International Journal of Technology Management & Sustainable Development
Volume 13 Number 2
 doi: 10.1386/tmsd.13.2.177_1

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Mobile phone users from low socio-economic strata in Asia: The moderating roles of age and gender

ABSTRACT

This article investigates the continued usage of mobile telecommunication services (voice services and short messaging services (SMS)) among users from low socio-economic groups in Asia, and also examines the moderating effects of demographic variables age and gender on the intention to continue using these services. We investigate the phenomenon of information obtained *using voice-based services and non-voice-based services by users from low socio-economic groups. This investigation brings together the Technology Acceptance Model (TAM) framework, and the information search paradigm to suggest a model for continued use of mobile phones. Data collected from individual telecommunication users across five South East Asian countries are analysed through structural equation modelling (SEM) to test the hypotheses. Findings demonstrate that for voice services,* perceived ease of use *(PEU) significantly affects* intention *in younger users (and not older users), while* usefulness *is a stronger predictor of intention for older users. For users of voice services and SMS, PEU significantly affects intention in males only, while* subjective norm *significantly affects intention only in females. From a public policy perspective, a greater emphasis may be placed on disseminating information about the benefits of mobile telecommunication among potential mobile phone users through groups that influence user behaviour.*

KEYWORDS

mobile phone adoption
mobile telecommunications
work-related information
technology acceptance model (TAM)
South East Asia
low socio-economic groups

INTRODUCTION

The factors affecting mobile phone adoption is a widely researched topic. However, little research has been done to investigate the role of specific benefits obtained via the use of mobile phones and their effect on user intention to continue using these mobile phones, especially among users in lower socio-economic groups in developing countries.

Especially important is the role of information that allows these individuals to enhance their reach of job-related/livelihood-related activities through the use of mobile phones. For example, among several rural communities across various countries in Africa, Aker and Mbiti (2010) find that the benefits of using mobile phones include reduced costs of communication, and allowing users to send and obtain information quickly and cheaply. Several studies find that a reduced cost associated with access to information has tangible economic benefits associated with improving agriculture (e.g., Aker 2010), as well as labour, producer and consumer market efficiencies (e.g., Jensen 2007). In the context of telecommunication, a user can obtain work-related information through various services (e.g., voice calls, short messaging services (SMS), mobile alerts and others) chosen by the user.

This study adopts the socio-economic classification (SEC[1]) offered by the Market Research Society of India (MRSI), and includes representatives of SEC D, E, R1 and R2 (as per the old SEC system) from users of mobile phones across five countries in Asia (i.e., Bangladesh, Pakistan, India, Sri Lanka and Thailand). Users who belong to these socio-economic groups are unskilled/semi-skilled labourers and small-shop owners/businessmen who have a maximum of middle-school level education. Specifically, this research addresses the following two questions: (1) what is the relationship between the work-related *information obtained* via telecommunication services, and the intention to continue using mobile phones?, and (2) what are the factors that affect work-related information obtained through mobile telecommunication services? In order to address these questions, we suggest a model, and test the model on two separate groups of users: (1) Group 1 (G1): users who use voice services only; and (2) Group 2 (G2): users who use voice services and SMS (i.e., a non-voice service). We also investigate the moderating effects of demographic variables (i.e., age and gender) on the hypothesized relationships.

1. The MRSI has introduced a new SEC from May 2011 onwards. Our study adopts the old SEC in force between 1988 and 2011, which classifies urban consumers into eight groups (SEC A1, A2, B1, B2, C, D, E1 and E2), and rural consumers into four groups (R1, R2, R3, R4) based on socio-economic factors including education and occupation of the chief wage earner of a household (see MRSI (2011) and IMRB (2011), for a discussion on the old and new SEC systems).

LITERATURE REVIEW AND HYPOTHESES: TECHNOLOGY ADOPTION

Technology adoption theories (e.g., Theory of Reasoned Action (TRA), TAM, TAM2, UTAUT) were originally tested and extensively applied in the context of developed countries (e.g., the United States, Canada, the United Kingdom) across settings that included individuals who adopted a technology in organizations (e.g., Plouffe et al. 2001) as well as in their own individual capacities (Venkatesh and Davis 2000). TAM has been applied in the context of developing economies as well (e.g., Brown 2002). Specifically, studies that have used TAM to investigate adoption of mobile phones in the context of developing economies in Asia, have examined the adoption of mobile phones in the context of users that belong to higher socio-economic groups. Studies that investigate mobile phones/services adoption among lower socio-economic groups have largely been case-based, used the diffusion of innovation framework (e.g., de Silva et al. 2011), or have used other frameworks. Our research on continued mobile adoption among users from lower socio-economic strata is grounded in the technology adoption theories (TAM and TRA) and the information seeking paradigm.

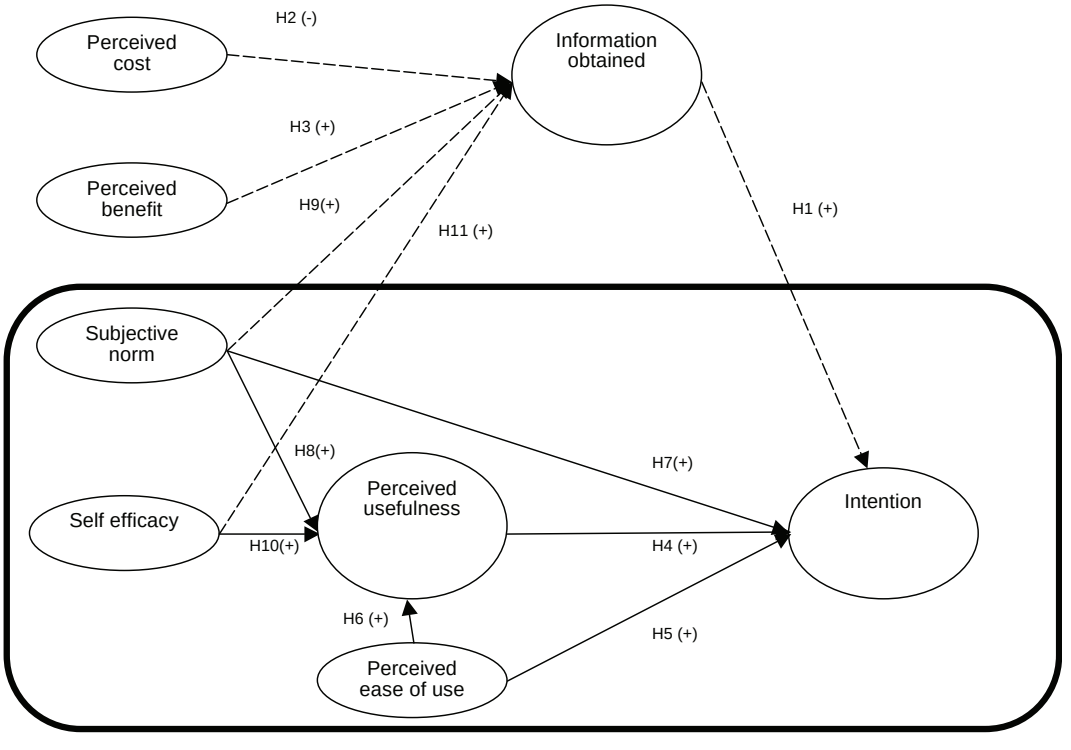
TAM, SOCIAL COGNITION THEORY AND INFORMATION SEEKING

