

# **Social Influence in Mobile Phone Adoption: Evidence from the Bottom of Pyramid in Emerging Asia<sup>1</sup>**

**Harsha de Silva<sup>2</sup> and Dimuthu Ratnadiwakara<sup>3,4</sup>**

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<sup>2</sup> Lead economist, LIRNEasia, Colombo, Sri Lanka. [harsha@lirneasia.net](mailto:harsha@lirneasia.net)

<sup>3</sup> Researcher, LIRNEasia, Colombo, Sri Lanka

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## **Abstract**

*This paper empirically considers the importance of various influencing factors in mobile phone adoption discussed in theory. Using data from a large sample survey among the bottom of the pyramid in Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand, the paper finds compelling evidence for significant social influence in the purchase of mobile phones by this population. This influence is assessed both from a 'social pressure' angle as well as a 'social benefit' angle to recognize the importance of adoption behavior of one's close network and the perceptions of benefits in one's own adoption. Evidence is also found to confirm the importance of perceived economic benefits in mobile adoption among this group even though such benefits are found to be closely tied with social benefits.*

## **1. Introduction**

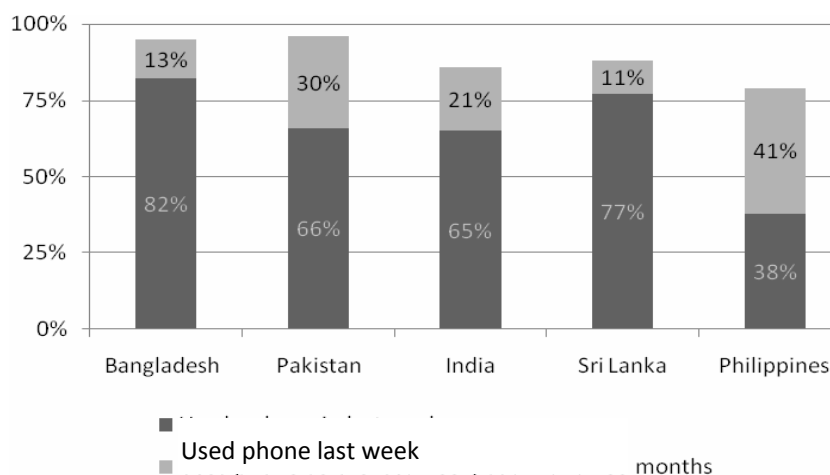
The phenomenal growth in phone adoption among the poor in emerging Asia has been getting wide publicity across the world. LIRNEasia, a regional information and communication technology (ICT) think tank, has been following (and also catalyzing) this unfolding story through its T@BOP (Teleuse at the Bottom of the Pyramid) research series.<sup>6,7</sup> The third in this series, consisting of a large survey among the poor across Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand in late 2008 has been able to establish that the vast majority of the poor in these countries now have affordable access to telephony (mainly via mobile phones). Figure 1 depicts BOP with access to a phone (whether owned or not) in this region.

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<sup>6</sup> See [www.lirneasis.net](http://www.lirneasis.net) for more information.

<sup>7</sup> Teleuse at the bottom of the pyramid, or Teleuse@BOP, pioneered by LIRNEasia in 2005, is a unique series of demand-side studies on ICT use among the BOP. It is among the first large regional studies to assess demand for ICT services among emerging Asia's BOP in a systematic way. T@BOP studies have proved useful in making governments understand the significance of telecom, especially mobile, at the BOP. Its findings have contributed inter alia to debates on universal service policies, on taxation and even on registration of phones for security purposes. Results have also been used by industry to better understand and design products and services for the BOP. <http://lirneasia.net/projects/2008-2010/bop-teleuse-3/>

**Figure 1: Phone use by the BOP<sup>8</sup>**



It is noteworthy that this process of access provision to hundreds of millions of poor is taking place under low and declining average revenue per user (ARPU) scenarios in every country in the region at some of the lowest tariffs in the world, by companies that continue to be profitable.<sup>9</sup> Samarajiva (2008) has explained this phenomenon, from a supply-side angle, as a "budget telecom model" where service providers under hostile external conditions, low purchasing power and pressure from disruptive competitors, have implemented innovating processes; technical, marketing, acquisition, customer service etc. to exploit long-tail markets.<sup>10</sup>

Quite apart from attempting to understand this extraordinary activity, many have been studying the resulting impact of phone adoption at various levels of society. From primarily a macroeconomic perspective, studies ranging in time from Hardy (1980) to Waverman, Meschi and Fuss (2005) to the recent Kathuria et al. (2009) have demonstrated the significant impact of telecommunication services on economic growth and development. For instance the recent Kathuria et al (2009) study points to a 10 percent increase in mobile penetration in India translating in to 1.2 percent annual increase in output. Many of these studies are naturally cited as evidence to push for policy and regulatory reforms in the sector to help further increase telephone penetration. In contrast to these supply-side macroeconomic studies, others like Donner (2006), Jensen (2007), Abraham (2007), Aker (2008), de Silva and Ratnadiwakara (2008) among others have used demand-side approaches to look at, in varying degrees of sophistication,

<sup>8</sup> Thailand not included.

<sup>9</sup> <http://expandinghorizons.nokia.com/issues/?issue=ExpandingHorizonsQ12009>. This study looks at not only tariffs, but a composite of tariffs, cost of handset (as lowest cost Nokia handset depreciated over 36 months) and all applicable taxes.

<sup>10</sup> Also in <http://expandinghorizons.nokia.com/issues/?issue=ExpandingHorizonsQ42008>

the microeconomic impacts of mobile phones; be it among farmers, fishermen or small businesspeople. These studies have mainly focused on efficiency increases; how mobile phones can reduce information search costs leading to lower transaction costs. This genre of work is being used to convince operators to appreciate the win-win benefits of providing services to poor masses who are engaged in such occupations. A recent IDRC (2009) scoping study on ICT for rural livelihoods across Asia and Pacific has documented scores of on-going mobile-centric interventions aimed at reducing information asymmetries among this population. Then there are demand-side studies that have focused on user perceptions. For instance, de Silva and Zainudeen (2007) use a large sample-survey to analyze perceived economic benefits of direct access to (mobile) phones among the poor in emerging Asia and signal caution on overestimation on anecdotal evidence. They find actual user perceptions of economic (business) benefits via direct access to (mobile) phones cannot be interpreted in a straightforward manner.<sup>11</sup> Moving beyond pure economics, others like Bayes et al. (1999), Goodman (2005), Frost and Sullivan (2006) and Kwaku and Kweku (2006) have shown how mobile phone adoption leads to greater social cohesion and improved social relationships. In their emerging Asia work, de Silva and Zainudeen (2008) provide evidence from a user perspective how important the poor themselves view direct access to phones is in improving their social relations and status.<sup>12</sup> While voice and SMS services drive improvements in social relations for the most part, the emerging press on the growth of mobile phone based social-networking in the developing world goes to show the growing importance of this aspect.<sup>13</sup> The other major area of influence that has been documented by many, for instance Frost and Sullivan (2006), is the feeling of security that a mobile phone provides the owner. Katz and Aakhus (2001) have shown that safety is the primary motive for women to acquire a mobile phone (in Rice & Katz, 2003). De Silva and Zainudeen (2008) have reiterated that perceptions on the ability to act in an emergency as being a very significant benefit of direct access to a (mobile) phone in their emerging Asia work.

In this context it is clear that adoption (and subsequent use) of a mobile telephone will have significant benefits not just to the user but to the community at large. The next question is about the actual levels of mobile adoption at the BOP in the selected emerging Asian countries.

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<sup>11</sup> Mpogole et al. (2009) find evidence from Tanzania to support the de Silva and Zainudeen (2007) argument.

<sup>12</sup> On a scale of 1 to 5 with 1 worsened, 3 no change and 5 improved, the scores for the five countries were: Pakistan 4.3; India 4.14; Sri Lanka 4.35; Philippines 4.45 and Thailand 4.66.

