented studies, focus has been on adoption of basic services (voice and SMS), rather than on "the kind of complex and integrating services that will be typical of 3G services like e.g., mobile commerce services" (ibid., p. 4).

Data and Descriptive Statistics

This article is based on data from a 2008 representative study among poor people, or the "bottom of the pyramid" (BoP), in Bangladesh, Pakistan, India, Sri Lanka, the Philippines, and Thailand. The study was conducted using quantitative and qualitative research methods among those who had used, but not necessarily owned, a telephone to make or receive voice calls in the previous three months.[5] The BoP was defined as the two lowest socioeconomic groups (SEC),[6] D and E, with the exception of the Philippines, where only SEC group E was considered.[7]

The quantitative component comprised 9,540 face-to-face interviews among those who had used, but not necessarily owned, a telephone in the previous three months. Methodological details of the data collection process can be found in de Silva, Ratnadiwakara, and Zainudeen (the lead article in this special issue). In the survey component of the study, all respondents were asked whether they were aware that the following kinds of service could be accessed through telephones or computers; awareness of the Internet (not specific to any device) was also captured. The responses are summarized in Table 1 for

1. Banking and financial;
2. Payment;
3. Government (local, state, or central);
4. Health;
5. Participation in competitions, polls, or other live TV/radio programs;
6. General information;
7. Agricultural/fisheries information; and
8. Internet (in general).

Awareness of services was below 20% in the three lower-mobile-penetration countries (Bangladesh, Pakistan, and India), while it was closer to two-thirds in the three higher-penetration countries (Sri Lanka, the Philippines, and Thailand) in the study.

Those who answered positively were then asked whether they actually used such services, either regularly or occasionally. All respondents were also asked whether they have used the Internet and from where (a computer or a mobile). For the purpose of this article, we therefore considered as those who had used at least one of these services,[8] or who had used the Internet via a mobile phone, as more-than-voice users. Table 2 shows that use of the more-than-voice services among the BoP in the six countries was, on the whole, not very high, and further, that it was still in its nascent stages in the three low-penetration countries. Given the low bases in the three low-penetration countries, the logistic regression analysis that follows only considers the higher-usage countries (Sri Lanka, the Philippines, and Thailand) to understand the factors relating to more-than-voice use at the BoP. Table 3 indicates the number of more-than-voice users versus nonusers in the samples in Sri Lanka, the Philippines, and Thailand.

The profiles of more-than-voice users in the three countries under consideration are summarized in Tables A1 and A2 in the Appendix.[9] The chi-square values given in the tables indicate where there are statistically significant associations between the concerned variable and more-than-voice use. The significance level established in chi-square significance tests, with probability of 0.05 or less, is commonly interpreted as justification for rejecting the null hypothesis that variables are not related in some way.

5. Phone use in the previous three months included making or receiving a telephone call (but not SMS) on any phone, whether the user owned it or not.
6. See de Silva, Ratnadiwakara, and Zainudeen (the lead article in this special issue) for details on SEC.
7. The SEC D and E population of the Philippines constitutes 92% of the population, whereas only the SEC E population, corresponding with the population living on US$2 per day, comprises 38%.
8. Either on a regular basis or not.
9. Table A1 in the appendix provides a countrywide breakdown of the Pearson chi-squared significance test results.

Table 1. Awareness of More-Than-Voice Services (% of BoP Teleusers).

	Bangladesh (n=2,050)	Pakistan (n=1,814)	India (n=3,152)	Sri Lanka (n=924)	Philippines (n=800)	Thailand (n=800)	Total sample (n=9,540)
Banking and financial		7	3	34	23	23	11
Payment	4	11	2	29	41	25	12
Government (local, state, or central)	3	5	2	35	24	9	8
Health	9	8	4	37	19	9	11
Participation in competitions, polls, or other live TV/radio programs	7	10	10	59	51	48	21
General information	1	9	3	39	18	41	12
Agricultural/fisheries information	4	4	1	21	13	6	6
Internet (in general)[a]	44	43	37	77	90	80	44

Note: a. Data on the respondents' awareness of "the mobile Internet" was not specifically captured; data on the awareness of "the Internet" in general was captured instead.
Source: Teleuse@BOP3 survey data.

Table 2. Use of More-Than-Voice Services (% of BoP Teleusers Who Are Aware of Services).