The TAM (Davis 1989), a framework based on the TRA (Fishbein and Ajzen 1975), consists of three components that shape a user's attitude and intention towards using a technology. TAM proposes that *perceived ease of use* (PEU), *perceived usefulness* (PU) and other external variables predict a user's intention to use a technology. TAM2 (Venkatesh and Davis 2000), which extends TAM, identifies *subjective norm* as a variable that affects intention to use the technology. *Self efficacy* is identified as a key variable that affects a user's intention to use a technology, and is defined as the judgment of one's ability to use a technology to accomplish a task.

In our research, we identify work-related information obtained through mobile communication as an advantage of adopting the technology.

There exists widespread acknowledgement that there are costs associated with *acquiring information* (e.g., Punj and Staelin 1983). As a consequence of the costs involved in acquiring information, users will continue to obtain additional information until the benefit obtained from additional information is less than the cost of obtaining it, which corresponds to the cost-benefit framework. Two of the widely investigated factors in the context of acquiring information include *perceived cost*, and *perceived benefit* (Punj and Staelin 1983).

Therefore, in our model, we include the following variables: information obtained, perceived cost, perceived benefit, PU, PEU, subjective norm, self efficacy and intention (Figure 1).



Note: Variables inside the box: Adapted from Technology Adoption Theories (e.g., TAM2, TRA).

Variables outside the box: Adapted from the Information Search paradigm.

Figure 1: Hypothesized framework.

Intention (continued usage)

In the technology adoption literature, intention (to adopt a technology) is an often-investigated dependent variable. In our study, we define intention as the user's intention to continue to use mobile telecommunication services.

Information obtained (work-related)

In our research, information obtained is conceptualized as any information related to job and livelihood-related issues that is accessible to the user by using mobile telecommunication services. The effort required for obtaining such information is low. For example, a user of voice or SMS services can easily exchange information with other such users at the touch of a few buttons. Traditionally, exchange of information among individuals in lower socio-economic segments occurs when these individuals interact with the source of the information (e.g., a person, an organization) in face-to-face situations, which require a high level of effort. For most individuals in this socio-economic segment, mobile telecommunication is an individual-level technology that they are interacting with, probably for the first time. Venkatesh and Davis identify *job relevance* as a variable that affects a user's decision to adopt a technology, where the authors conceptualize the construct as whether adopting a technology 'is applicable' for one's job or not (2000: 191). In other words, a user decides on adopting a technology when the technology has a direct bearing on the outcome associated with his or her job. In our conceptualization, information obtained is the information that the user is able to obtain *after* he or she adopts the mobile phone, and broadly encompasses any information that may be accessible through mobile phones. Note that it is not suggested that the information obtained through mobile phones was not available to the user prior to the adoption of the phones. Information obtained is the 'improvement' in access to information due to the adoption of mobile phones. Therefore, our construct is conceptually different from *job relevance*, as we situate our research in a continued adoption situation. Information obtained is an outcome of using the mobile telecommunication services, and is expected to positively affect the intention to continue to use the technology:

H1: A higher level of information obtained leads to a greater intention to continue using mobile telecommunication services.

Perceived cost

A lens employed to study information seeking is the cost-benefit approach (e.g., Punj and Staelin 1983). In explaining cost, some studies emphasize the importance of source accessibility (seeking cost) (e.g., Kwasitsu 2003). Similarly, the information search paradigm suggests that as users seek information, the cost associated with acquiring information has an impact on the amount of information obtained (e.g., Punj and Staelin 1983). In our model perceived cost is represented by the hindrances posed by the telecommunication network. J. D. Power and Associates find that factors like failed call connection, and dropped calls affect call quality (Reardon 2011). We argue that the signal strength of the telecommunication network that a user uses to make calls, affects the usage of mobile phones. Users of telecommunication services may incur cognitive, time and energy costs associated with using the telecommunication network. For example, the strength of the signal that

is available on a network often determines the ease with which a call can be placed or an SMS can be sent from a mobile device. In other words, if the strength of the signal is weak, a user may have to make several attempts before a call can be successfully completed, or an SMS can be successfully sent. If the strength of the signal is very weak, the user may be discouraged to use the telecommunication service. Therefore, we expect the relationship between perceived cost and information obtained to be negative, and, it is hypothesized that:

H2: A higher level of perceived cost leads to a lower level of information obtained through mobile telecommunication services.

Perceived benefit

Perceived benefits of using telecommunication services may refer to realized benefits, which may be short or long term in nature. Long-term benefits may include cost savings realized through superior service. Short-term benefits may include immediate savings or satisfaction associated with using the service. Saunders et al. (1994) find that some of the benefits accruing from the adoption of information and communication technologies to those in the lower socio-economic strata in developing countries, include improving the coordination of transportation (especially during emergencies), and enhancing the effectiveness of development activities. In our study, perceived benefit is conceptualized as the actual benefits that users obtain by using mobile phones. Specifically, these benefits include improvement in cost savings through a reduction in travel and the ability to contact others during emergency. Perceived benefit positively affects information seeking (e.g., Punj and Staelin 1983). Hence, we formulate the following:

H3: A higher level of perceived benefit leads to a higher level of information obtained through mobile telecommunication services.