<sup>13</sup> A recent (2009) survey by BuzzCity, a large mobile social networking service provider, has some interesting developing country results of its use patterns at <http://www.buzzcity.com/l/reports/WhoUsestheMobileInternet08.pdf>

While there are frequent updates on national regulator websites on new connections made, they do not breakdown the aggregate number by purchaser: rich, poor; male, female; urban, rural; resident, visitor; etc. The perennial problem of overestimation due to multiple SIM card use continues to be an issue in estimating unique-adoption (Kalba, 2008). Therefore, the only way to obtain meaningful disaggregated data at the user-level is via surveys, be it through large household surveys by national statistics offices (NSO) or by smaller ones by research organizations. Given the lack of comprehensive NSO data, sample surveys like the ones conducted by LIRNEasia in emerging Asia, by RIA<sup>14</sup> in Africa and by DIRSI<sup>15</sup> in South America, have become valuable sources of information on actual adoption of mobile phones in those regions.<sup>16, 17</sup> Adoption itself can be categorized in to levels. Notwithstanding various case studies that indicate growing mobile Internet use among the poor, for instance in Donner and Giatu (2009), in Cape Town, South Africa, broader demand-side surveys (like LIRNEasia, 2009) show that most BOP users, at least in emerging Asia, are still in what we refer to as the mobile 1.0 mode, where the phone is being used by and large to make or receive phone calls, 'missed calls' or short messages services (SMS).<sup>18</sup> This is important in the context that mobile phones are in fact expected to become the best platform to bring poor people affordably in to the information society; the mobile 2.0 narrative.<sup>19</sup>

In this context, the objective of this paper is to examine, from a user-perspective, the various influences and the interplay of these influences on mobile phone adoption by the BOP in

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<sup>14</sup> Research ICT Africa (RIA) is an IDRC supported network of universities and research institutions from 19 African countries hosted at The EDGE institute, Johannesburg, South Africa.

<sup>15</sup> Dialogo Regional sobre Sociedad de la Infomacion (DIRSI) is an IDRC supported network of professionals and academic institutions working on ICT issues in Latin America and the Caribbean.

<sup>16</sup> International Development Research Centre (IDRC), Canada, has been the primary source of funds for this work across the three continents.

<sup>17</sup> For instance the difference in the urban rural break down of mobile adoption in India where LIRNEasia demand-side data indicate a much smaller divide than the one estimated using supply side (regulator) data is an important issue with wide-ranging policy implications on universal service obligations.

<sup>18</sup> LIRNEasia (2009) finds that among mobile phone owners for India, for instance, 99% use the phone for receiving and/or making voice calls; 84% for 'missed calls'; and 33% for SMS, all mobile 1.0 services. The adoption percentages for emerging mobile 2.0 services such as listening to music downloaded or sent by others is only 3% or browsing the internet 1%.

<sup>19</sup> Mobiles are increasingly becoming payment devices that can also send, process and receive voice, text as well as images; in the next few years they will also be capable of information-retrieval and publishing functions normally associated with the Internet. Through such services and applications, industry experts predict that many in emerging markets will experience the Internet, or 'elements' of the Internet for the first time through a mobile phone, rather than a PC; mobile payments, mobile social networking, SMS voting are just a few examples of some of these services and applications, that is referred to as mobile 2.0 (LIRNEasia)

Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand. It is hoped that the findings will help policy makers, regulators, operators and other stakeholders in the industry in their endeavors to connect the still unconnected hundreds of millions in the region and also help move forward the mobile 2.0 story. The rest of the paper is structured as follows. Section 2 discusses mobile adoption from both a theoretical and an empirical perspective. Section 3 provides a brief background to the T@BOP3 methodology and presents some descriptive statistics. In section 4 we develop the statistical model and in section 5 discuss the findings. Section 6 links the empirical findings to theory and finally concludes.

## **2. Mobile Phone Adoption: Brief Theoretical and Empirical Background**

### **Theoretical background**

Many approaches have been used by researchers to understand technology adoption in general and mobile phone adoption in particular. Pedersen and Ling (2002) find that even though technology adoption is studied by researchers of different traditions, (economics, sociology, marketing, technology etc.) they often use methodology of one tradition while applying theoretical perspectives of another. In this background, they categorize the literature in to three schools of thoughts; diffusion, adoption and domestication. Pedersen (2005) explains diffusion research as describing the adoption process as an S-shaped function of time that may be used to group adopters of different kinds (Rogers, 2003, Kiljander, 2004); domestication research as looking at adoption and use of technology in everyday life with a focus on the social, cultural, political and economic consequences (Silverstone and Haddon, 1996); and adoption research as explaining adoption decision of individuals by applying cognitive and social theories of decision making (Davis, 1989; Fishbein and Ajzen, 1975).

Building primarily on adoption and domestication schools of thought, Van Biljon and Kotze (2008) expand existing frameworks to explain mobile adoption from a wider perspective. This approach contextualizes mobile phone adoption in a multi-dimensional setting, say, in terms of socio-cultural-gender-income as well as perceived technology usefulness and ease of use. As background to the Van Biljon and Kotze (2008) model, we begin with perhaps the most influential model of technology adoption research, the technology acceptance model (TAM) originally proposed by Davis (1989). The TAM is an adaptation of the theory of reasoned action (TRA) developed by Fishbein and Azjen (1975) using attitude and subjective norms as the two factors that affect behavioral intentions.<sup>20</sup> Davis (1989), Davies et al. (1989) conceptualize TAM as focusing on the attitudinal explanations of intention to use a specific technology or service encompassing six concepts; external variables, perceived usefulness, perceived ease of use, attitudes towards use, intention to use and actual use.<sup>21</sup> While this model is able to explain adoption well from a technical perspective, Malhotra and Galletta (1999) identify the lack of explicit accounting of social influences affecting adoption as a limitation in the TAM. In this background, Venkatesh et al. (2003) in an attempt to overcome this restriction developed a new model called the unified theory of acceptance and use of technology (UTAUT) to adoption.

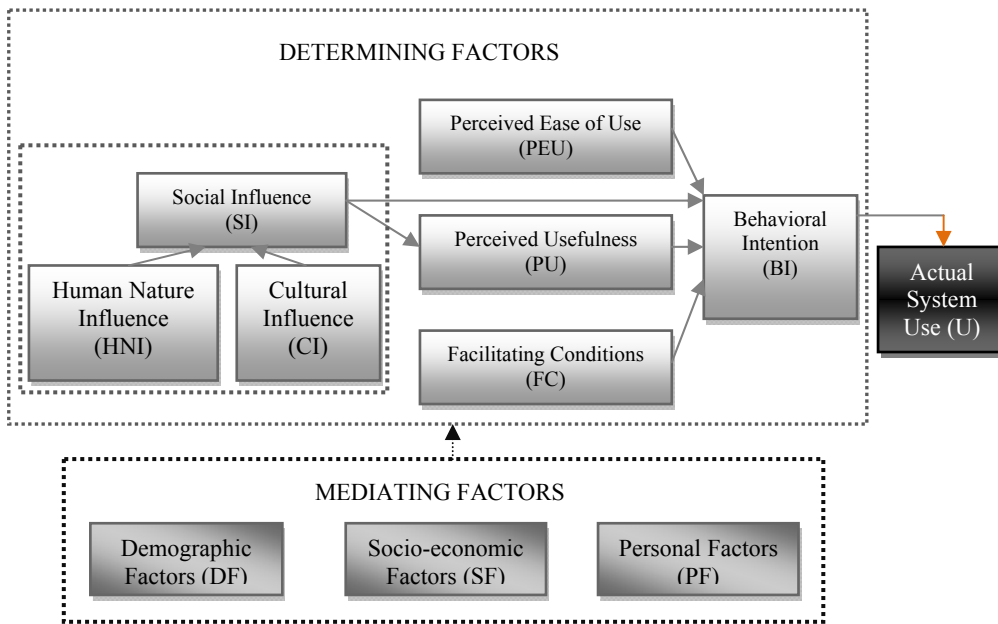
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<sup>20</sup> TRA is a very general model that analyses behavioral intentions; as evidenced by Azjen and Fishbein (1980) where they explain that TRA is "designed to explain virtually every human behavior".

<sup>21</sup> Although the TAM is mainly applied to explaining the adoption of technology within organizations, the constructs of the model are meant to be fairly general (Davis et al., 1989)

According to UTAUT, social influences play an important role along with (the earlier) determining factors of expectations of performance and effort while mediating factors such as gender, age, experience, and the degree to which use of the innovation is perceived as being of free will (voluntariness) play a roles in driving usage intention and actual use of technology (Venkatesh et al, 2003). Van Biljon and Kotze (2008), keeping in place the determining and mediating factor framework of UTAUT, extend the model further by incorporating cultural aspects to gain even greater insights in to mobile phone adoption. The diagrammatic form of Van Biljon and Kotze (2008) model is presented in Figure 2.

