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A Theoretical Analysis of Growth And Diffusion of Innovative Mobile Service Portfolios

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ABSTRACT

The paper discusses the growth and evolution of mobile phone rendered serviceportfoliosthat comprise rich voice service, messaging, internet services, and personalized content. The paper examines factors which lead to adoption of diffusion of innovative generic and multimedia services among surveyed households.An array of government and commercial innovations in services such as mobile education, mobile health,and mobile entertainment have already been anticipated to makefull-fledged practice in India. The paper discussesthe pre-requisite to diffuse digital technologies and innovation across urban areas and village settlements. The paper further examines various obstacles to adopt an innovation at individual and household level, existing structural problems regarding the diffusion of technological innovations and existing gap or divide among the surveyed households. It emerges from the study that the possession of mobile phone and the need driven uses cannot make much distinction between young and old users of the households in the pretext that everyone use a cellphone. Rapid evolution of digital technologies has embedded new applications and service provisioning with the old easy way to use mobile phone. As a result, technology has been diffused but the gap between owning a mobile phone and innovative uses have not got over. Instead, the applications and services that the advanced convergent cell phone or smartphone provided has exacerbated gender divide in society and new digital divides among different cohorts in households.

KEYWORDS : Telecommunication, Transactional Service, MVAS, Mobile Banking, Mobile Service Portfolios, Diffusion of Innovation, Digital Divide

1. Introduction

Any 'innovation' in goods, service and application represents a change in the perception of users or customers. Mobile phone technologies can have potential impacts on the success of service acceptance and to sustainable service usage. Prior to the late 1990s, voice reigned over data with few, simple service concept as restricted to national and regional markets. Mobile phone is evolved from transmitting voice to converged data such as video, multimedia, music, internet to serve all in one device for consumers. Voice, video, email, listening to music have considered to become daily necessity for people which compelled companies to include all services in one package and provide consumers to gratify needs at all levels of communication.

The transition from voice to data is the result of the interplay of technology and market innovation. The transition from voice to data application is more crucial for end user than the transition from 2G to 3G[1]. The evolution of network does not habitually translate to evolution in mobile telephony applications and services.

Global System for Mobile communications (GSM) is followed by an improved second generation technology such as EDGE (Enhanced Data rate for GSM Evolution) and GPRS (General packet radio service) which has fundamentally increased the rate of data transmission. The rapid development of technology in addition to increasing demands for accessing Internet via mobile devices have led to third generation of mobile phone technology (ITU, 2010) . Evolution of network technologies especially 3G technology has made an array of services possibly available at customer's end that include wide-area wireless voice telephone, video calls, internet access in mobile phone and mobile TV. Since 2004, the content package starts getting more emphasize in any service provider's strategy to delight its customers, to improve customer loyalty at all touch points and to achieve customer preferences in the service brand.

Cumulative empirical evidences from academic investigationhave strengthenedappreciation among policymakers that extensive diffusion and innovative uses of mobile phone is important for country's economic development and social progress. Adoption decision helps the policy makers' to design effective user friendly regulatory frameworks which could ensure consumer welfare. Further adoption decision of adopters can influence telecommunication operators to develop inclusive strategies to attract even the laggard.

1.1 Growth of Mobile Service Portfolios

At present, the mobile service portfolio comprises rich voice service,

messaging, internet services, and personalized content. Levitt classified mobile service portfolios into generic, expected, augmented and potential services (Levitt, 1980). In 1980s, mobile telephony was only occupied with voice services and short messaging service (SMS) dominated the scene in 1990s.

The generic service portfolio includes voice, mobile internet, and a set of content services which render the basic 'look and feel' of wireless mobile phone services. Expected services involve customer's minimal expectations usually differ in ranges from region to region. Expected multimedia services by the urban youth are often limited by bandwidth and performance capabilities. In the decision stage of diffusion of innovation prior to the adoption of the finished innovation, the expected services are augmented by the service providers which could cater to the needs of adopters.

Originally designed as part of the GSM digital mode standards, SMS or text messages are now available on a wide range of networks, including the nascent multimedia networks. New SMS services offer automated 'alerts' sent on a regular basis giving news, whether, financial information, sporting event scores and other information. Some vending machines allow payment by sending an SMS and the cost of the item bought is added to the user's phone bill.