PU

PU is 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis 1989: 320). In our investigation, PU is the user's perception of the usefulness of mobile telecommunication services for obtaining work-related information. In the context of our research, a distinction needs to be made between PU and perceived benefit. The PU of telecommunication services is the user's 'belief' regarding the general usefulness of these services to the user. Perceived benefit, in contrast, is the specific set of realized benefits that a user obtains from using telecommunication services. For example, in this research, perceived benefit encompasses certain specific benefits (e.g., ability to reduce travel, contact others in an emergency) that the user obtains (after using the mobile telecommunication services).

As in the context of developed countries, studies applying the model in the context of developing countries find a strong positive relationship between PU and intention (e.g., Sukkar and Hasan 2005). Therefore, as per TAM and TAM2, in our study, we expect that the effect of PU of mobile telecommunication on intention to continue using the services will be positive. Thus it is hypothesized that:

H4: A higher level of PU leads to a greater intention to continue using mobile telecommunication services.

PEU

PEU is 'the degree to which a person believes that using a particular system would be free of effort' (Davis 1989: 320). In our investigation, PEU is the user's perception of the ease with which mobile telecommunication services can be used for obtaining work-related information. A system that is relatively effortless to operate is more likely to be adopted (Davis 1989). Studies applying TAM in the context of developing countries find a strong positive relationship between PEU and intention (e.g., Dasgupta et al. 2011; Sukkar and Hasan 2005). Therefore, in our study, we expect that the effect of PEU of mobile telecommunication on intention to continue using mobile telecommunication services will be positive. Thus it is hypothesized that:

H5: A higher level of PEU leads to a greater intention to continue using mobile telecommunication services.

The relationship between PEU and PU is positive, as demonstrated by the TAM (Davis 1989), and therefore, we expect that:

H6: A higher level of PEU leads to a higher level of PU of mobile telecommunication services.

Subjective norm

Subjective norm captures a user's social influences. Subjective norm is defined as a 'person's perception that most people who are important to him think he should or should not perform the behavior in question' (TRA, Fishbein and Ajzen 1975: 302). As per TRA (Fishbein and Ajzen 1975), subjective norm directly affects behavioural intention. It is theorized that a user may intend to act in a specific way simply because the user's referent group may be favourably inclined towards that particular behaviour, and the user is sufficiently motivated to comply with the referent group. TAM2 (Venkatesh and Davis 2000), however, finds that the positive relationship is significant only when the technology adoption situation is mandatory.

In our study, the continued use of mobile telecommunication presents a voluntary (and not a mandatory) setting. In the context of developing countries Nasri and Charfeddine (2012) find that subjective norm affects the intention to use a social media platform among users in Tunisia. These findings from developing countries in technology adoption situations, albeit voluntary, are not surprising because many of these countries are collectivist societies, where the influence of the community that one belongs to is fairly strong in influencing individual choices. Therefore, we hypothesize that:

H7: A higher level of subjective norm leads to a greater intention to continue using mobile telecommunication services.

TAM2 also suggests that subjective norm influences intention 'indirectly through perceived usefulness' (Venkatesh and Davis 2000: 189). In the context of our study, we expect that a user adopts a referent's belief system as one's own, and this belief system in turn affects the user's intention to use. The process, through which the transfer of the belief system occurs from the referent to the user, is internalization (Warshaw 1980). A user, upon observing/interacting

with a referent, forms a belief about the usefulness of mobile telecommunication services, and about the work-related information that can be obtained through these services. In a continued usage situation, subjective norm is expected to reinforce the beliefs already formed. We, therefore, hypothesize that:

H8: A higher level of subjective norm leads to a greater PU of mobile telecommunication services.

H9: A higher level of subjective norm leads to a higher level of information obtained through mobile telecommunication services.

Self efficacy

Self-Efficacy is an important user trait that has been identified to predict the adoption and use of a technology by an individual (e.g., Dabholkar and Bagozzi 2002). Self-efficacy is defined as 'the belief that one has the capability to perform a particular behavior' (Compeau and Higgins 1995: 189), and it is also referred to as 'people's judgments of their capabilities to organize and execute the course of action required to attain designated types of performances' (Bandura 1986: 391). In our research, self-efficacy refers to a user's perception of the degree of efficiency with which he or she is able to obtain work-related information through mobile telecommunication services.

Low self-efficacy leads to higher resistance to change (Lankton and Wilson 2007). In contrast, a relatively high level of self-efficacy is seen to have a positive effect on cognitive processing, to enhance self-motivation, to reduce anxiety and to allow an individual the resilience to innovate or to persevere in long-term behaviours with ambiguous outcomes. Similarly, Ellen et al. (1991) suggest that self-efficacy may be a critical influence on decision-making technology. People with self-esteem deficits are uncertain about their capacity to deal with new technology and may choose to avoid it. Dasgupta et al. (2011) find that self efficacy has a significant positive effect on user intention to adopt a technology among users in India. Thus, we formulate the following hypothesis:

H10: A higher level of self efficacy leads to a greater PU of mobile telecommunication services.

Similarly, it is expected that high self efficacy will lead a user to obtain more information through the mobile device. Therefore, we hypothesize that:

H11: A higher level of self efficacy leads to a higher level of information obtained through mobile telecommunication services.

MODERATING EFFECT OF GENDER AND AGE

Many studies have examined the influence of external factors on many of the relationships that have been identified in TAM. Venkatesh et al. (2003) in their UTAUT model considered the moderating effects of gender, age and experience on the various relationships identified by the model. Gender and age have been found to be significant moderators in the context of technology adoption (e.g. Venkatesh and Morris 2000).

Gender

For example, Alshare et al. (2005), investigated the moderating effect of demographic variables on the relationships between PE, PEU and intention,

and the authors found that gender was a significant moderator. According to gender schema theory, the different roles that males and females are expected to play are reinforced through the socialization process (e.g., Kirchmeyer 1997). Males are usually expected to be focused on the task at hand (Minton and Schneider 1980).