	Bangladesh (n=262)	Pakistan (n=328)	India (n=466)	Sri Lanka (n=632)	Philippines (n=511)	Thailand (n=462)	Total sample (n=2,660)
Banking and financial	6	12	18	6	7	15	10
Payment	9	20	16	12	11	23	15
Government (local, state, or central)	7	8	4	8	8	2	7
Health	11	9	16	22	6	17	15
Participation in competitions, polls, or other live TV/radio programs	4	7	12	9	14	19	12
General information		17	17	8	11	37	20
Agricultural/fisheries information	5	7	4	3	7	7	5
Internet via mobile phone	0	1	0	2	12	6	4

Source: Teleuse@BOP3 survey data.

Table 3. Use of More-Than-Voice Services.

	More-than-voice users	Nonusers	Total sample
Sri Lanka	145	779	924
Philippines	63	737	800
Thailand	185	615	800
Total	393	2,131	2,524

Source: Teleuse@BOP3 survey data.

The data show that more-than-voice users at the BoP in Sri Lanka, the Philippines, and Thailand are likely to share the following characteristics:

- Be younger
- Have a relatively higher level of education;
- Belong to an upper-level socioeconomic classification group (SEC D) within the BoP;
- Be mobile phone owners (versus non-owner users);
- Have owned a mobile phone for a longer period than have the nonusers;
- Have used the Internet in the past, either through a mobile or a computer;
- Have a more phone-connected social network (i.e., a higher share of their top five contacts own phones);
- Have a television in the household; and
- Have access to electricity in the household;

Respondents were also asked to rate on a five-point scale how they perceived telephone access to have impacted 12 aspects[10] of their lives (where 1 indicated that *access had worsened* that particular aspect, and 5 indicated that *access had improved* it).

An index ranging from 12 to 60 was created by adding the responses to each of the above aspects. A higher value implies that the respondent perceives more benefit in terms of the 12 aspects already mentioned in using phones and vice versa.

Figure 1 illustrates the strong positive association between the perceived benefits and use of more-than-voice services at the BoP in the study countries. People who perceive higher levels of benefits of using phones have a higher tendency to use more-than-voice services. It is clear from the figure that, when the index value is less than 20, no use of more-than-voice services is observed, and a gradual increase in more-than-voice service use can be seen as the index value increases. Therefore, these data are seen as a valid proxy for the "performance expectancy" postulated by UTAUT.

Model and Findings

Based on the associations discussed in the previous section, our study presents a statistical model in this section that will help in understanding the nature of the relationship between an individual's characteristics and that person's use of more-than-voice services. Here, we take the individual's characteristics as independent variables and examine how these variables will explain the differences in more-than-voice service usage.

A logistic regression gives each independent variable a coefficient B_i that measures the predictor variable's contribution to variations in the dependent variable. The logistic model formula computes the probability of the selected response as a function of the values of the predictor variables.

To arrive at the probability, these coefficients should be applied to a logistic function; for example, if each independent variable $X_1, X_2, X_3 \ldots X_n$ has respective coefficients of $B_1, B_2, B_3 \ldots B_n$ and a constant of B_0, the probability of the event of interest Y happening is given by:

$$P(Y) = \frac{1}{1 + e^{-\sum_{i=0}^{n} B_i X_i}}$$

From each coefficient, a corresponding odds ratio is computed. The odds ratio is a way of presenting the probability of an event. The odds of an event happening indicate the probability that the event will happen, divided by the probability that the

10. The ability to earn more using the phone, or to save a certain expenditure; the ability to make more money (excluding airtime resale); the ability to make more money through airtime resale; the ability to find out about employment/work opportunities; the ability to access price or market information; the ability to save money; the ability to save on travel costs; the ability to act in an emergency; the ability to contact others in an emergency; the efficiency of day-