Few services add to the existing service line and an improvement to existing service are influenced by the cost driven modifications to services. For instance, model of i-mode[2] has received acceptance from the users because of its affordability, easy to use features which added value to life style, and contributed to productivity.

I-mode[2] provides a whole new range of capabilities to mobile phone users and keeps them connected to the internet with easy web access through mobile phone. Through the persistent net link, users can subscribe a panoply of Web-based goodies such as e-mail and chat, calendars, games, online horoscopes and customized news bulletins.

Universal Mobile Telecommunications System (UMTS) technology, a 3G standard has unified the disparate standards of today's wireless networks and enabled multimedia services (UMTS world, 2009). The UMTS technology delivers robust telecommunication network infrastructures to telecom carriers enabling them to provide diverse services to consumers. After the augmentation of LTE [3](Long Term Evolution) technology for mobile broadband system, most of the telecom carriers' have moved towards LTE [3]technology in order to increase the capacity and speed of mobile telephone networks to enhance and

improve multimedia services (Steinbock, 2005).

Conventional mobile services were offered only from telecom carriers' portal, however, with the arrival of first official App-Stores [4]in 2007, mobile users have started obtaining mobile service applications via the app-store. Device manufacturers, -like Nokia, Apple (iPhone), HTC, BlackBerry have entered to mobile service market and started offering high-end application on the user handset. Indian players have tie-ups with most Telco's which has provided them a strong presence in the local market. Global players also work through tie-ups with Indian content players. The share of feature phones shipments at Indian market is 88 percent whereas traffic and revenues come from smart phone users' stand at 50 percent (Avendus Report, 2013). Apple has registered significant impact on the paid apps market in India with increasing number of Apple devices and higher percentage of paid apps downloads. In June 2013, 1.42 million and 0.38 million paid apps downloaded respectively by iphone[6]and ipads users (Apple Inc. report, 2013).

Other internet service providers such as Facebook, Google and Skype have entered mobile market by providing innovative service solutions to users, however, unable to ensure the highest Quality of Service (QoS), customer privacy and security.

Instant Messaging (IM) allows users to send short and simple messages that are delivered immediately to online users. Empowering people rather than places, instant message receives quick acceptance among the SMS users. The essential point is not the technology used, but the connectivity that allows the IM user over different access based on GPRS, 3G, and so on.

The popularity of free Instant Messaging apps such as WhatsApp [7], WeChat[8], LINE[9], BlackBerry Messenger (BBM), Viber[10] etc. for smartphones is on the high since the last one year. Ease of access, superfast service, and the rising need of social networking among the youth are some of the factors leading to the skyrocketing popularity of these apps, and steady downfall of the once revolutionary SMS.

WhatsApp[7] by competing with other Asian based messaging services such as Kakao Talk[11], LINE manages an upward increase of ten billion messages per day as of August 2012 from two billion in April 2012. By August 6, 2013, WhatsApp has shared 325 million photos over 300 million active users each day. WeChat registered around 300 million users by January 2013. By January 18, 2013, Line application had been downloaded 100 million times worldwide. LINE mobile application is made available in BlackBerry, Nokia Asha and Windows Phone during 2012- 2013. The number expanded to 140 million by early July 2013 and to 200 million by July 21, 2013.

Diverse communication via chat groups or dedicated discussion site over internet was limited only among BlackBerry device users until 2013. The release of BlackBerry Messenger 5.0 allows users not only to simply use email and numeric PIN identification, but also to use a QR[12] Code to add each other to their respective friends' lists. BlackBerry Messenger 7.0 which was released in December 2012 introduced additional traits such as voice chat and 'BBM Voice Call' (Blackberry messenger, 2014).

Kaiser Family Foundation's (2005) survey of youth media use during 2003–2004, reveals that Instant Messaging had become the second most popular computer activity after computer games, averaging 27 minutes per day among 15 to 18-year olds.

1.1.1 Transactional Service Portfolio

The lack of access to banking and payment services affects consumers' purchasing behaviors. The limited penetration of financial industry in provisioning technology, lack of mobile banking standard technology, security of financial transaction at the data encryption level suggest that it is imperative to leverage mobile telecom's existing distribution channel and networks' ability to scale and transcend boundaries (Siau et al, 2001).