**Figure 2: Van Biljon and Kotze model for Mobile Adoption**



Source: Van Biljon and Kotze (2008)

This model has a number of determining factors that form the basic construct influencing mobile phone adoption and use. Social influence is expressed as the pressure exerted on the individual by the opinions of others. This encompasses human nature influences or basic motivational needs that all humans have, i.e., inherited and cultural influences that are defined as learned culturalized needs. Facilitating conditions or the necessary infrastructure, perceived usefulness or the extent to which a user believes that he or she will benefit from using the mobile phone and perceived ease of use drive behavioral intention. Besides the determining factors the model contains a set of mediating factors that influence the determining factors; say a person finds it beneficial to use a mobile phone (determining factor; perceived usefulness) but lack of income (mediating factor) could hold back adoption. As such, mediating factors the model identified are; personal factors like preference and beliefs about mobile phones, including image,



demographic factors like age, gender, education etc. and socio-economic factors such as occupation and income. The model postulates that actual adoption and use is the final outcome of the interplay of the mediating and determining factors as depicted by the arrows.

### **Empirical Background**

While some researchers have been concentrating on theorizing technology adoption as discussed in the preceding section others have been focusing on empirical models to explain technology adoption by fitting mathematical models to the data. The widely cited Rice and Katz (2003) paper and the recent Chabossou, Stork et al. (2009) paper are but two of numerous papers approaching the question from such an angle. While these models are not necessarily used to explain a situation they are most useful in predicting behavior.

There are many ways in which data can be modeled, but at the outset, it must be noted that linear regression models are not appropriate for modeling adoption as the depended variable of adopting or not adopting, is dichotomous; thus, logit or probit models which use exponential functions that give a dependent variable between 0 and 1 explaining the state of adoption are generally used. Rice and Katz (2003), based on a nationally representative (adult) sample of 1,800 in the United States, used a logistic regression model to explain three types of digital divides in phone and internet use; owner vs. non-owner divide, veteran vs. recent divide and continuing vs. dropout divide. The paper demonstrated that the factors that influence each of these three kinds of Internet and mobile phone divides were not the same. For instance, compared to users, Internet non-users were found to be mainly older, female, having lower income, less educated, slightly disproportionately African-American, with no children, working full-time and belonging to fewer community organizations. Compared to mobile phone users, non-users were found to have lower income, less education, more likely to be never married, not have children, not working full-time and belong to fewer community organization. Chabossou et al. (2009) used a probit model to analyse factors that contribute to the probability of an individual adopting mobile telephony based on a 22,000 respondent study that is nationally representative across 17 countries in Africa.<sup>22</sup> This paper showed income and education vastly enhances mobile adoption in this group of countries, but gender, age and membership in social networks have little impact. The last finding is interesting from the theoretical construct of earlier analyzed adoption models

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<sup>22</sup> This study was conducted by RIA. The 17 countries were: Benin, Botswana, Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda and Zambia. We are aware of the significant logistics and security difficulties faced in completing this unique study and are thankful for their attempts to shed light on this important subject area.

including Van Biljon and Kotze (2008) where social (including cultural) influence is an important determining factor, which perhaps Chabassou et al (2009) implicitly attempted to measure with the social networks variable.

The debate on the social pressure and impact on mobile adoption as separate from economic pressures and benefits has been going on for a long time; for instance (Rogers, 1993) and impact (Davis, 1993). But the debate is taking a new twist with adoption in developing country scenarios where mobile phones are seen as a way out of poverty.<sup>23</sup> In this context, in an interesting essay Donner (2009) criticizes over-emphasis of the development angle of mobile phone adoption by questioning how the value of social calls (implicit here is the existence of a social network with phone to make calls) can be ignored when evaluating the drivers of demand; i.e., "though people might be willing to adopt a mobile, and to use it in ways which eventually will be beneficial to them in a development sense, the reasons many of them will do so will likely have little to do with these development outcomes." There are two interrelated issues here. One is the benefits of mobile phone adoption from a social angle: described in Van Biljon and Katze (2008) as perceived usefulness; as benefits measured by social relations in de Silva and Zainudeen (2008); or "blurred" social and business benefits implied by Donner (2009). The other issue not explicitly stated is the societal pressure applied by social or "blurred" social and business networks towards mobile adoption.

### **3. Methodology, Data and Descriptive Statistics**

The data for this paper is from LIRNEasia's T@BOP3 representative survey of poor telephone users in Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand during September-October 2008. Given there are many ways to define 'poor' our T@BOP series has always used the socioeconomic classification (SEC) frequently used in market research. The benefit of using such a common categorization is that it allows for meaningful cross-country and time series (our own studies) comparisons. SEC segments people to groups A to E based on the education and occupational status of the chief wage earner of a household. For instance in Sri Lanka a professional with post-graduate qualifications will be classified as A1 while an industrial worker with ordinary level qualification (ten years of school) will fall in to D and an unskilled

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<sup>23</sup> Nobel Laureate Professor Muhammad Yunus told the author that mobile phones were going to change the world as we knew it. "We have not seen the real power of the technology yet" he said, and added that a "digital genie" will appear from the "Aladdin's lamp" (mobile phone) to "empower the poor". [http://www.youtube.com/watch?v=9O4BvXG\\_btI](http://www.youtube.com/watch?v=9O4BvXG_btI)

agricultural worker to E.<sup>24</sup> For the purposes of this study, the 'top and middle of the pyramid' was defined as SEC groups A, B and C, while the 'bottom of the pyramid' was defined as SEC groups D and E. In terms of age, males and females between 15 to 60 years were considered. Table 1 provides a comparison of national statistics with SEC D and E to illustrate the compatibility of our criteria with the widely used USD 2 per day lower limit generally employed by various international agencies to define poverty. This shows that our sample as a percentage of population is very similar to less than USD 2/day percentage for Bangladesh, Sri Lanka, Philippines and Thailand, while being smaller than the USD 2/day group in Pakistan and India.

**Table 1: SEC classification vs. less than USD 2 per day criteria by country\***

Percent (%) population	BN	PK	IN	LK	PH	TH
SEC D+E**	73	59	69	44	38	33
< USD 2/day	78	85	86	45	40	28

\*Bangladesh (BN); Pakistan (PK); India (IN); Sri Lanka (LK) and Thailand (TH)

\*\* Only SEC E in Philippines (PH)

The survey consisted of a quantitative module and a qualitative module.<sup>25</sup> The quantitative model was made up of 9,540 face-to face interviews among those who had used a telephone (not necessarily owned) in the previous three months (tele-user).<sup>26</sup> A structured questionnaire, pilot tested in all six countries, was employed to elicit answers from respondents at an interview that approximately lasted 40 minutes. In addition, a diary (log sheet) was placed among slightly more than half the sample (to obtain a 50 percent success rate) in which the users were requested to record their phone usage for a period of one week.<sup>27</sup>

A multi-stage stratified cluster sampling by probability proportionate to size (PPS) technique was used to select the target number of urban and rural centers. After determining the

<sup>24</sup> For the most part the classifications are similar across countries even though there are some country-specific criteria with little impact on the profile of the target population. In Philippines only SEC E was used due to the inconsistency in the SEC D and E proportions and less than USD 2 per day definition; SEC E proportion is more in line with the less than USD 2 per day definition.

<sup>25</sup> The fieldwork for the quantitative study was carried out by The Nielsen Company in all six countries. The qualitative study was undertaken jointly with CKS Consulting (Bangalore, India) in the same six countries.

<sup>26</sup> Phone use in the previous three months included making or receiving a telephone call (but not SMS) on any phone whether owned or not.