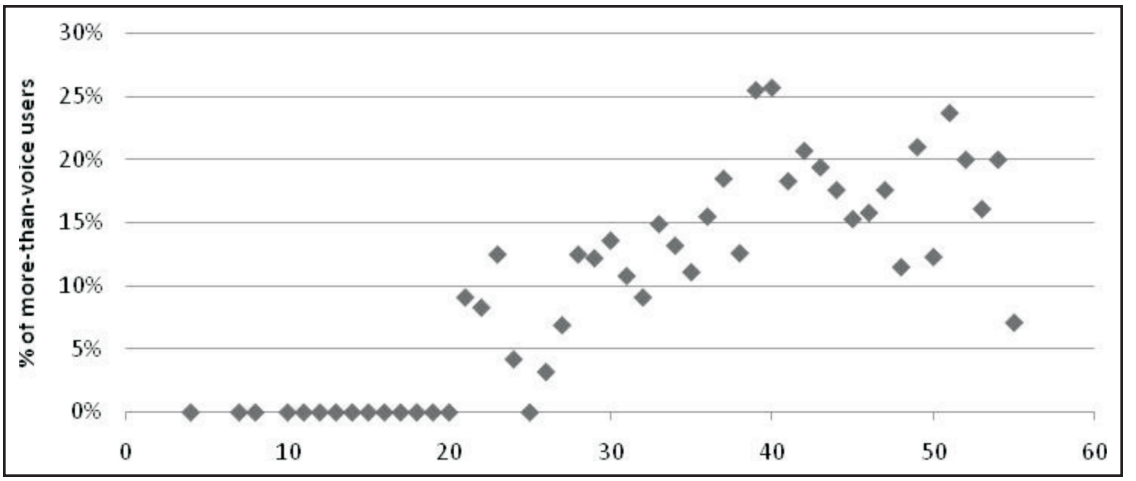

Figure 1. Scatter Plot of Perceived Benefits Index for BoP More-Than-Voice Service Users in Sri Lanka, the Philippines, and Thailand.

Source: Teleuse@BOP3 survey data.

Table 4. Summary of Variable Information.

Variable	Variable information
Age squared	Squared[a] value of respondent's age
Gender	0 = male, 1= female
Ln (monthly personal income)	Natural log of respondent's monthly personal income
Secondary education	0 = no, 1= yes
Tertiary education	0 = no, 1= yes
Walk time to nearest town	Value in minutes; proxy for ruralness of respondent's location
Internet through computers	Use of the Internet via a computer; 0 = no, 1 = yes
Number of phone-owning contacts	Number of closest five contacts who own a phone
Sum of perceived benefits	Index of perceived benefits ranging from 12–60
Duration of mobile ownership	Number of months respondent has owned a mobile; 0 if non-owner
Philippines	Country dummy for Philippines; 1 = respondent is from the Philippines, 0 = otherwise
Thailand	Country dummy for Thailand; 1 = respondent is from Thailand, 0 = otherwise
Constant	Constant

Note: a. The squared value of the respondent's age has a higher explanatory power than the respondent's age alone does.

event will not happen. The independent variables used in the model are explained in Table 4. The output of the model can be seen in Table 5. A P-value of *less than or equal to* 0.05 indicates statistical significance of the coefficient (and therefore, of the estimated relationship between that particular independent variable and the probability of more-than-voice adoption) within a 95% confidence interval.

The odds ratio implies that, for each unit increment of the independent variable, the odds of the concerned dependent variable (using more-than-voice services in this case) changes by a percentage of *odds ratio − 1,* given in Column 3 of Table 5.

to-day work; the respondent's relationships with family and friends; and the respondent's social status/recognition in the community.

Table 5. Logistic Regression Output.

	Coefficient (1)	Odds ratio (2)	Change in odds (%) (3)	P-value (4)
Age squared	−0.001	0.999	−0.1	0.09
Gender	−0.153	0.858	−14.2	0.04
Secondary education	0.242	1.274	27.4	0.00
Tertiary education	0.391	1.478	47.8	0.00
Walk time to nearest town	−0.012	0.988	−1.2	0.19
Internet through computers	1.958	7.085	608.5	0.00
Number of phone-owning contacts	0.164	1.180	17.8	0.00
Sum of perceived benefits	0.078	1.081	8.1	0.00
Duration of mobile ownership	0.013	1.013	1.3	0.02
Philippines	−1.789	0.167	−83.3	0.00
Thailand	−1.160	0.313	−68.7	0.00
Constant	−6.340	0.000	−100.0	0.00
n=2,524; Nagelkerke R-Square: 0.354				

Source: Authors.