Rapidlygrowing mobile tele-density,increasing familiarity and receptivity towards prepaid payment instruments suggest thatthe mobile phone based payment can possibly transform the banking scenarioin India by serving India's underserved rural population. Large number

of under-banked and disadvantaged rural household of low income group can make transaction at an affordable cost in a transparent and fair manner with the support of mobile money (Banzal, 2010). Immediately accessible, cost effective, mobile banking can help rural customers to save travelling time and money to visit the distant branches for money transaction.

Manyservicesare already made available through mobile banking by financial institutions in India. These amenities includes automatic updates on bill payments, electronic fund transfer- both domestic and international, account balance, scheduled alerts on transaction activity, loan access, mobile recharging service, card statements, support services such as email, cheque book requests, location based services such as ATM location, content services, personalized alerts on security prices, loyalty services and so on(Corporate Essvale, 2011).

In order to achieve financial inclusion, Reserve bank of India has issued guidelines for running mobile telephony based financial services. The guidelines includes anti-money laundering, know your customer, combating the financing of terrorism prohibition of cross border outward and inward transfers(Gupta & Mittal).

Various schemes related to Mobile banking have been successful in many countries of the world. Various banking service in India such as SBI, HSBC ICICI, Standard Chartered have provided banking alerts on mobile phones via SMS about money deposits & withdrawals, and cheque clearance. Business news channels in India, such as NDTV profit, CNBC have Information services applications that offer stock updates and market news to users.

Utility and assumed benefits of both UID card and mobile phone are different, still, any attempt to distribute free mobile phone can have comparatively better edge over free distribution of UID card among the rural masses. Of late, the Unique Identification Authority of India (UIDAI) has integrated with various handset manufacturers (such as Nokia) and operators (such as Bharti) in order to figure out the execution of electronic authentication using mobile phones. Mobile phone technologies by leveraging UID and prepaid could distribute government and social benefits at a low-cost. Prepaid approach to mobile payment[13]has been an emerging trend in BRIC[14] countries.

The registered UID number helps to open an account connected to a reloadable prepaid card and would allow rural recipients to expect services. Electronic payment transactions and credit-based services can accelerate the volume and value of services and goods exchanged across rural India.

RBI grant license to Bharti Airtel to use the Semi Closed Wallet [15] among the private mobile phone service providers. Moreover, players such as ICICI's iMobile[16]NGPay[17], MChek[18] are offering information and payment services via basic applications.

Airtel in collaboration with Axis bank has launched its mobile wallet [19](Airtel Money) [20] across 403 cities in India and allowed cash withdrawal from the bank account on Airtel Money. Following this development, SBI has launched its own mobile wallet Mobicash Easy [21] in Delhi and Mumbai with a future vision for national roll out (SBI Report, 2014). Other non-bank and non-telco players include Oxigen[22], Zipcash[23], etc have too sprung mobile wallet services in India. Development of the mobile POS[24], an innovation driven by US-based Square Inc. has revolutionized the card acceptance market.

E-commerce merchants have been active in launching their own mobile wallets. After Flipkart took the initiative to use mobile phone to pay for its digital store, Flyte, BookMyShow, Cleartrip, Infibeamand others have started their respective wallets .

Considering recent initiatives, government of India seems to have realized the potentialities of M-Commerce to promote financial inclusion and to foster economic growth for large section of Indian society if Government can ensure effective partnership among different profit, non-profit entities.

1.1.2 MVAS for Development

The Indian mobile market is the fastest growing market in the world. It adds 8 to 10 million subscribers every month. As of 2009, the Indi-

an MVAS (mobile value added service) market closed at Rs. 84 billion, forming around 11 percent of the total telecom revenue. Enterprises in India started using SMS as a channel to endorse their products and reach out to the maximum possible customers. As a result, SMS has dominatedthe MVAS market and conventional Entertaining MVAS such asBollywood, horoscope, caller ring back tones (CRBT) and cricket recordsa lion's share of 63 percent in the market (IAMAI, 2013). Other MVAS such as mEducation, mHealth have anticipated and registered steady growth in the market.Technological innovation in mobile phone helps to create service innovation which has boosted India's m-commerce.