<sup>27</sup> The diary technique while not being perfect is a work-around given almost all BOP owners are pre-paid subscribers without any monthly bills to distinguish the calls made while non-owner users used phones of others; friends, relations, public phones, etc and had no records of use. We used a similar technique for T@BOP2 in 2006 and used learning from it to improve the diary for T@BOP3. The success rate exceeded expectations and the data quality was acceptable for the most part.

number of centers to be selected from each cell (strata in respective provinces) urban and rural areas were selected; again using PPS on a constant population interval on geographically ordered centers within each cell. In each selected centre, a common place such as a road, park or hospital was designated as the starting point for contacting households using either the right-hand-rule or the left-hand-rule. Only one respondent was selected from each household. In households with more than one valid respondent, a Kish grid (random number chart) was used to select the respondent. Within each country, data was weighted by gender, province group (or zone) and urban rural proportions to correct over- or under-sampling in certain areas and socioeconomic groups. An additional purposive sample of migrants was also interviewed to understand the aspects unique to them.<sup>28</sup> An overview of the sample size and composition is given in Table 2.

**Table 2: Sample size and composition**

	All BOP	Urban BOP	Rural BOP	Margin of error @ 95% CL (%)
Bangladesh	2,050	1,719	331	3%
Pakistan	1,814	899	915	2%
India	3,152	773	2,379	2%
Sri Lanka	924	320	604	3%
Philippines	800	468	332	4%
Thailand	800	400	400	4%
<b>Total</b>	<b>9,540</b>	<b>4,579</b>	<b>4,961</b>	

The qualitative module consisted of 60 protocols in the six countries (not equally distributed) consisting of respondent mini-ethnographies, home visits cum media mapping exercises and focus group discussions. The respondent mini ethnographies involved the respondent self documenting a slice of his or her daily routine; 3 hours roughly, using a camera to click photographs that would throw light on his or her lifestyle, livelihood and mobile phone use.<sup>29</sup> Home-visits involved in-depth discussions with respondents at their own homes to explore their use of telephones. Here the focus was to understand the communication needs in the context of social and business networks of the respondents to understand their coordinating of personal or business related tasks. The group discussions were aimed at obtaining their perceptions on mobile 2.0 services and to understand the high level usage patterns of mobile phones amongst this section of society.

<sup>28</sup> However analysis of the special migrant sample is not included in this paper.

<sup>29</sup> Some respondents were unable to click on their own. In such cases the researcher took the requested photographs.



#### **4. Statistical Model for Mobile Phone Adoption**

##### **Logit model for mobile adoption**

Based on the earlier theoretical construct, this section develops a statistical model to assess factors that contribute towards the probability of an individual adopting a mobile telephone. As mentioned earlier typical techniques to model mobile adoption (dichotomous variable) are logit, probit or discriminant analysis models.<sup>30</sup> While discriminant analysis classifies a set of observations into predefined classes, the logit and probit models estimate the probability of a discrete outcome given the values of independent variables used to explain the outcome. The probit model, which is based on the assumption of normally distributed error terms, estimates the probability that the condition is satisfied (i.e. will adopt a mobile phone) given the values of independent variables. However, as pointed out by Chabassou (2009) the validity of the assumption about the error term is arbitrary and cannot be tested, bringing in a complex set of conditions to interpret the results.<sup>31</sup> The logit model is identical, except that it is based on the logistic distribution of error terms rather than a normal distribution. The logit model assumes that the underlying variables that predict the probability of mobile adoption are random variables. In this background, we use a logit model to assess the factors that impact the adoption of mobile phones.<sup>32</sup> Having discussed the technical reasoning for using a logit model it is now necessary to understand the link between the theoretical and the statistical models. What we propose to do is to use the Van Biljon and Kotze (2008) construct as the theoretical framework to interpret the results from our statistical model. This follows similar attempts by others; for instance Kwon and Chidambaram (2000) where they used the TAM framework base their empirical study on mobile phone adoption in Hawaii.

The Van Biljon and Kotze (2008) model explains that the actual adoption and use of mobile phones will be the result of the complex interplay among a number of factors; within the determining and mediating categories. For instance certain demographic factors may impact social influences that in turn may influence perceptions on usefulness leading to influencing behavioral intention which may finally translate in to adoption. In reality, these factors are

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<sup>30</sup> See for instance (Maddala, 1983; Goumieroux, 1986) in Chabassou et al. (2009)

<sup>31</sup> "This implies that coefficients cannot be interpreted directly since they are influenced by the necessary assumptions. Changing the assumptions about the error term changes the values of the coefficients uniformly (Long, 2006), but it does not affect the probability of an event occurring. It affects the spread of the distribution but not the proportion of the distribution above or below the threshold (Long, 2006)" in Chabassou (2009).

<sup>32</sup> For purposes of parameter estimation, logit and probit models have been shown to be more robust than Discriminate Analysis (Andrew, 1986). Also odds ratio in logit models makes the logit model easier to interpret compared to probit models.

different for each individual and cannot be observed. What can be observed is whether a person simply has a mobile phone or not. Chabassou et al. (2009) explain the reality well when they say "One individual might neither be able to afford nor be interested in a mobile phone while another might just be close to getting one and still saving money towards it. For both individuals it can only be observed that they do not have a mobile phone." The process leading to the adoption decision is unobservable and the factors used to model the adoption decision are referred to as the determining and mediating factors. Probit or logit models tie the determining and mediating factors to the latent variable (i.e. mobile adoption) though contributions to the probability of the latent variable taking a value above or below a threshold that would lead to the observable outcome; here, adoption or not (Chabassou et al., 2009). Therefore, the logit model assigns a probability of adoption of mobile phones based on the various determining and mediating factors postulated in the theoretical model. LIRNEasia T@BOP3 research happened independently of the Van Biljon and Kotze (2008) work and only subsequently we have attempted to link the two. This has naturally created some gaps in the overlap which will be discussed later.<sup>33</sup>

The general formula of the logit model is:

$$Probability(Y) = \frac{1}{1 + \exp(-\alpha - \sum_{i=1}^n \beta_i X_i)}$$

Where Y is the probability of mobile adoption and  $X_i$  are the factors that impact such adoption; also referred to as determining and mediating factors or influential factors.  $\beta_i$  values are factor sensitivities of each influential factor,  $X_i$ . The Y variable (mobile adoption) is, as explained before, a dichotomous variable and takes the value 1 if the respondent owns a phone and 0 if the respondent does not. Influential factors,  $X_i$ , can be quantitative or qualitative variables; dummy variables are used to represent the 'states' in case of qualitative variables. The influential variables,  $X_i$ , used in the study are given below in the Table 3.

**Table 3: Influential Variables for the Mobile Adoption Model**

Variable	Expected sign	Remarks ( <i>Van Biljon and Kotze model factor</i> )
Gender		Male =0; Female =1. Expect no gender difference. ( <i>demographic</i> )
Age squared <sup>34</sup>	-	Usually technology is adopted faster by younger people.

<sup>33</sup> For instance we have no way to assess the perceived ease of use factor as our questionnaire did not have questions to assess the same. However, we have been able to assign questions from our questionnaire to address most of the other factors.

<sup>34</sup> Age<sup>2</sup> has a higher explanatory power compared to Age.

		<i>(demographic)</i>
Ln(monthly personal income) <sup>35</sup>	+	Natural log of the monthly personal income. Lack of income is key barrier for adoption. <i>(socioeconomic)</i> .
Primary Education		Yes = 1; No=0 <i>(demographic factor)</i>
Secondary Education		Yes = 1; No=0 <i>(demographic factor)</i>
Tertiary Education		Yes = 1; No=0 <i>(demographic factor)</i>
Number of top five contacts having a mobile phone	+	The more people in one's close network having phones, greater will be the social (social-economic-business) pressure to adopt. <i>(social influence; social pressure)</i>
Emergency Perceived Benefits Index (PBI)	+	Phone enables emergency communication. <i>(perceived (safety) usefulness and/or personal factor)</i>
Social PBI	+	Phone helps maintain and improve social relationships <i>(perceived (social) usefulness and/or personal factor)</i>
Economic PBI	+	Phone brings economic benefits through lower transactions costs such as less need to travel to obtain business information <i>(perceived (economic) usefulness and/or personal factor)</i>
Access to a fixed phone	-	Yes = 1; No=0; Mobile phones are substitute for fixed phones at the BOP. <i>(facilitating condition)</i>
Walk time to the nearest town	-	Proxy for urban and rural. Rural adoption is lower than urban. <i>(demographic factor)</i>
Access to electricity	+	Yes = 1; No=0; Electricity as a facilitating condition for mobile adoption <i>(facilitating condition)</i>

*Table 3 continues on next page*

*Table 3 (Continued): Mobile adopters vs. non-adopters*

Variable	Expected sign	Remarks <i>(Van Biljon and Kotze model factor)</i>
Television in household		Yes = 1; No=0; Impact of having a television in household on mobile adoption <i>(socioeconomic factor)</i>
Radio in household		Yes = 1; No=0; impact of having a radio in household

<sup>35</sup> Natural log of monthly income better explains the impact of monthly income on the mobile adoption.



		on mobile adoption ( <i>socioeconomic factor</i> )
Pakistan		Country dummy for Pakistan
Sri Lanka		Country dummy for Sri Lanka
Thailand		Country dummy for Thailand
Bangladesh		Country dummy for Bangladesh
Philippines		Country dummy for Philippines
Constant		

The influential variables are self explanatory and the expected signs are logical. Country dummies capture the unique characteristics in each country such as culture, perception, different needs etc. The characteristics unique to India are captured in the constant. The variable "percentage of top five contacts having a mobile phone" and the emergency, social and economic perceived benefit indices are new; and explained below.