The largest predictor of more-than-voice adoption is Internet use through computers; the odds of using more-than-voice services are more than 600% higher for mobile owners that use the Internet from a computer than those who don't, holding other variables constant. Education is the second largest contributor, with completion of tertiary education, as well as secondary education, leading to increases in the odds of more-than-voice use by 47.8% and 27.4%, respectively.

The next largest contributor to the probability of more-than-voice adoption is the number of the respondent's closest five contacts that own a mobile phone. For each additional mobile-owning contact within the respondent's closest five contacts, the odds of using more than voice services increases by 18%. Thus, compared to a mobile owner with no mobile-owning close contacts, one with all five of his closest contacts owning mobiles has 90% higher odds of using more-than-voice services.

Being a female is negatively associated with the odds of more-than-voice use, leading to a 14.2% reduction in the odds of more-than-voice use when compared to a male of similar characteristics.

A higher level of perceived benefits from using phones, as well as a longer period of mobile ownership are also significant, positive predictors of the probability of more-than-voice services, though only having small contributions to the associated change in odds. Age is a significant negative predictor of more-than-voice usage, though at a lower level of significance (90%), and also contributing only a small amount to the odds of more-than-voice use.

The country variables are significant, indicating that there are country-level effects that predict the probability of using more-than-voice services. These country-level effects would include cultural factors, overall infrastructure levels, and different policy environments, among others. The inclusion of country variables is necessary because the number of respondents using more-than-voice services is insufficient to perform the logistic regression separately for each country; therefore, the three were aggregated. The model captures the relationships between the independent and dependent variables common to all three countries, and the residual factors that are unique to certain countries are captured in the respective country dummy variable. Sri Lanka is used as a reference category; therefore, its country-level effects are captured in the constant.

Variables which were not significant predictors were how rural the respondent's location is—proxied by the time it takes the respondent to walk to the nearest town—and the natural log of the respondent's monthly personal income.[11]

11. The former variable appears in the logit regression output, the latter has been dropped out of the output altogether by the software, probably as its significance is even lower than the former.

Table 6. More-Than-Voice Use (% of BOP Teleusers).

	Sri Lanka (n=924)	Philippines (n=800)	Thailand (n=800)
More-than-voice service use	16	8	23

Source: Teleuse@BOP3 survey data.

Discussion of Findings

It should be noted that the results of the analysis confirm *correlation* between the independent and dependent variables, but cannot confirm *causality.*

According to Rogers' classification, the BoP more-than-voice service adopters (as a percentage of the entire sample) considered in the analysis fall into the *innovators, early adopters,* and *early majority* categories of adopters (i.e., falling within the first 34% of all adopters; see Table 6). The findings in Table 5 confirm that, as expected (based on prior research and theory), they are among the younger in age[12] and are more educated than current non-users, and in fact, are among the earlier adopters of mobile phones, too. Those who use the Internet through computers are also more likely to take up more-than-voice services, as would be expected, since these are the kinds of people who are already aware of the kinds of services available, have the necessary knowledge and skills to use the services, and already have some degree of trust in services provided over electronic networks.

It is expected that the duration of mobile ownership would proxy for some degree of technical efficacy (or the skills), as the latter would increase with the former; this is a significant factor in determining the odds of more-than-voice service usage.

The share of the respondent's closest five contacts that are also mobile owners also has an impact on more-than-voice service adoption. This suggests a kind of social influence exerted by these social networks (and consistent with the UTAUT model), indicating that social influence has an impact on the probability of using more-than-voice services. It is plausible that the relationship between the connectedness of the respondent's closest five contacts and the probability of more-than-voice use is a bidirectional one, given that causality cannot be confirmed with the current data. Phone-owning (predominantly mobile) members among the closest five contacts may be more likely to positively influence the respondent's use of more-than-voice services, while more-than-voice-using respondents may also influence those in their social networks to take up phone ownership. Intuitively, it seems like the former effect may be larger; however, it is not possible to confirm this with the current data. This social influence was also seen to affect the decision to adopt a mobile phone among the respondents in the current study by de Silva, Ratnadiwakara, and Zainudeen (the lead article in this special issue), though this variable had a larger contribution to the odds of mobile phone adoption than that of more-than-voice service use seen in this article. Put simply, a connected social network matters more when it comes to mobile phone adoption than it does for more-than-voice use.