Age

Extant literature on information seeking has investigated the effects of age. For example, Schaninger and Sciglimpaglia (1981) find that older adults seek less information. Examining the social psychology literature on the impact of cognitive ageing on the ability of decision-making, Mata et al. (2007) find that older adults tend to look for less information and take longer to process the information than younger adults. Age-related cognitive decline is attributed to decreased attentional capabilities (McDowd 1997) and their use of non-compensatory decision rules, which demand less cognitive processes. Kirasic et al. (1996) show that age negatively affects information-processing. This is in line with the theory of cognitive competence as outlined by Schaie and Willis (1993), which suggests that the ability to perform tasks decline with age, which is pertinent in the context of our research. On the other hand, there are studies that suggest that younger adults take less time to perform tasks predominantly due to their adaptability in information search (Gregan-Paxton and Roedder-John 1995), with some (Davids and Falkoff 1975) attributing this behaviour to the younger consumers' impatience. Therefore, we expect, age to be a significant moderator in the context of adoption of mobile telecommunication services. Specifically in the context of technology adoption, Meyer (2011) finds that younger users are more likely to adopt a technology than older users. For these two moderators, we do not present specific hypotheses, but expect that *age* and *gender* moderate the relationships presented in the model.

RESEARCH METHODOLOGY

Data collection

A structured survey was conducted among individual telecommunication users as part of the Teleuse4@BOP project by LIRNEasia (a think tank initiative based in Colombo, Sri Lanka), to obtain telecommunication usage data from owners as well as non-owners of mobile phone. This study was carried out with the aid of grants from the International Development Research Centre, Ottawa, Canada, and UKaid from the Department of International Development, UK. Data were collected from 9066 respondents across five countries in Asia (i.e., Bangladesh, Pakistan, India, Sri Lanka and Thailand). All participants were between 15 and 60 years of age. Participants were approached at their households to take part in the survey. The mean age of the respondents was 32.82 years, 55.0 per cent were females, and 74 per cent were from the rural areas.

The study used a multi-stage stratified cluster sampling by Probability Proportionate to Size (PPS). In all countries except India, data were collected from all provinces in each country. For the data collected from India, data were obtained from the majority of the states, where the target number of urban and rural centres in each province was chosen using PPS. Within each selected centre, a well-known place such as a road, park or hospital was assigned as the starting point to contact households for survey using the

right-hand or the left-hand rule. The number of starting points in each centre was determined proportionate to the population and then a fixed number of interviews were conducted at every starting point. The structured survey questionnaire was first created in the English language and then translated to local languages. Back-translation and pre-tests were conducted to modify any obscure questions and words. The survey was conducted face-to-face by trained administrators who read out each question and marked the answers on behalf of the respondents.

The following analysis concentrates on mobile phone owners only. Of the total respondents, 4926 users own mobile phones. Analysis regarding the leading reason for using the mobile phones shows that 4567 users use the phone for making voice calls (359 users did not provide any response). Additionally, 1582 users use SMS services, 37 users access information services, while only six use banking services. In order to investigate the stated objectives, only valid responses to users' perceptions of usage regarding the services that they use on the mobile phones and the benefits obtained due to the usage are included in the analysis. Our analysis concentrates on the following two user groups: (1) Group 1: users who use the mobile phone for voice-services only (valid responses: 1171); (2) Group 2: users who use the mobile phone for SMS and voice-services (valid responses: 1125). (The two groups are henceforth referred to as G1 and G2).

Measurement

Existing literature is used as the source of measurement for most of the constructs defined in the theoretical model. Specifically, intention, PU, PEU, subjective norm and self efficacy were measured using validated scale items. The measures for information obtained, perceived cost and perceived benefit were collected through other items that were included in the survey. All items were measured on a five-point scale. A refined list of question items (indicators) that survived an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA) is summarized in Table 1.

For each of the two groups of users, the underlying factor structure among the variables was assessed by EFA with a varimax rotation (i.e., an oblique rotation). The scales factored as expected with factor loadings for the specific scale items recording an excess of 0.50. Subsequently, a more rigid statistical procedure (CFA) was employed to assess the dimensionality and validity of the measures. In particular, a CFA can assess the convergent and discriminant validity of the studied constructs in the measurement model. SPSS-AMOS (version 18.0) was used as the analytical tool for the estimation of the measurement model as well as the structural path model. The descriptive statistics, Cronbach's α values, composite reliability, average variance extracted and the standardized factor loadings are reported in Table 2. All coefficient αs are substantially higher than the generally recommended benchmark of 0.60 (Churchill 1979), demonstrating internal consistency for all constructs included in the study.

AVEs above 0.5 are treated as indications of convergent validity (Fornell and Larcker 1981). This use of CR and AVE emanates from the two-step procedure recommended in Anderson and Gerbing (1988). A variance extracted of greater than 0.50 indicates that the validity of both the construct and the individual variables is high (Hair et al. 2010). A composite reliability above the 0.70 threshold and an extracted variance above the 0.50 threshold, as recommended by Hair et al. (2010), are achieved.

Construct	Items	Sources
Information Obtained[1]	* Access to a mobile phone has improved your access to information you need in your job * Access to a mobile phone has improved your ability to plan and make decisions relating to your livelihood * Access to a mobile phone has improved your ability to find out about employment/work opportunities	LIRNEaisa researchers
Perceived cost[3]	* Often, I can't get a signal, or signal strength is weak * Often, I can't get a call through (network is busy). * The connection is not clear when I get connected	LIRNEaisa researchers
Perceived benefit[1]	* Access to a mobile phone has improved your ability to reduce travel * Access to a mobile phone has improved your ability to act or contact others in an emergency * Access to a mobile phone has improved the efficiency of your day to day work	LIRNEaisa researchers
Perceived Usefulness[2]	* I find voice calls/sms to be useful in my life * Using voice calls/sms increases my chances of achieving things that are important to me * Using voice calls/sms helps me accomplish things more quickly[4] * I find voice calls/sms gives me useful information	Davis (1989)
Perceived Ease of Use[2]	* I find voice calls/sms to be easy to use * I think learning how to use voice calls/sms is easy to me * My interaction with voice calls/sms is clear and understandable	Davis (1989)
Subjective Norm[2]	* I use voice calls/sms because I want to use the same service people around me use * I use voice calls/sms because it is common to use it in my community	Venkatesh et al. (2003)
Self Efficacy[2]	* I am confident of using voice calls/sms if there was no one to show me how to do it[4] * I am confident of using voice calls/sms if someone showed me how to do it first * I am confident of using voice calls/sms if I could ask someone for help if I got stuck	Compeau and Higgins (1995)