Various government departments have already started delivering SMS based public services as a part of their e-Government initiatives. Two states of India, Gujarat and Chhattisgarh have successfully launched and maintained SMS based information on food supplies by the fair price shops under the Public Distribution System (Siau, K. et al, 2001). Mobile communication has been used in health solutions such as patient monitoring, providing updates and alerts, etc.AIIMs, Apollo, Dr. Batras, Maestros Mediline Systems are some of the private players existed in the health sector in India. A number of experimental studies have shown effective execution of health services via SMS, telephonic calls, and other mobile content such as MVAS. For the spread of service innovation in the health sector, both Government and commercial initiatives are required.

Mobile phones can be used as an effective channel for the delivery of basic education related services primarily value added services across the country. Innovation related to Mobile Education would aid to address the shortage of teachers in rural and remote areas by providing a platform to users to access educational content. The mobile phone based learning model promotes audio only and audio-video learning for the adults, kids and facilitate learning from wherever they are without any slog. An inspiring project, Millee uses mobile gaming technology to enhance access to literacy among deprived children of school-going age in the developing world. Mobile education or MVAS on education has been adopted in different countries across the world such as Tanzania, Bangladesh, West Africa, South Africa, Kenya and China in order to support and enable the school curriculum (Ally, 2009; Graham, 2012; Kasumuni,2011).Use of mobile phone to access information such as examination alerts, results etc. has been in vogue already. M Gurujee[25] and English Seekho[26]from Tata DoCoMo are some initiative towards mobile education in India in order to deliver content of civil services, medicine, engineering, management on mobile phone through an interactive voice response (IVR) application. Other simple mobile applications such as SMS, USSD,WAP etc. could also be used to assist the dissemination of both formal and non-formal education. SNDT Women's Universityformed astrategic alliance withIndian PCO Teleservices, Tata Teleservices and Atom Techin order to deliver mobile education to village communities in India and to those who are physically challenged.

2. MethodologyApplied
The study pursuesto find out the diffusion of innovative mobile phone service portfolios among households and the influence of existed digital divide on technology diffusion. 'Structured questionnaire', is administered as an instrument for data collection to elicit information on demographic and psychographic aspects of the household respondents. The questionnaire is distributed among 40 households of 14 selected villages from 14 development blocks of Sonitpur District, two wards of Guwahati Metro. The variables identified comprise attitude toward owning and using mobile phone, training on advanced use, support for use, age factor, gender factor that were used to predict the use of mobile phone by household members. The survey investigated factors such as generalized self-efficacy, participant's information, motivation to integrate technology to services, impediments to integrate technology for services, knowledge about technology. The secondary data were collected mostly from government departments, books, journals, newspapers etc.

2.1 Objectives:
1. To examine the growth and evolution of mobile phone services portfolio.
2. To assess various challenges to the diffusion of technologies and innovation.
3. To examine the factors which lead to adoption of diffusion of in-

novative services among rural and urban youth.

2.2 Units of Analysis:
Skills and knowledge of the members of the household is measured by the respondents' perception of their own skills and knowledge in the use of embedded features and applications in the mobile phone; the capacity to manage simple work on a computer and to surf and use internet; proficiency in English language, psychological attributes regarding the interest in information and digital technology.

The composition of household is determined by various socio-economic elements identified variables : (1) Educational level of the head of family: (Illiterate, Literate-up to Primary, Middle complete, High school and above); (2) Place of Residence (Urban, Rural); and (3) Gender and occupation of the head of family (Male, Female); (4) Ages of the members of family (less than 35 years, 36-60 years and above 60);(5) Size of family (Small; Nuclear family of 1-3 members, Medium; Nuclear family of 4-6 members, Semi-Large; joint type of family of 7-9 members, Large: joint extended family of 10 and above). The variables are identified on the basis of the literature review and previous empirical findings.