This is an important finding, as it implies that even though it is the younger, more educated, more experienced-with-mobiles and more experienced-with-Internet segments who become more-than-voice users first, social influence can enable those in their sphere to similarly become users. In turn, the social influence among those new users can lead to those within their networks becoming connected, and so on. Social influence is thus an important channel through which the rest of the BoP can be carried into the market. Therefore, group or "affinity" marketing strategies (through group discounts, etc.) promoted by operators are likely to be useful ways to increase service diffusion.

Surprisingly, the data do not indicate that higher-income earners within the BoP are more likely to use more-than-voice services than are lower-income earners, despite the early adopters of new technologies having often been found to be among the higher-income groups (Ivatury & Mas, 2008).

The insignificance of the respondent's ruralness (proxied by the walking time from the respondent's house to the nearest town) indicates that whether

12. Though, as noted earlier, age only has a small impact in this case.

the respondent resides in a rural or urban location has no relationship with that person's probability of more-than-voice use. This indicates that, with respect to more-than-voice, rural BoP mobile users are as important a market segment as urban ones. This is a counterintuitive finding, given that rural incomes tend to be lower and infrastructure tends to be worse than it is in urban areas. These factors would be expected to reduce the probability of more-than-voice service use in rural areas.

It is also important to understand the barriers to greater use or adoption. Further qualitative investigation shows that most nonusers either feel that such services are not applicable to them, or they simply don't know how to use them. In addition, many feel that the pricing of these services is too high; many at the BoP top-up their prepaid credit in small amounts at a time and may not have sufficient credit available at any given time to engage in either a transaction or an Internet browsing session. Those who are aware of these services report that they do not use these services, as the same content can be obtained through cheaper alternatives (e.g., news or weather updates via TV, or even word of mouth). Innovations in pricing strategies are needed to enable prepaid users to make use of the services without their prepaid balance being depleted through a single transaction. Such innovations would be akin to the "sachet" pricing strategy, introduced in prepaid voice to enable low-denomination prepaid top-ups, which is a particular advantage for low-income users (see also Wishart, 2006).

Conclusions

Evidence that the developing world is connecting to the Internet through mobiles is mounting. The mobile phone offers an increasingly ubiquitous way to deliver information and services, and to transact with the BoP at lower costs and with affordable prices. Though use of such services at the BoP in emerging Asia is currently low, it is expected to grow with the supply of relevant services, increasing service affordability and uptake of data-enabled mobile phones, as well as with mobile broadband connections.

This article examined the factors predicting the adoption (or usage) of more-than-voice services among BoP mobile owners in emerging Asia. Awareness and use of these services in Bangladesh, Pakistan, and India are seen to be very low. Awareness of such services is seen to be relatively high in Sri Lanka, the Philippines, and Thailand; however, use in those countries is seen to be low, particularly regular use. The largest predictor is whether or not the mobile owner already uses the Internet through a PC; while this is a very strong predictor of more-than-voice usage, BoP Internet usage in developing countries does not seem to be growing fast enough to have any significant impact on the use of more-than-voice services at an overall level. Leaving education aside, the next largest predictor is the share of the respondent's closest five contacts that also own mobiles. This finding is important in that it implies that those mobile-owning contacts are likely to have influenced the user's uptake of more-than-voice services, too, a kind of social influence. While it is apparent that it is the younger, more educated, more experienced segments that are likely to become users first, the impact of social influence could be an important channel through which many current non-users at the BoP may be brought into the market, given appropriate pricing strategies that take into account the irregular income patterns among the poor.

The article also shows that the poorer segments of the BoP and the rural BoP are *as likely* to use more-than-voice services than are the less poor and urban segments, respectively. This suggests that the market is beginning to find ways to overcome the barriers or transaction costs of providing services beyond voice to these previously underserved segments. It indicates that the budget telecom network model (Samarajiva, 2009), which involved a series of technological and service process innovations by several South Asian mobile operators, enabling them to provide mobile voice service for as little as US$5 per month in 2007, may already have been extended into more-than-voice services.