	* I am confident of using voice calls/sms if I had a lot of time to try and use 'the service'[4]	
Intention[2]	* I intend to use voice calls/sms in the future * I expect that I would use voice calls/sms frequently in future	Davis (1989)

Five-point Likert scales:
[1]1=No Change; 5=Greatly Improve
[2]1=Strongly Disagree; 5=Strongly Agree
[3]1=I always face this problem; 5=I never face this problem
[4]Item dropped after EFA

Table 1: The measurement items.

However, two of the variables have AVE less than 0.5. Specifically, the measure PU has an AVE of 0.43 (for G1), and the measure perceived benefit has an AVE of 0.43 (for G2). Note that the measure PU is an established measure, and has been used across a number of studies undertaken by researchers. Also note that this construct achieves an AVE of more than 0.5 for the second group (G2) in our investigation. Similarly, for the measure perceived benefit, we obtain an AVE of more than 0.5 for the first group (G1). Therefore, we are confident that the measures that we use in our study are reliable and valid. However, these measures may have limited meaning in the context of the population that we are testing.

The convergent validity (i.e., the degree of association between measures of a construct) and composite reliability (i.e., the internal consistency of the indicators measuring each CFA construct) were tested and the results were satisfactory (see Table 2). The discriminant validity (i.e., the degree to which items of constructs are distinct) was empirically assessed by using the variance-extracted test. The criterion to examine the discriminant validity is to check whether the variance shared between measures of two different constructs (the squared correlation) is less than the amount of variance extracted for the items measuring each construct (Tables 3a and 3b). Empirical results indicated that discriminant validity was achieved for all constructs for both the two groups in this study.

EMPIRICAL RESULTS

The model: G1 and G2

To assess the overall fit of the measurement model for the two user groups, we reviewed a number of goodness-of-fit indices: (1) G1: RMSEA (0.033), CFI (0.974), TLI (0.966), and a χ^2/df ratio of 2.98 (χ^2_{161}=480.41; p<0.05); (2) G2: RMSEA (0.041), CFI (0.966), TLI (0.955), and a χ^2/df ratio of 2.87 (χ^2_{161} = 462.05; p<0.05). Though the χ^2 value is significant, this result is expected in large samples. However, according to the criteria summarized in Hair et al. (2010), a battery of fit indices establishes a good fit between the proposed model and the data for both the user groups.

Next, we test the hypothesized model (as shown in Figure 1), on the two user groups. The fit indices of the path model present good fit for the two user groups: (1) G1: (RMSEA (0.040), CFI (0.961), TLI (0.951), and a χ^2/df ratio of

Construct and Indicators	Mean (SD)	Standardized loading	Average variance explained	Composite reliability (α)	Mean (SD)	Standardized loading	Average variance explained	Composite reliability (α)
Information Obtained	3.43 (1.21)		.59	.81 (.81)	3.42 (1.22)		0.50	0.74 (0.74)
Info1		0.815[1]				0.781[1]		
Info2		0.767[1]				0.559[1]		
Info3		0.709[1]				0.743[1]		
Perceived Cost	3.66 (0.87)		0.60	0.82 (0.82)	3.77 (.83)		0.53	0.77 (0.77)
Cost1		0.81[1]				0.715[1]		
Cost2		0.765[1]				0.734[1]		
Cost3		0.753[1]				0.738[1]		
Perceived Benefit	4.34 (0.79)		0.54	0.78 (0.77)	4.54 (.62)		0.43	0.70 (0.71)
Benefit1		0.782[1]				0.713[1]		
Benefit2		0.711[1]				0.623[1]		
Benefit3		0.716[1]				0.618[1]		
Perceived Usefulness	4.32 (0.57)		0.43	0.70 (0.70)	4.27 (.66)		0.59	0.81 (0.81)
Useful1		0.63[1]				0.788[1]		
Useful2		0.648[1]				0.809[1]		
Useful3		0.687[1]				0.71[1]		
Ease of Use	4.19 (0.66)		0.51	0.76 (0.76)	4.21 (.68)		0.59	0.81 (0.81)
Use1		0.637[1]				0.743[1]		
Use2		0.734[1]				0.773[1]		
Use3		0.772[1]				0.792[1]		

Subjective Norm	3.92 (0.97)		0.63	0.77 (00.77)	3.68 (1.04)		0.76	0.86 (0.86)
SubNorm1		0.829[1]				0.886[1]		
SubNorm2		0.757[1]				0.859[1]		
Self Efficacy	4.00 (0.94)		0.54	0.70 (0.70)	3.94 (.83)		0.55	0.70 (0.68)
Efficacy1		0.737[1]				0.625[1]		
Efficacy2		0.733[1]				0.838[1]		
Intention	4.22 (0.73)		0.60	0.75 (0.75)	4.24 (.72)		0.66	0.79 (0.79)
Intention1		0.791[1]				0.813[1]		
Intention2		0.763[1]				0.809[1]		

[1] indicates significance at $p<0.01$ level; Coefficient αs are reported within the parentheses in the last column.

Table 2: Properties of the two measurement models (CFA) (G1, G2).