Understanding social influence or social pressure in technology adoption has a long history. For example the original Fishbein and Ajzen (1975) theory of reasoned action (TRA) model postulated that subjective norms that encompassed social pressure influenced behavioral intentions. Even though the technology acceptance model (TAM) did not account for social influences explicitly, others, for instance Malhotra and Galletta (1999), found that to be a limitation of the TAM resulting in the unified theory of acceptance and use of technology (UTAUT) model of Venkatesh et al. (2003) placing social influence as a key construct that determine usage intention and behavior. Van Biljon and Kotze (2008) innovate further by segmenting social influence in to human nature influences (inherited) and cultural (learned) influences. At an empirical level, Rice and Katz (2003) implicitly examining this phenomenon in explaining digital divides do not find that belonging to various social groups; religious, leisure and community as having any uniform influence on adoption and use of mobile phones and Internet. Sometimes membership in particular social groups has a positively influence, but other times it does not. Similarly, Chabassou et al. (2009) in their model also attempt to implicitly assess the importance of this factor by including a variable of whether respondents belonged to any "social network" such as church groups and sports clubs or not. They found that belonging to social networks contributed positively to the probability of mobile adoption in seven of the seventeen and found no impact in the others.

How does the social pressure really impact adoption? Chen and Sutano (2007) have proposed that "social coercion, social imitation and social normalization" as the key contributing processes which social pressure is applied. Others have also explained this process (Segrest et al., 1998; Chen and Wong, 2003). In the Harvard Business Review 20 breaking ideas for 2009,

Goldstein (2009) explaining how to harness social pressure, shows that people are much more likely to adopt if others who are like them also adopt. This, we believe, has direct relevance to the way in which social pressure may impact mobile phone adoption in the BOP in the emerging Asia region as well. Therefore, the question is how to model the impact of a person adopting when 'others like him or her' also adopt.

In this background, we take an innovative approach to attempt to capture this complex social influence factor. Instead of the previously used membership in social or community group type measure, we use a new measure; the number of people in the respondent's closest circle of contacts (friends, family, business contacts etc) that already has mobile phones. We postulate that if more people in one's circle have mobile phones, then the social influence or social pressure towards his or her adopting will also be more. That is why the expected sign for "percentage of top five contacts having a mobile phone" is positive.

The other innovative feature of our work is the attempt to disaggregate and capture the perceived emergency, social and economic benefits of mobile adoption. Perceived usefulness has been at the base of technology adoption models since the early days of TAM where Davis (1989) defined perceived usefulness as the extent to which a person believes using the system can enhance his or her job performance (the original paper was for technology adoption in organizations) later generalized to mobile adoption by others (Kwon and Chidambaram, 2000; Kleijnen et al., 2004). Following this logic, Van Biljon and Kotze (2008) place perceived usefulness at the centre of their model; the extent to which the user believes that he or she will benefit from using a mobile phone. The model also refers to user's beliefs on the benefits of mobile phone (including, inter alia, image and trust) under personal factors. Once again, we consider an alternate approach to the previous models and disaggregate perceived benefits of mobile phone adoption in to emergency (or safety), social and economic-business categories. We requested respondents to evaluate eleven aspects belonging to the three groups on a Likert scale of 1 to 5; with 1 indicating the phone worsening that particular aspect for the respondent, 3 no change, 4 somewhat improved and 5 indicating that it had improved. The categorization is given in Table 4.

**Table 4: Perceived Benefits**

Category	Disaggregated benefit aspects
Emergency	<ol style="list-style-type: none"> <li>1. Ability to act in an emergency</li> <li>2. Ability to contact others in an emergency</li> </ol>
Social	<ol style="list-style-type: none"> <li>1. Relationships with family and friends</li> <li>2. Social status/ recognition in the community</li> </ol>

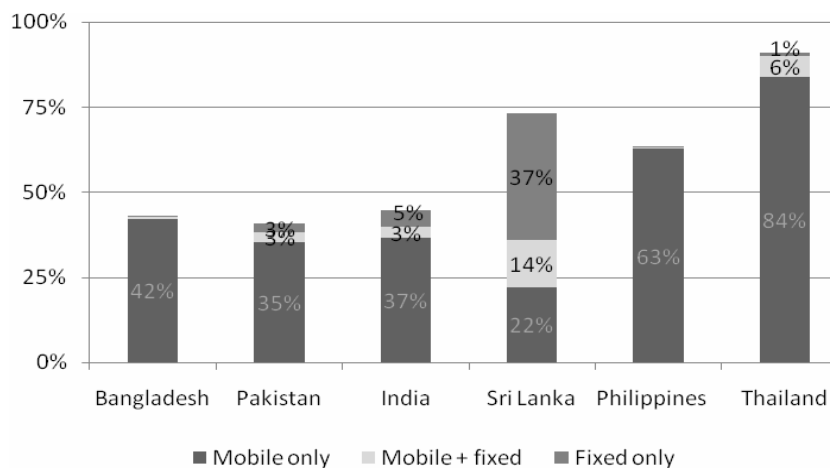
- Economic
1. Ability to make more money (generally, and not via sale of talk time)
  2. Ability to make more money through the sale of calls
  3. Ability to find out about employment/work opportunities
  4. Ability to access price or market information
  5. Ability to save money
  6. Ability to save on travel cost
  7. The efficiency of your day to day work

Three indices were created to reflect each category of benefits; Social Perceived Benefits Index (SPBI), Emergency PBI (EmPBI) and Economic PBI (EcPBI). SPBI and EmPBI indices reflect the number of benefit aspects (0, 1 or 2) that the respondents perceived to have improved (score of 4 or 5 in the scale for each aspect) as a result of using (whether own or otherwise) a phone; i.e. SPBI would take the value 2 if the respondent perceives benefits have accrued to both aspects in that category. EcPBI has 4 levels. First level is when the respondent sees either no aspects or only one aspect has improved. Second is when the respondent perceives 2 or 3 economic aspects have improved; third if 4 or 5 aspects have improved and finally the fourth level is when the respondent perceives 6 or all 7 aspects have improved.

## 5. Findings and Discussion

Before focusing on the mobile adoption model, we provide some general findings on adoption from the T@BOP3 across Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand. One of the most significant results is that the poor in these countries seem to enjoy 'almost' universal access; with, between 79 and 96 percent of all respondents having either made or received a call on their own or someone else's mobile or fixed telephone in the three months preceding the interview (Figure 1).<sup>36</sup> The next logical issue is ownership; do these high use numbers actually translate in to owning mobile telephones? Not surprisingly, as depicted in Figure 3 we found that mobile adoption at the BOP is still generally low for most countries; with lack of affordability being the main reason given for non-adoption.<sup>37,38</sup> Only 2 percent of the non-adopters had mentioned they did not have coverage in their areas of residence.

**Figure 3: Phone ownership at BOP<sup>39</sup>**



Besides the phone instrument, interestingly we found that in almost all countries at the BOP, adoption of multiple SIM cards (as hypothesized by Kalba, 2008, but only anecdotal evidence) was fairly significant; going up to almost a quarter of mobile phone owners having more than one.<sup>40</sup> This phenomenon we found was primarily to take advantage of on-net calling

<sup>36</sup> BN 95%, PK 96%, IN 86%, LK 88%, PH 79%; non voice services including SMS, was not included. TH not included.