Information sources in Household are measured by the possession of various communication technology such as TV, radio, computer, internet, newspaper, mobile phone etc. This is accompanied by the attitude of the members of the household towards the awareness of events in their surrounding and the interest of the household members to get informed or to participate in such events. Venues and means of accessing information are found varied and are not necessarily determined by the owning of the communication technology. Higher possession of number of communication technologies in a household makes obvious co-relation with higher information needs of the households. Nevertheless, the need is no longer separated from the affordability and status seeking attitude of the respondent members of the household.

The financial status of household which is represented in the monthly expenditure in various basic needs and communication services shows a significant and interesting difference between the rural and the urban/semi-urban regions.

3. Theatrical Construct of Diffusion of Innovation
Rogers stated that diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system.

Evolution of mobile network, improved bandwidth, innovation in services and applications in mobile telephony has been diffused among people in a fixed social system over the years. Social system represents household, community or society based on geographical precincts where the individual members are characterized by gender, age. Channel of communication represents the intensified interpersonal communication among the members, the role of opinion leader among members, member's exposure to mass media, folk media and information and communication technology.

As Rogers (2003) and Roman (2003) asserted, it is often difficult to accurately predict, identify, and measure the consequences of an innovation. Consequences of adoption of the innovation on the community may involve intervening variables to change as against the intended costs. Effects of consequences of adoption of innovation on the community can be expected and predicted at times as against undesirable and unanticipated outcomes.

Davis (1989) postulated a theory construct 'Technology Acceptance Model' (TAM) that asserts that adoption is affected by the perceived usefulness of the innovation of the technology and the perceived ease of use of the technology by the community. An approach to the theory of reasoned action (TRA) posits that the adoption decision is influenced by attitudes toward the use of the innovation (Fishbein&Ajzen, 1980). Many studies argue against the TAM construct assert that TAM fails to adequately predict users' intentions behind acceptance (Fishbein&Ajzen, 1980). The intervening socio-psychological and cultural variables such as subjective norms of the household, community and society, social influence while making decisions, critical mass (Markus et al, 1996) perceived enjoyment are the other identifiable

grounds behind the technology acceptance by the individual. The proposed framework of Theory of Acceptance and Use of Technology provides a justification of uses and acceptance behavior of the users (Venkatesh et al, 2003).

Theory of reasoned action justifies the acceptance of innovation irrespective of gender, age, experience, facilitating condition and social influence. The perceived relative advantage constitutes (i) having access and no access to technologies and (ii) comparative advantage of having access to mobile phone technology vis-à-vis other forms of access to information, i.e. TV, radio, newspaper, internet or other digital technologies available in households and in community.

Compatibility factor too stresses on the adoption of mobile phone service and application innovation by the user member of the household. User's compatibility can be affected by the exposure to other forms of technology, skill, literacy, needs, financial status as accompanied by daily ways of doing things as well. Similarly user's possession of financial resource, skills and knowledge aids to count on effortless and affordable test of an innovation. Testing an innovation helps to make purchasing decision.

Observability or visibility of the innovation among the member embrace another aspect of theory of reasoned action. Any invention which is perceptible by the eye of the individual can influence the believe system of the viewer. Social identity theory that bridges the gap between the service providers and users can improve the likelihood of adoption (Gefen& Ridings, 2003). Domestication of technology, would provide insight into the impact of length of time that has on adoption.

Theory of Reasoned Action (TRA) embrace the subjective norms of society as per social norm theory which represent social influence. The factors such as social influence take into account the role of opinion leader in motivating an individual to adopt an innovation.

3.1 Discussion on the Adoption of Innovative Services

This study examines the behavioral and psychological factors influencing the adoption and use of mobile phone service portfolios in rural and urban Sonitpur District. Rural resident's adoption and use of mobile phone can be related more with the factors that stimulate their behavior than the factors that influence their psychology. Moreover, behavioral factors can significantly predict some of the psychological factors. By adding behavioral factors into the theoretical model, this study supplements the perceived needs theory and extends it from urban setting to rural setting.

The survey reveals that all kinds of innovative services, new applications and device innovations pertaining to mobile phone are not accepted by all the members of a household. The acceptance of innovation is necessarily related to the perception of the head of the household, sharp majority of who are male member of the household. Decision of the household head influences the perceived need and urge of women and children of a household. A few head of the household are opinionated about the negative effects of mobile phone use even after they possess a mobile phone for themselves. This befalls not to own mobile phone by other family members of the households as influenced by the personal notion, attitude and subsequent decision of the household head.