Construct	1 Obt	2	3	4	5	6	7	8	9
1. Information obtained	1.00								
2. Perceived cost	–0.078	1.00							
3. Perceived benefit	0.437	0.063	1.00						
4. Perceived usefulness	0.364	0.026 n.s.	0.322	1.00					
5. Perceived ease of use	0.332	–0.020 n.s.	0.228	0.756	1.00				
6. Subjective norm	0.384	–0.077	0.105	0.466	0.504	1.00			
7. Behavioural control	0.351	–0.002 n.s.	0.251	0.638	0.782	0.512	1.00		
8. Self efficacy	0.257	0.007 n.s.	0.226	0.425	0.396	0.338	0.450	1.00	
9. Intention	0.326	–0.070	0.280	0.581	0.536	0.414	0.586	0.579	1.00

Notes: All correlations, except those with n.s. (non significant), are significant (p<0.05)

Table 3a: Correlations among latent constructs (G1).

Construct	1	2	3	4	5	6	7	8	9
1. Information Obtained	1.00								
2. Perceived cost	–0.115	1.00							
3. Perceived Benefit	0.228	0.010 n.s.	1.00						
4. Perceived Usefulness	0.252	0.057 n.s.	0.355	1.00					
5. Perceived ease of Use	0.213	–0.039 n.s.	0.339	0.775	1.00				
6. Subjective Norm	0.428	–0.208	0.092	0.458	0.451	1.00			
7. Behavioural Control	0.289	–0.093	0.328	0.601	0.720	0.507	1.00		
8. Self efficacy	0.243	0.067	0.268	0.538	0.454	0.389	0.465	1.00	
9. Intention	0.250	0.043 n.s.	0.302	0.752	0.641	0.407	0.588	0.543	1.00

Notes: All correlations, except those with n.s. (non significant), are significant (p<0.05)

Table 3b: Correlations among latent constructs (G2).

3.87 (χ^2_{168}= 650.82; p<0.05); (2) G2: (RMSEA (0.042), CFI (0.962), TLI (0.952), and a χ^2/df ratio of 3.01 (χ^2_{168}=503.04; p <0.05).

Observation of the magnitudes and the directional signs of the standardized beta weights lead us to different conclusions regarding the two groups of users. For the voice only users (G1), our results find support for ten of the eleven hypotheses (Table 4a). We do not find support for H5. Perceived cost, perceived benefit, subjective norm and self efficacy are found to be significant drivers of information obtained via voice services through mobile phones. Information obtained, subjective norm and PU are significant predictors of the intention to continue using mobile telecommunication services, while subjective norm, self efficacy and PEU significantly affect PU.

For the users of SMS and voice services (G2), our results find support for seven of the eleven hypotheses (Table 4b). We do not find support for $H1_1$, H_2, H_7, and H_{11}. Perceived benefit and subjective norm were found to be significant drivers of information obtained via SMS and voice services through mobile phones. PU and PEU are significant predictors of the intention to

Hypotheses	Overall model	<35 years	>35 years	Difference is Significant/not significant	Male	Female	Difference is Significant/ not significant
	Estimates	Estimates from the unconstrained model		Constraining each path	Estimates from the unconstrained model		Constraining each path
H1 (+)	0.110[3]	0.073[1]	0.136[2]	n.s.	0.130[3]	0.067	n.s.
H2 (–)	–0.080[2]	–0.067[1]	–0.102[2]	n.s.	–0.026	–0.146[3]	p<0.05
H3 (+)	0.394[3]	0.290[3]	0.480[3]	p<0.05	0.450[3]	0.321[3]	n.s.
H4 (+)	0.493[3]	0.211[1]	0.609[3]	p<0.05	0.497[3]	0.446[3]	n.s.
H5 (+)	0.069	0.358[3]	–0.038	p<0.05	0.133	–0.006	n.s.
H6 (+)	0.653[3]	0.775[3]	0.519[3]	p<0.05	0.652[3]	0.639[3]	n.s.
H7 (+)	0.110[3]	0.136[2]	0.057	n.s.	0.029	0.254[3]	p<0.05
H8 (+)	0.066[1]	0.026	0.138[2]	n.s.	0.041	0.099	n.s.
H9 (+)	0.318[3]	0.307[3]	0.317[3]	n.s.	0.305[3]	0.339[3]	n.s.
H10 (+)	0.218[3]	0.048	0.362[3]	p<0.05	0.249[3]	0.182[3]	n.s.
H11 (+)	0.072[1]	0.065	0.096[1]	n.s.	0.068	0.058	n.s.

[1] $p < 0.05$
[2] $p < 0.01$
[3] $p < .001$

Table 4a: Hypotheses Testing (G1).

Hypotheses	Overall model	<35 years	>35 years	Difference is Significant/not significant	Male	Female	Difference is Significant/ not significant
	Estimates	Estimates from the unconstrained model		Constraining each path	Estimates from the unconstrained model		Constraining each path
H1 (+)	0.051	0.074[1]	–0.031	n.s.	0.099[1]	–0.059	p<0.05
H2 (–)	–0.042	–0.020	–0.108	n.s.	–0.039	–0.035	n.s.
H3 (+)	0.173[3]	0.135[2]	0.310[2]	n.s.	0.211[3]	0.101	n.s.
H4 (+)	0.659[3]	0.647[3]	0.663[3]	n.s.	0.565[3]	0.892[3]	p<0.05
H5 (+)	0.100[1]	0.135	0.035	n.s.	0.193[2]	–0.147	p<0.05
H6 (+)	0.638[3]	0.683[3]	0.569[3]	n.s.	0.597[3]	0.714[3]	n.s.
H7 (+)	0.037	0.006	0.098	n.s.	–0.011	0.170[2]	p<0.05
H8 (+)	0.069[1]	0.057	0.014	n.s.	0.171[3]	–0.050	p<0.05
H9 (+)	0.380[3]	0.416[3]	0.266[2]	n.s.	0.314[3]	0.438[3]	p<0.05
H10 (+)	0.252[3]	0.204[3]	0.406[3]	n.s.	0.183[3]	0.317[3]	p<0.05
H11 (+)	0.051	0.061	–0.003	n.s.	0.069	0.064	n.s.

[1] $p < 0.05$
[2] $p < 0.01$
[3] $p < .001$

Table 4b: Hypotheses testing (G2).

continue using mobile phones, while subjective norm, self efficacy and PEU significantly affect PU.