<sup>37</sup> Sri Lanka fixed phone suffers a categorization anomaly as CDMA phones are counted as fixed, not mobile phones. 83% of fixed phones at Sri Lanka BOP are CDMA.

<sup>38</sup> There is always the issue of overestimating ownership data due mainly to multiple-SIM use; see Kalba (2008) for example for a discussion on this. However, demand-side figures from surveys such as these are much more reliable than supply-side figures reported by national regulatory agencies and reproduced in international agencies as they fail to account for multiple SIM use.

<sup>39</sup> Ownership in 2006 PK 36%, IN 19%, LK 41%, PH 54%, TH 77%

<sup>40</sup> Multiple SIM use: BN 10%, PK 23%, IN 9%, LK 16%, PH 19%, TH 13%.

rates; by switching SIM cards to 'belong' to a particular network. Moving beyond voice (making and receiving calls and 'missed calls') and SMS the research showed that hardly anyone used mobile phones to browse the Internet or send emails etc. Only some features such as listening to the radio on the phone, listening to music downloaded or sent by others, playing (individual) games had been adopted at the BOP to any reasonable level.<sup>41</sup> Use (even infrequently) of mobile 2.0 services such as m-banking, m-payments, m-government, m-health, m-agriculture and m-polling (voting in interactive game shows on television etc.) was very low in the BOP across most countries in the sample. For instance in India, at the BOP, the study found that only 1 percent used m-banking services and m-health services while just 2 percent (highest occurrence) frequently engaged in m-polling. Ironically, the reason for low adoption was not so much price, but the thought that such services were not relevant to them or they just were not aware of their existence.

### Mobile Adoption

We now consider the profiles of those who have adopted mobile phones as against those who have not (but are users nevertheless; using other's phones). Table 5 provides an easy-to-interpret breakdown of the sample showing the characteristics of the two groups.<sup>42</sup> The Chi-Square value given in the table is used to test is whether there is a significant association between the two variables. A significant Chi-Square value indicates the existence of a relationship between the concerned variable and the mobile adoption.

**Table 5: Mobile adopters vs. non-adopters**

	Mobile adopter, %	Non adopter, %
Overall	45.9	54.1
N	4,382	5,158
Gender (Chi-Square=401.30)***		
Male	63.9	43.4
Female	36.1	56.6
N	4,382	5,158
Age (Chi-Square=33.32)***		
Less than 35 yrs	65.3	59.6

<sup>41</sup> For example, listening to music files downloaded or sent by others: BN 4%, PK 5%, IN 3%, LK 7%, PH 3%, TH 22%.

<sup>42</sup> Rice and Katz (2003) present a similar table where they dichotomize almost all variables in order to make it easier to interpret the otherwise complex data. While agreeing that such a dichotomization (yes/no, high/low etc) reduces the strength and significance of relationships they argue that the simplification of interpretation was a worthwhile tradeoff.

More than 35 yrs	34.7	40.6
N	4,381	5,158
Monthly Personal Income (Chi-Square=363.16)***		
Less than the median [USD 26.25]	37.7	60.9
More than the median [USD 26.25]	62.3	39.1
N	4,277	4,901
Education (Chi-Square=291.0)***		
Primary	35.1	51.1
Secondary	52.0	43.7
Tertiary	12.9	5.2
N	4,123	4,245
No. of top 5 contacts with mobiles (Chi-Square=801.52)***		
0	0.9	2.7
1	6.4	11.9
2	12.2	23.5
3	15.3	24.0
4	14.7	13.1
5	50.5	24.8
N	4,381	5,155
Emergency Perceived Benefit Index (PBI) (Chi-Square=20.49)***		
0	2.5	3.0
1	9.9	12.6
2	87.6	84.3
N	4,318	4,800
Social PBI (Chi-Square=176.15)***		
0	4.0	6.2
1	30.9	46.2
2	65.1	51.3
N	4,230	4,720
Economic PBI (Chi-Square=197.76)***		
1	10.1	18.1

2	27.6	33.1
3	30.8	23.4
4	31.5	25.4
N	4,256	4,693
Access to fixed phone (Chi-Square=23.09)***		
Yes	7.9	10.8
No	92.1	89.2
N	4,382	5,158

*Table 5 continues on next page*

*Table 5 (Continued): Mobile adopters vs. non-adopters*

	Mobile adopter, %	Non adopter, %
Walk time to nearest town (Chi-Square=125.76)***		
Less than the median [20 minutes]	57.1	46.6
More than the median [20 minutes]	42.9	53.4
N	4,469	5,071
Access to electricity (Chi-Square=569.14)***		
Yes	91.8	77.3
No	8.2	22.7
N	4,382	5,159
Television in household (Chi-Square=569.14)***		
Yes	80.9	57.1
No	19.1	42.9
N	4,381	5,158
Radio in household (Chi-Square=284.11)		
Yes	48.3	31.4
No	51.7	68.6
N	4,382	5,158

\*\*\* Chi-Square is significant at 95%

The table shows that at a high level, mobile phone adopters owners at the BOP in the selected emerging Asia region are more likely to be younger males, with higher relative income, with mainly a secondary education with most of their closest contacts already having mobile

phones of their own.<sup>43</sup> They perceive that their phones have improved their social and economic aspects of their lives and helped their capabilities to communicate in emergencies. It is found that they also live somewhat closer to a town with relatively better access to electricity and with a television set in the household. The profile for non-adopters, in contrast to adopters, is mainly younger females in a relatively lower income bracket and only a primary education living somewhat further away from town. We also find that less of their closest contacts have their own phones. In terms of perceived benefits we find non-adopters not very different from adopters in terms of placing value on benefits from mobile phones; while emergency benefits seem to be the same there is a slight drop in perceived social and economic benefits.

We now consider the results of the logit model to assign probabilities of adoption of mobile phones to correspond to, as much as possible, the mediating and determining factors postulated in the theoretical model in Van Biljon and Kotze (2008). Expected signs for the variables along with brief remarks for same were provided in Table 3. In general, the R-square (Nagelkerke R-square in the case of the logit model) statistic is used to evaluate the goodness of fit of a model; in that it is a statistical measure of how well the model approximates the real data points. An R-square of 1.0 indicates that the regression line perfectly fits the data. In our case, the logit model showed a good fit with an R-square value of 0.34; in that 34 percent of the variance is being explained by the model. The signs of the coefficients of the variables are as expected except in the case of gender where we pre-supposed no gender difference.<sup>44</sup> In a logit model, as in this case, coefficients of variables can have either positive or negative values. If the sign of a coefficient is positive then that particular variable will have a positive impact on adoption and vice versa. Odds ratios are generally used to interpret the size of the impact as coefficients cannot be directly interpreted due to their non-linear relationship with the dependent variable. The odds of success are defined as the ratio of the probability of success (mobile phone adoption) divided by the probability of failure (non-adoption); i.e., odds increase as the probability of success increases and vice versa. Here an odds ratio of X would mean that the odds of mobile adoption are X to 1. Therefore, an odds ratio of greater than 1 implies a positive impact on mobile adoption and less than 1 indicates a negative impact for each unit increase in the particular variable. Higher odds ratios of greater than 1 imply greater positive impact and an odds ratios closer to zero imply greater negative impact. Odds ratios for variables in a logit

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<sup>43</sup> The mean is USD 47.75 per month. The adoption profile is the same even dichotomized at USD 50 per month: adopters, less than USD 50, 48.6%; more than USD 50, 51.6%; non-adopters, less than USD 50, 73.3%; more than USD 50, 26.5%.

<sup>44</sup> While theoretically that may be the case; gender neutral, many studies have found that males are more likely to adopt mobile phones over females (Katz, 2003), Chabassou, 2008).



models can be calculated by taking the exponent of each the coefficient<sup>45</sup>. P value is used to test the null hypothesis that the concerned variable is not significant, i.e., that variable does not impact the mobile adoption decision. A p-value close to zero signals that the null hypothesis is false, and that the concerned variable has an impact on the mobile adoption. Large p-values closer to 1 imply that the variable is not significant. A p-value of 0.05 is a typical threshold used to evaluate the null hypothesis. Table 6 contains the results.