Head of the Family is the opinion leader to influence the decision of the other members of a household as per the social norms and to serve as a role model for other members of the society. However, all heads of the families don't belong to the so called Roger's identified group of *early adopters*. Circumstances make them belong to either *early majority*, a deliberate self to adopt an idea or late majority, when adoption is driven by the economic necessity. In fact, rural backdrop with limited resources makes many head of the household to behave as laggard, to be suspicious of the benefits of service innovation by repeatedly having a point of reference of the failure of past incidents.

Adoption of mobile phone service portfolios is influenced by the demographic characteristics of users'. Socio-economic factors such as gender, age, education, and income are considered to be key variables to determine the acceptance of mobile service. For instance, the

survey finding demonstrates that multimedia services such as mobile game is preferred more by urban youth male members than female or rural or adult or old membersof a household. Attitude, intention, beliefs, and behavior are the major elements in the theory construct of reasoned action (TRA) as proposed by Fishbein and Ajzen in 1970s which pronounces that the psychology of individual being influences the attitudes and behavior of the individual towards a reasoned or well-grounded action.

The attitudes, skills, and behaviors of the household members related to mobile phone use has been analyzed qualitatively and quantitatively. Age is found to be positively correlated with digital experience and use of mobile phone. Young members of a household are found to belong to the "earlier adopters" group of Roger's (1995) two major adopter categories. Access to requisite adequate training are the predictors in the diffusion of mobile based service innovation. The relationship between level of awareness of the mobile phoneapplications or new line of value added services and adoption of such innovation has been positively co-related. Affordability and control over substantial financial resources makes user members of households venturesome, and help to absorb possible loss from an unprofitable innovation.

During survey, the researcher expose to many critical questions based on "What?," "how?," and "why?" of the innovations from the villagers. Most of the villagers seek information about the innovation in the knowledge phase. According to Roger's disposition, any question by the respondents would be classified into (1) awareness-knowledge, (2) how-to-knowledge, and (3) principles-knowledge (Rogers, 2003). Many members of households are aware of the innovative functions and services but lack of functional technical knowledge and want of practical exposure to SMS uses and to the embedded applications, internet uses, dissuade them to adopt an innovation.

Most of the affluent urban young have the ability to understand complex technical function of a mobile phone and to apply their knowledge. They can cope with a high degree of uncertainty about an innovation. Many rural youth, with limited resources have become the innovators in general carve of adopters of the villagers.

The degree of uncertainty about the actual functioning of innovation and the social reinforcement from others (colleagues, peers, etc.) affect the opinion and beliefs of the individual member of households about an innovation. Any exposure to scientific and expert evaluations will not necessarily lead to adopt innovation. Instead, subjective opinion of one trusted friends and colleagues about a new innovation can persuade individual member of the household to adopt innovation. Close peers' subjective assessments of the innovation often aids to reduce uncertainty of the members of the households and make the outcomes of innovation more credible to them. Village people are often uncertain about the consequence of their adoption of innovation. Technical assistance, or training at village level can lead to high uncertainty avoidance, thus, help to implement a decision.

Triability affects the choice to adopt or reject an innovation. Households adhere to collectivist culture influence the personal decision of the member of household on innovation to transform into a collective decision on innovation.

However, young,in many households, of the age bracket of 16-24 are found to possess different opinions from their parents in relation to the use of mobile phone application and service portfoliosirrespective of rural and urban. Many young and teenagers are well aware of different types and sizes of mobile phone of diverse device manufacturers, its associated network, and service specification and embedded new features.

Interestingly, in many urban households specially from Tezpur and Dhekiajuli Municipal Towns, children from age bracket of 16 to 24 years are found to opine in defense of his or her requirement for having a mobile phone when he or she has not received granted permission from their parents to own and use it considering the tenderness of the children.

In many cases, young won't take pocket money from parents and manages the expenses of their own.Reading a book, networking with

people, listening to music and surfing the net, down load the pdf files and so on are usual daily tasks for many young surveyed users. Young users aged 14- 25 are found to be the major users of instant messaging apps.