Our model achieves the following R^2 values for the two endogenous variables: (1) G1: 0.324 for information obtained, 0.648 for PU and 0.428 for intention; (2) G2: 0.217 for information obtained, and 0.674 for PU and 0.598 for intention.

Multi-group analysis: G1 and G2

Multi-group analyses were undertaken to test for the moderating effects of the demographic variables *age* and *gender* on the hypothesized paths. The tests were carried out separately for G1 and G2. To test for the moderating effect of *age*, respondents in each user group were divided into two groups reflecting whether they were below or over 35 years of age. To test for the effect of *gender*, respondents in each user group were divided into males and females.

In order to test for group invariance, we first run the unconstrained and the fully constrained models for each moderator in each group, which results in four pairs of models. Note that since we are interested in investigating group invariance on the relationships among the constructs, only the beta weights are constrained (Byrne 2004) for testing the fully constrained model in each of the four pairs of tests. We find that in three of the four pairs of models (*G1-Age*, *G1-Gender*, *G2-Gender*), the constrained models (χ^2_{347}=885.315, χ^2_{347}=926.389, χ^2_{347}=714.4), have a significantly higher χ^2 values compared to the unconstrained models (χ^2_{336}=840.553, χ^2_{336}=897.529, χ^2_{336}=671.17) (χ^2 difference tests as suggested by Byrne (2004)), indicating that the constrained models demonstrate a significantly lower fit than the unconstrained models. These findings suggest moderating effects of the moderators on specific paths, which require further investigation. The χ^2 values for the constrained model (χ^2_{347}=719.033) and the unconstrained model (χ^2_{336}=703.007) for *G2-Age* are not significantly different. This finding indicates that *age* does not have a moderating effect for G2, and that the beta weights for respondents *below 35 years* and *above 35 years* in this group, are similar. The findings for *G2-Age* are not discussed further.

Next, for each of the other three pairs of models, each path in the unconstrained model was constrained *one at a time* and the χ^2 reading was compared to that of the unconstrained model. These tests determine which of the paths are significantly different in each unconstrained model (Tables 4a and 4b).

In *G1-Age*, 955 (816) respondents are less (more) than 35 years of age. The fit indices for the unconstrained model for multi-group analysis on *age* are acceptable ((RMSEA (0.029), CFI (0.959), TLI (0.949), and a χ^2/df ratio of 2.50 (χ^2_{336}=840.553; p<0.05)). Findings indicate that *age* moderates five relationships as hypothesized in H3, H4, H_5, H6 and H10.

In G1, 1081 (690) respondents are males (females). The fit indices for the unconstrained model for multi-group analysis on *gender* are also acceptable ((RMSEA (0.031), CFI (0.955), TLI (0.943) and a χ^2/df ratio of 2.67 (χ^2_{336}=897.529; p<0.05)). *Gender* moderates two relationships: H2 and H7.

In G2, 671 (454) respondents are males (females). The fit indices for the unconstrained model for multi-group analysis on *gender* are also acceptable ((RMSEA (0.030), CFI (0.962), TLI (0.952), and a χ^2/df ratio of 1.99 (χ^2_{336} = 671.170; p<0.05)). *Gender* moderates seven relationships as captured in H1, H4, H5, H7, H8, H9 and H10.

Discussion and conclusion

This study investigates user intention to continue using mobile telecommunication services among the population across lower socio-economic groups, across five Asian countries, and applies the technology adoption and the information seeking paradigms to formulate and test specific hypotheses. We demonstrate that the TAM framework does provide an adequate explanation of intention to continue using different telecommunication services for users belonging to lower socio-economic groups.

Group 1

Overall model

An unexpected finding for G1 is that the relationship between PEU and intention is not significant. As expected, however, the relationship between PEU and PU is positive and significant, reducing the possibility that the findings are confounded by measurement errors. One possible reason for this finding could be that the construct PEU does not have any specific meaning for this particular user-base. This user group traditionally has had to travel long distances or make special efforts to obtain information that most users in higher socio-economic groups (e.g., users in developed western economies, and users in SEC A, B, and C in Asia) usually take for granted because of a greater access to different modes of communication. However, we anticipate that a test of moderators may provide a further insight into this relationship.

Moderating effects

In testing for the moderating effect of *age*, it is particularly interesting to note that the relationship between PEU and intention is positive (and significant) for respondents *below 35 years*, and negative (and not significant) for those *above 35 years*. This finding sharpens the finding reported above. Our findings demonstrate that for younger users, PEU affects intention as per expectation, while for the older users, the results are not in the expected direction.

One possible reason for the finding for the older users could be that surmounting the difficulties of using a mobile phone provides a sense of achievement to the older users. In other words, a decrease in PEU leads to an increase in the intention to use the device for accessing information via voice calls, as it provides these users with a sense of empowerment. Extending this argument, one might further argue that the older users may be willing to use this device for accessing information despite the odds that adoption of the device might present. Elsewhere, it has been noted that adoption of mobile devices have led to an enhancement of self-worth and a sense of inclusion for users belonging to lower socio-economic groups (e.g., Chew et al. 2011), which resonates with the argument presented here.

One possible reason for the finding for the younger users could be that the notion of 'ease-of-use' is more applicable (for this group) in the context of obtaining information through voice services. Using voice services is probably perceived to be equivalent to conducting a face-to-face conversation, and the ease of using the device and the associated services render this variable as an important one for this particular user group.

We note that the relationship between self efficacy and PU is significant for the older users and not for the younger users. One possible reason for this finding could be that younger users tend to be more technology savvy as compared

to older users, and therefore, are more comfortable using the technology. As Al-Natour and Benbasat (2009) argue, the relationship between a user and a technology changes over time based on the events and outcomes that occur when the two parties interact. The user assesses these interactions not only at a single point in time, but over repeated interactions. In this research, we investigate the user's intention to continue using a specific service, and self efficacy probably becomes less important over time for the younger user, who is more technologically savvy than the older user.

In testing for the moderating effect of *gender*, we note that subjective norm is a significant predictor of intention for females, and not for males. These results echo the findings/outcomes of the Akshaya project in Kerala, India (IT for Change 2008), where women entrepreneurs aver that adoption of technology is a means through which they have been able to gain respect of community members, and motivate other women to become entrepreneurs.