Evidence as to the benefits of more-than-voice services remains unclear. Until the business models are worked out (allowing affordable access), and the services are taken up on a wide scale, it will be difficult to empirically assess them. However, based on the early assessments, it does seem likely that there are concrete benefits to providing such services, e.g., overcoming transaction costs of providing services to low-income, low-spending market segments. The usually low value of individual trans-

actions in this segment makes the prospect of engaging with such consumers unattractive, as do factors like the higher costs of rolling out services in rural areas, and so forth (Ivatury & Mas, 2008). If the services are relevant and priced appropriately, there could be great opportunity for consumers to benefit from the kinds of more-than-voice services that this article looks at.

Many governments have adopted policies and strategies to encourage the spread of broadband. Instead of focusing solely or primarily on desktop computers connected by wire guides, it now behooves all governments to consider mobile devices and networks as legitimate means of providing the benefits of broadband to citizens. The costs are lower than those of its alternatives, and the tasks of learning how to use the services associated with broadband are that much easier with these familiar devices. Governments should consider offering more nonvoice-based services over mobile networks, which offer the easiest way to reach large numbers of citizens quickly. This will also serve to increase the momentum of more-than-voice services being offered on this platform.

Policymakers should implement policies that will allow service providers to provide more-than-voice services at lower costs, for example, reducing or eliminating mobile-specific taxes, reducing the cost of backhaul, and making spectrum more easily available to operators (ITU, 2011). ■

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Appendix

Table A1. Characteristics of More-than-Voice Services Users in Sri Lanka, the Philippines and Thailand.

	% using more-than-voice services	Sample size	Pearson chi-Square	P-value	Significance of the difference
Age					
15–24	20.9%	762	42.223	0.000	Significant at 99.9%
25–34	16.9%	724			
35–49	12.7%	731			
50–60	6.2%	307			
Gender					
Male	14.8%	1,262	1.088	0.297	Not significant
Female	16.3%	1,262			
Education					
Secondary or lower	14.3%	2,211	20.623	0.000	Significant at 99.9%
Higher than secondary	24.3%	313			
Average daily Income					
Less than US$1 per day	16.3%	1,189	0.674	0.222	Not Significant
More than US$1 per day	15.1%	1,303			
Socioeconomic classification group					
SEC D	21.8%	1,213	69.974	0.000	Significant at 99.9%
SEC E	9.8%	1,311			
Employed					
Yes	14.3%	1,473	4.178	0.410	Not Significant
No	17.3%	1,051			
Urban/rural					
Urban	15.6%	1,188	0.000	0.998	Not Significant
Rural	15.6%	1,336			
Mobile phone ownership					
Own	19.0%	1,608	40.334	0.000	Significant at 99.9%
Don't own	9.5%	916			
Duration (in months) of mobile ownership					
Less than 6 months	9.7%	1,064	48.542	0.000	Significant at 99.9%
More than 6 months	19.9%	1,460			
Internet access through computer and/or mobile					
Yes	39.5%	483	261.142	0.000	Significant at 99.9%
No	9.9%	2,041			
Number of top five contacts that own a phone					
0	0.0%	7	46.613	0.000	Significant at 99.9%
1	5.6%	177			
2	8.8%	294			
3	12.5%	393			
4	12.4%	217			
5	19.6%	1,436			

Table A1. (Continued)

	% using more-than-voice services	Sample size	Pearson chi-Square	P-value	Significance of the difference
TV in houshold					
Yes	16.4%	2,279	12.607	0.000	Significant at 99.9%
No	7.8%	245			
Access to electricity in household					
Yes	15.9%	2,379	4.095	0.043	Significant at 95%
No	9.7%	145			

Source: Authors

Table A2. Country-wise Indication of Pearson Chi-squared Significance Test Results Presented in Table A1.

	Sri Lanka	Philippines	Thailand
Mobile phone ownership	**	**	**
Gender	..	*	*
Education	**	*	*
Urban-rural	..	..	**
Socioeconomic classification group	*	N/A	**
TV in household	..	..	*
Duration (in months) of mobile ownership	**	*	**
Number of top five contacts that own a phone	**	**	**
Access to electricity in household	..	..	..
Age	**	..	**
Employed	*	..	*
Internet access through computer and/or mobile	**	**	**
Daily Income	..	..	*

*Note: ** Differences significant at 95%; * differences significant at 90%; .. difference not significant.*

Table A3. Variables Tested and Found to be Insignificant.

Variable	Remarks
Access to electricity in household	0=no, 1=yes
Television in household	0=no, 1=yes