The preferences of younger early adopters in content category is noticeably observed in their lesser interest in entertainment and information and greater interest in games and horoscopes.

Women are not the initial adopter of mobile phone if they are compared to their male counterparts in households. The adoption of mobile phones with advanced features by women in rural areas suggests that mobile phones are becoming affordable and accessible in rural areas.

Compared to having no access to ICT and its equivalent digital technologies in the village, the mobile phone in a household offer the members opportunities to consume services which they otherwise would not have accessed to.

Survey did not find a household which did not possess a single mobile phone. People without a mobile phone are counted as laggard 'mobile rejecter' who form the last group after late adopter in the upward graph of various adopters in diffusion of innovation.

Old member of the household and specially the female elderly members of the household are found to fall in laggard category of adopters of an innovation.

It is interesting to note that without training, the adoption rate of different service schemes are higher in the urban areas as compared to rural areas. This could be explained by the difference in the level of exposure to technology and services in rural-urban set up in general. The urban population is likely to raise their appreciation of what Information and Communication Technology is, what it can do, and how to use it as they have adopted 3G and 4G technology and its associated innovation in services and applications.

Survey findings reveals that communication via e-mail and chatting for information seeking, research activities, and reading news are ranked higher in the urban and semi-urban regions, while information searching activities are popular to certain extent in rural areas.

Cell phone ownership is higher in the urban areas as compared to rural areas. Compatibility score moves the household users in urban areas to make use of computing and sensing features in cell phone than the household users in rural areas. In villages, household user's compatibility score of using mobile phones is higher than that of computing and sensing apps in cell phone. Affordability of purchasing a mobile phone or a smart phone and the services used stand synonymous to compatibility. Accordingly, free of charge service could make any innovation compatible to the economic realities of the adopter household.

Survey finding suggest that any free internet services in schools may get less attractive than pricey mobile phone services because of ease of use, convenience of portability or mobilityto essentially motivate an individual for adoption of such services.

Facilitating conditions are crucial to support the user to use a technology such as improved networking bandwidth, effective government policies, adequate financial resources, positive attitude and necessary skill to facilitate the use of technology. Government has not initiated free or subsidized mobile value added services to be available for members of households.

Individuals are likely to expose themselves to messages that are consistent with their attitudes and beliefs (Rogers, 2003). It is likely to bear on the household member's interest in computer and internet use and to hear about the new innovation in service and application domain of mobile phone.

The ubiquitous character of mobile phone technology brings many benefits and opportunities which are perceived advantages of mobile phone technology over other communication devices. Mobility has been found to be among the user's preferences or needs which ne-cessitates the services to be available anywhere everywhere irrespective of a specific context.

By providing diverse array of benefits, mobile services enable users to access all kinds of information, interact with each other, perform a task, communicate, make banking transaction and even entertain themselves.

Acceptance of any mobile services depends on the worth and vales it gives to its user. User considers that any service should enhance user performance in doing a particular task. Many of the current, up-to-date available mobile services do not provide any value to its users except satisfying the hedonic intent. Services that improve user's performances are perceived to be utility service.

However, lack ofsufficient bandwidth, and absence of network coverage in some areas make some services non executable. Absence of eye-catching video content and the small screen of the device lead to noncompliance to users' expectation and has resulted less adoption of mobile TV in surveyed households in Sonitpur District.

3.2 Adoption of Transaction Services
The Indian Government and the Reserve Bank of India (RBI) have identified 'Financial Inclusion' as one of the key objectives to increase GDP of the country. Yu. S (2009) in his study substantiate that that mobile banking is cost effective and a simple way to provide banking to the non-banked customers. Government of India has realized the potentialities of M-Commerce to promote financial inclusion and to foster economic growth for large sections of the Indian society by ensuring effective partnership among different profit-non-profit entities. Government appreciation on the role of M-commerce to development has further facilitated a conducive environment to adopt innovative mobile services.

In India, only 5 percent of total mobile phone subscribers are registered users of mobile banking and only 0.5 percent of them are active mobile banking users (Kumar Reji .&Ravindran, 2012). However, users of active mobile banking are also restricted to information based services.However, rural households are aware of the mobile phone services related to payments, transfer of money, ticketing etc.