Group 2

Overall model

Some unexpected findings are also noted for G2. First, the relationship between acquiring information and intention is not significant. This finding raises the question of whether the users perceive SMS as less effective in acquiring work-related information, or whether there is a moderating effect of the demographic variables, which is presented in the next section.

Second, perceived cost has a non-significant relationship with acquiring information. We operationalize perceived cost in terms of the effort needed to negotiate with the network in order to use a telecommunication service. The asynchronous nature of SMS, allows a user to send a message at any time, with an expectation that the SMS will be delivered over the next few minutes, even if a network might not be immediately available. Similarly, low signal strength is often sufficient to successfully send and receive SMS. These reasons probably reduce an SMS user's dependency on the available network (compared to a user of voice services), providing possible reasons for this finding.

Third, subjective norm does not significantly affect intention. This finding resonates with the finding reported above (i.e., between acquiring information and intention). These findings probably indicate that users find it somewhat difficult to use SMS services, and therefore, the extent of work-related information obtained through these services is low.

Fourth, self efficacy is not a significant indicator of acquiring information for users of SMS and voice services. However, self efficacy significantly affects PU (the importance of self efficacy been noted in the extended TAM (Yousafzai et al. 2007).

Moderating effects

Examining the moderating effects of *gender*, we find that the relationship between acquiring information and intention is positive (and significant) for males and negative (and not significant) for females. This moderating effect indicates that males do obtain work-related information via SMS, while females probably do not.

We also note that the relationship between PEU and intention is positive for males and negative for females. This finding probably indicates that despite a decrease in the perceived ease of using a mobile phone, females

show an increase in their intention to use the technology. As already noted, the adoption of mobile devices has led to an enhancement of self-worth and a sense of inclusion for women (e.g., Chew et al. 2011), and our findings contribute towards that understanding.

The relationship between subjective norm and intention is significant for females and not significant for males. This finding is similar to the finding for G1. The relationship between subjective norm and PU is significant for males and not significant for females. These findings demonstrate the importance of subjective norm among users in lower socio-economic groups. Our findings agree with previous research that compared to males, women are likely to be more sensitive to others' opinions (Venkatesh et al. 2000).

Implications

The present study contributes to policy research in several ways. First, this study demonstrates that users belonging to lower socio-economic groups across many South East Asian countries are likely to continue using mobile telecommunication services because of the information obtained through voice services and through SMS services. However, voice-services, currently, are perceived as more amenable to obtaining work-related information. These findings indicate that the deployment of information-based services in future should probably be undertaken through voice services instead of through other types of services (e.g., SMS, Internet). Second, for voice-based services, the impact of subjective norm on information obtained is *weaker* than for SMS and voice-based services (0.318 vs 0.380). We also note that the total effect of subjective norm on intention is significant and positive (0.102) (for G2), even though the direct effect is not significant (0.037). These findings imply that whether a user uses SMS services for obtaining work-related information, to a great extent, is determined by whether those close to him or her use the service or not. Therefore, a greater emphasis may be placed on disseminating information among potential SMS users through groups that influence their behaviour. Such trainings may be imparted at the time of purchasing handsets, and incentives (e.g., additional top-ups, etc.) may be offered if a user is able to persuade other users to partake in the training.

The present study makes several contributions to the marketing and information technology literatures. First, this study identifies factors that affect the use of voice-based services and SMS services for obtaining work-related information by users in a population that has received limited attention in literature. Second, this study brings together existing research from management information systems and marketing literatures and contributes by studying a heretofore under-researched population. The proposed model, along with the empirical findings, shed new light on mapping the phenomenon of work-related information obtained using mobile phones by users in lower socio-economic groups. Third, this study shows that certain constructs (e.g., PEU) behave differently in the context of this user group when compared to user groups in developed countries.

From a theoretical perspective, this investigation situates the use of mobile phones for obtaining work-related information by users in low socio-economic groups within established and accepted research paradigms of adoption of technology and acquiring information.

The moderating effects of *age* and *gender* on the various relationships tested in the model allow us to sharpen our findings on voice services and

SMS usage in telecommunication among younger and older users, and among males and females in this specific user-base.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has several limitations. First, note that many of the items (that were included in the study to measure specific constructs, e.g., PU, PEU), have been developed and used in the context of organizational settings in developed economies, specifically the United States. This study adopts these existing scales for studying a different population. Second, some of the constructs (e.g., perceived cost, perceived benefit) are measured by anchoring the scales between 'no change' and 'greatly improve', instead of 'strongly disagree' and 'strongly agree'. It may be possible that some users, who have in fact used their phones to obtain information using voice or SMS services, have not responded to the specific question because they have not seen a change (or have seen a negative one). Though the possibility of this happening is low, it is necessary to make a note of this issue.

This study opens up several avenues for future research. First, future studies need to investigate the extent of benefits obtained because of accessing information via mobile phones. More research is necessary in order to understand the ways in which the use of these services has positively affected the lives of these users. Second, future research also needs to focus on whether the well-being of users in lower socio-economic segments has been affected because of information obtained via mobile phones. Third, this research looks at utilitarian benefits (i.e., information acquired) obtained via a set of services offered on a mobile phone. How do hedonic benefits (e.g., playing games) affect the continued usage of mobile phones? Fourth, this research investigates information obtained through only two types of services. Future studies need to investigate information obtained through other services, including access to the Internet. The findings of these studies will provide a deeper understanding of the impact of information obtained on the continued use of mobile phones, and will have implications for policy formulation and for practitioners.

ACKNOWLEDGEMENT

This article/presentation is a part of LIRNEasia's Teleuse@BOP4 study. The work was carried out with the aid of a grant from the International Development Research Centre, Ottawa, Canada (www.idrc.ca) and UKaid from the Department for International Development, UK (www.dfid.uk).

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ACKNOWLEDGEMENTS

SUGGESTED CITATION

Maity, M. (2014), 'Mobile phone users from low socio-economic strata in Asia: The moderating roles of age and gender, *International Journal of Technology Management & Sustainable Development*, 13: 2, pp. 177–200, doi: 10.1386/tmsd.13.2.177_1

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