**Table 6: Logit model results**

Variable	Coefficien t	Odds Ratio	P-value
Age <sup>2</sup>	-0.03	0.97	0.03
Gender	-0.43	0.65	0.00
Ln (monthly personal income)	0.48	1.61	0.00
Primary Education	0.34	1.41	0.00
Secondary Education	0.80	2.23	0.00
Tertiary Education	1.40	4.06	0.00
Number of top five contacts having a mobile phone	0.32	1.37	0.00
Emergency Perceived Benefits Index (PBI)	0.20	1.22	0.07
Social PBI	0.16	1.18	0.01
Economic PBI	0.10	1.10	0.00
Access to a fixed line connection in household	-0.63	0.54	0.00
Walk time to the nearest town	0.00	1.00	0.01
Access to electricity	0.38	1.47	0.00
Television in household	0.90	2.46	0.00
Radio in household	0.29	1.33	0.00
Bangladesh	-0.05	0.65	0.96
Pakistan	-0.42	0.00	0.66
Sri Lanka	-0.82	0.00	0.44
Philippines	-0.23	0.12	0.80

<sup>45</sup>

$$Probability(Y) = \frac{1}{1 + \exp(-\alpha - \sum_{i=1}^n \beta_i X_i)}$$

$$Odds Ratio = \frac{Probability(Y)}{1 - Probability(Y)} = \exp(-\alpha - \sum_{i=1}^n \beta_i X_i)$$

Thailand	1.27	0.00	3.58
Constant	-4.21	0.02	0.00

Starting with the demographics of the model, it is observed that age<sup>46</sup> is likely to have negative impact on mobile adoption; that younger people are more likely than the older people to purchase a mobile phone. The gender variable has a significant impact on adoption; being a woman decreases the probability of owning a mobile phone by a fair amount; odds of female mobile adoption is 35 percent less than odds of male mobile adoption. As expected, income increases the probability of adoption; with the natural log of monthly personal income having an odds ratio of 1.61. The results also show that assumptions about education can be accepted with the odds ratio of mobile adoption increasing significantly with more years of education.

Beyond the above demographics, the innovative concept to assess the social influences of mobile adoption was found to be a very important factor in increasing the probability of adoption; with an odds ratio of 1.37. This means that the likelihood of a respondent's adoption of a mobile phone increases with each additional member (at the margin) in his or her network of closest five members adopting a mobile phone. More specifically, holding other influential variables fixed, odds of adopting a mobile phone increases by 37 percent for each additional member in the network. It was also found that the likelihood of adoption increases quite dramatically; with an odds ratio of 4.86, when the number of persons owning a mobile among the top five contacts increases from none to five. These findings give credence to the importance of social (or social-business-economic) networks; defined here as the closest contacts of the respondent, in mobile phone adoption. This finding could well be considered as an interpretation of the extent of the social influence; "social pressure being exerted on the individual by the opinions of other individuals or groups" in mobile adoption in Van Biljon and Kotze (2008); social coercion, imitation and normalization in Chen and Sutano (2007); or explained as peer pressure, but from a work-related angle for instance in Mark and Poltrock (2001) and de Vos et al. (2004).<sup>47</sup> Figure 4 depicts the relationship between the top five contacts owning a mobile phone and respondent's mobile adoption status.

**Figure 4: Influences of network on mobile adoption**

<sup>46</sup> Age-squared gives more explanatory power to the model compared with the Age. As Tegegne (1999) and Chabossou (2009) point out differences of the impact of the age in mobile adoption can be better modeled by using Age-squared instead of Age.

<sup>47</sup> Mark & Poltrock (2001) and de Vos et al. (2004) findings on peer pressure in adoption communication technology at workplaces are at variance with each other.

No of members of the top 5 contacts owning a mobile phone	Respondent is an adopter (% of sample)	Respondent is not an adopter (% of sample)
0	22.0	78.0
1	31.5	68.5
2	30.6	69.4
3	35.1	64.9
4	48.9	51.1
5	63.3	36.7

Consider the other innovation in this paper; the contribution of the three perceived benefit indices towards the probability of mobile adoption. The three indices are significant, and as expected each exerts a positive impact on adoption indicating that higher likelihood of mobile adoption by the people who perceive higher level of benefits from phone access in terms of emergency, social and economic criteria.<sup>48</sup> The odds ratios are 1.22, 1.18 and 1.10; meaning that holding other influential variables fixed, odds of adopting a mobile phone increases by 22 percent, 18 percent and 10 percent, for every one unit increase in the perceived emergency, social and economic benefit index. As discussed earlier, perceived usefulness has been considered an important influence in mobile adoption from the earliest technology adoption models. The desegregation of perceived benefits in to the above three categories and measuring its impact on the probability of adoption of mobile phones among the BOP in the selected emerging Asia region now adds flavor to the discussion on how best to leverage on this aspect to further enhance adoption.. Tables 7 to 9 provide category-wise disaggregated data on adoption by the number of perceived benefit accrued; the level of adoption (adopted or not) vis-à-vis the level of perceived benefits from a mobile phone.

**Table 7: Emergency perceived benefits index and mobile adoption**

No of perceived emergency benefits accrued due to use of mobile phone	Respondent is an adopter (% of sample)	Respondent is not an adopter (% of sample)
0	42.1	57.9
1	41.4	58.6

<sup>48</sup> Emergency perceived benefit index is significant at 90% while social and economic perceived benefits indices are significant at 95%.

2	48.3	51.7
<b>Table 8: Social Perceived Benefits Index and Mobile Adoption</b>		
No of perceived social benefits accrued due to use of mobile phone	Respondent is an adopter (% of sample)	Respondent is not an adopter (% of sample)
0	36.8	63.2
1	39.4	60.1
2	53.2	46.8

**Table 9: Economic Perceived Benefits Index and Mobile Adoption**

No of perceived economic benefits accrued due to use of mobile phone	Respondent is an adopter (% of sample)	Respondent is not an adopter (% of sample)
1	31.6	68.4
2	43.5	56.5
3	53.7	46.3
4	54.1	45.9

These results indicate that adoption is linked to the level of perception of benefits (or usefulness as in the theoretical adoption literature) accrued due to use of mobile phones particularly with social and economic factors; the higher the perceived benefits, the higher the adoption. While the adopter percentage is higher than non-adopter percentage at the highest level of perceived benefit (highest index number) for social and economic benefit categories it is not so for the perceived emergency benefit category. Perhaps the importance of emergency benefits (ability to contact others in an emergency) is subsumed in the "blurred" social-economic network and cannot be easily isolated.

Apart from these new findings, we were able to confirm a number of other reasons typically postulated as influencing mobile phone adoption; defined as various demographic and socio-economic factors as well as facilitating conditions in Van Biljon and Kotze (2008). We found that access to electricity and having a television and/or radio in the household had a positive impact on the probability of adoption of mobile phones among the BOP in the selected emerging Asia region. Further it was found that access to fixed phones has a negative impact on mobile adoption reflecting the effect of substitution; in other words it is more likely that those without access to fixed phones would adopt mobile phones. However our finding on the urban-rural influence that was proxied by 'walk time to nearest town' is a little complex. While the profiles suggest that a slightly higher percentage of adopters are closer to town than non-adopters, the odds ratio of adoption is 1.0; giving no real advantage of being urban. This finding is consistent with LIRNEasia (2009) on the urban-rural divide in India.<sup>49</sup>

Having discussed the findings on the various influences on the probability of mobile phone adoption at the total sample level, Table 10 provides an analysis of the same at an individual country level. The (++) indicates significant positive relationship at 95% confidence level, (+) indicates significant positive relationships with 90% confidence level, (--) indicates significant

<sup>49</sup> In India, villages with population of less than 300 as per 2001 census were not included the survey.

negative relationships at 95% confidence level and (-) indicates significant negative relationships at 90% confidence level. If no sign, then that variable is not significant.

**Table 10: Country wise analysis of mobile adoption model**

	BN	PK	IN	LK	PH	TH
Nagelkerke R-square	0.32	0.43	0.28	0.31	0.26	0.24
Age <sup>2</sup>	(--)	(-)	(--)	(--)	(--)	.
Gender	(--)	(--)	(--)	.	.	.
Ln (monthly personal income)	(++)	(++)	(++)	(++)	(++)	(++)
Primary Education	(++)	.	.	.	.	(-)
Secondary Education	(++)	.	(++)	.	.	.
Tertiary Education	(++)	(+)	(++)	.	.	(+)
Number of top five contacts having a mobile phone	(++)	(++)	(++)	(++)	(++)	(++)
Emergency PBI	.	(++)	.	.	.	.
Social PBI	.	(++)	.	(++)	.	.
Economical PBI	(++)	.	(++)	(++)	.	(++)
Access to a fixed phone	.	(+)	(--)	(--)	.	.
Walk time to the nearest town	.	(--)	(--)	.	.	(--)
Access to electricity	.	.	(++)	.	.	.
Television in household	(++)	(++)	(++)	.	(++)	.
Radio in household	(++)	.	(++)	.	.	.
Constant	(--)	(--)	(--)	.	.	.

Table 10 is self explanatory and reiterates the preceding sample-wide discussion. Besides the income and other demographics, the obvious area to highlight is the importance of the social (or social-economic-business) network on the probability of mobile phone adoption in each country. It is the only variable that has a very significant positive relationship with adoption, further reiterating the findings of the earlier aggregated sample. The importance of emergency, social and economic perceived benefits in adoption is also clear. Special mention of the influence of economic benefit perception on adoption in India and Bangladesh in particular is perhaps necessary given the vast strides these countries have made in their attempts to link mobile phones to improvements in the livelihoods of the poor (IDRC, 2009; Zainudeen et al., 2009). Of course the evidence of people just using mobile phones without any special applications to create efficiencies in the business has been well documented; particularly (Jensen, 2007). One other

interesting finding is the gender impact of mobile adoption seems to be only prevalent in Bangladesh, Pakistan and India with a culture that has relatively more restrictions on women than men as seen in the qualitative component of the T@BOP3 research.

## **6. Linking Back to Theory and Concluding Thoughts**

The odds ratios we calculated for the identified variables using the logit model can be used to validate, to some extent, the basic thrust of the Van Biljon and Kotze (2008) model which postulate a framework that combines the influence of mediating factors (personal, demographic and socio-economic) and determining factors (social influence, perceived ease of use, perceived usefulness, and facilitating conditions) on behavioral intention leading to mobile phone adoption and use. Our results indicate strong influence of two of the more complicated determining factors in increasing the odds ratios of mobile adoption. One is the social influence factor; innovatively structured as pressure brought on by the increasing number of people in the close circle of a person obtaining mobile phones. The other is the perceived usefulness; disaggregated in to perceived emergency, social and economic benefits expected due to the use of a mobile phone. Besides the above our results are quite straight-forward with respect to the mediating factors. They are able to validate the importance of the various components within the demographic and socio-economic mediating factors that influence actual mobile adoption.

Given the primary objective of our study was to examine, from a user perspective, the various influences that affect mobile telephone adoption by the BOP in Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand we feel the study has been able to highlight the importance of the combined social and economic factors in the integrated adoption process. As suggested by Donner (2009), and particularly at the BOP, there is no clear distinction between business uses and social uses of the mobile phone; the distinction between a business and social call is not clear; there is a "blurring of livelihoods and lives". Our findings corroborate this position that perceived economic and social benefits from owning a phone are almost the same in explaining the probability of mobile adoption (odds ratio for social benefits 1.18; for economic benefits 1.10). The idea that the poor must purchase mobile phones because it will improve their economic well being by being able to make 'economically beneficial' calls instead of (obviously economically non-beneficial) 'social calls' (Donner, 2009 suggests that there is an undercurrent of concern in the emerging mobiles for development, or M4D, community that some individuals are spending 'too much' on 'unnecessary' mobile phones and airtime) is challenged by our findings. It is not argued that business calls are less important, in fact technically it would be the other way around, but at the BOP in the emerging Asia region (perhaps in other regions also) social and

business networks seem to significantly overlap with one another and communication between the two networks seem intertwined. This is what de Silva and Zainudeen (2007; 2008) postulated, without corresponding evidence, when they were unable to isolate economic gains as a key perceived benefit of direct access to mobile phones.

In order to better understand the quantitative findings of T@BOP3, as described earlier, the study contained a qualitative segment as well. The following is an interesting passage from the report of the qualitative study (page 79) that corroborates the earlier finding on intertwined social and business benefits:<sup>50</sup>

*"In all countries within the scope of the study, there seem to be an overlap between the social and business networks of the BOP respondents. In several instances, it was seen that the BOP respondents obtained a lot of work through references and recommendations from their friends and family. Friends are the first point of reference for jobs, guidance on directions and financial consultation; and family members for advice on ways to live, save money and future plans. With both parties now connected, mobile phones are becoming the tool that is enabling such interactions with various new schemes and provisions to enhance same. In Bangladesh and Sri Lanka the friends and family (FnF) offer has brought more density and texture to the social networks of BOP users. Saleem<sup>51</sup> and Saeeda Afeez in Bangladesh who are in their late forties have both activated the FnF function in all their SIMs. They can have 3 people in the FnF scheme per SIM card. Having 5 SIMs between 2 of them, they can now call 15 people at 60 paisa per minute instead of 1 taka per minute. Trust and reliability in people who are close to you along with their good intentions for your business are considered to be very significant factors in leveraging social networks for work related reasons."*

The most significant finding with considerable stakeholder-relevance is the importance of the social influence or pressure exerted by members of small groups or networks where we find that the greater the number of members having mobile phones, the greater the influence on others also to purchase phones. Below is another interesting subsection from the same report that corroborates this finding (page 73):

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<sup>50</sup> Full report on the qualitative study will be available at <http://lirneasia.net/projects/2008-2010/bop-teleuse-3/>

<sup>51</sup> Names have been changed to protect privacy of respondents.



*"In terms of the influence of the social ecology, many BOP respondents are also buying phones as they envy people around them having mobile phones. This is seen particularly in the case of several Southeast Asian female respondents. Interestingly, these respondents had bought mobile phones because everybody around them owned a mobile phone and they felt pressurized to buy one themselves. But after buying the phones, the respondents have now started using them for their work as well. In this scenario, the respondents have started benefiting from mobile phones in both their social and professional lives and feel that their phones have become inseparable from them. In the words of a male group discussion respondent from Philippines, mobile phone is his "second wife". This pressure to purchase a mobile phone, however, was not perceived to be very strong in South Asia because respondents in these countries said that although youngsters may feel the pressure more, those who were in 20 - 25 age group, they could not do anything even if their social circles derided them if they could not afford to have a phone; the moment they could afford to purchase a mobile they would. However, respondents in these countries did feel some shame but they had no other option"*

### **Concluding thoughts**

We set out to determine and measure the various influences that impact mobile phone adoption at the BOP in Bangladesh, Pakistan, India, Sri Lanka, Philippines and Thailand. Based on the Van Biljon and Kotze (2008) theoretical framework we modeled adoption by fitting a logit model to our six country dataset generated by LIRNEasia's T@BOP3 on a 9,540 sample survey. We then described and discussed the importance of social influence in mobile adoption in the selected segment of the population. We showed that social influence comprises of two components: one that exerts pressure on individuals to adopt; and another that helps generate benefits via social networks that are tied in with economic and business networks. Beyond these two innovations we demonstrated the relationships and importance of a number of determining and mediating factors that drove mobile adoption at the BOP.

The study however has a number of limitations. First, it only models adoption and not usage; second, the model has not been able to address the ease-of-use aspect of adoption that could be important within the low-literacy group in the BOP; third, the cultural factors of adoption has not been explicitly analyzed beyond the interpretations of the country dummies.

While this study was defined only to study the BOP, and therefore cannot be classified as a limitation as such, it still is a fact that the middle and top of the pyramid of the selected countries are not addressed.

Notwithstanding these drawbacks, our study has been able to isolate what seem to be some very powerful influences of mobile adoption. These findings will be useful in understanding the adoption process of mobile 2.0 services; that social influences consisting both pressures and benefits will play a significant role in how fast the emerging Asia BOP will adopt m-health, m-banking, m-agriculture and other such services. These findings also throw caution to the wind on focusing purely on economic benefits and in the process de-emphasizing the social angle in phone adoption, particularly in poor countries. If our findings are correct, we will see more and more people at the BOP emerging Asia region joining the information society by adopting mobiles; first mobile 1.0 and then 2.0, not necessarily because they see economic benefit in doing so, but more because their friends and family, who also happen to be their social and business contacts, get connected. This would obviously be an important research topic for the future.

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