Prepaid is accepted by rural households and it has ready served market need for many Indian consumers. This facilitates Indian consumer to accept mobile phones as their e-wallet for money transfers or other electronic payment transactions.

Mobile payment services have not attained popularity in household users despite the large mobile subscriber base and the reach of the medium to a large unbanked and under-banked population. The limited presence of vendors who accept mobile mode of payment restrain household consumer to adopt mobile payment. All banks have not started offering mobile banking services to customers so far and all mobile phone device does not supportmobile banking.

Digital illiteracy, lack of information literacy, problems related to cellular connectivity are a few reasons to dissuade rural household users to use mobile phone for banking. Most of rural households have no clear idea about mobile banking and its uses and advantages.

Low reliability of mobile internet connections as compared to Personal Computer and Internet connections tend to increase the failure of transaction. Moreover, factors such as the contrivance of filling cash at merchant points, know your customer (KYC)sign up, and limited merchant points where the wallet can be used to make payments lead to slow customer adoption of mobile wallet.

However, services related to remittances, ticketing and utility payments are adopted by the urban household users because of its direct-to-consumer model, ability to give convenient access points to consumers and make mobile phone a channel for the hitherto unbanked users to gain and use a bank account.

Survey has substantiated that user or customer requiresconvenience to pay for digital goods and services as part of their regular prepaid recharge or monthly post-paid billing. Reserve Bank of India has to relax the restriction to use talk-time balance as a currency for purchas-

ing goods or services which could necessarily motivate mass adoption of mobile payments, especially for digital goods and services.

Consumers in India have not yet adopted M-Commerce services because they are still apprehensive about secured monetary transactions through mobile phone. In order to enable adoption of M commerce service, it is essential to build consumer awareness of the services; ensure high reliability and security of the service concerned and to win the trust of the consumer.

3.3 Existing Digital Divide and Barriers to Adoption of Innovation

The government's vision for financial inclusion of the hitherto unbanked users has to be supported by expansion of telecommunication infrastructure and networking and nationwide rolling out of identity number. Strategic alliance between financial Industries and mobile operators is imperative to make credit markets easy, accessible, secure and fulfilling for consumer.Expansion of at least a few retail banking outlets in rural India and to create a conducive market environment for those banks is essential in order to develop market opportunities for 'bottom of the pyramid' consumers in rural India.

Many rural households have lack of idea and awareness about e-wallet for electronic payment, however, they are looking for the innovative uses of mobile phone for money transfer.

Acute levels of poverty and deprivation characterize most of the rural areas of Sonitpur District. As a result, any developmental initiative of Government has compelled to prioritize towards public health, housing, provision of clean water and education, instead of developing telecommunication infrastructure to ensure the inclusion of the citizens in the so-called information age. The focus on such basic social needs invariably reduces the access to information as one among the endless list of social needs considering that the telecommunication networks are not so indispensable for a poor region where there is dearth of basic needs.

The policy disparities in telecommunications also inevitably affect the level of digital opportunities for the people living in a particular region. The growing population, insufficient funds, affordability, and delays in implementation of government policies and programs are the challenges that lead to unequal development in the society, which defydiffusion of innovation.

Factors such as age, technological illiteracy, technological phobia and the lack of motivation are the impediments which make member of households digitally disengaged even if the household earn comparatively higher income. Similarly, lower income does not always result in digital exclusion. BPL communities may not afford to access to the Internet or digital technologies such as TV, printer, pager and a camera at home, still these BPL households are found to possess one or, sometimes, more than one mobile phones for themselves.

BPL households can become consistent user of digital technologies themselves in public libraries, cyber cafés, rural Internet centers and other public access points if they can identify their needs to use these technologies. The needs, preferences, attitude to own and use a technology differ from person to person.

The possession of resources by the user (financial, skill based)and the environment they withstand (conducive policies and user's individual positive attitude towards technology use) do vary among users. Possession of mobile phone and the need driven uses cannot make much distinction between young and old users in the pretext that everyone use a cellphone. Rapid evolution of digital technologies has embedded new applications and service provisioning with the old easy way to use mobile phone. As a result, technology has been diffused but the differences between ownershipanduses have not passed over. Instead, the applications and services that the advanced convergent cell phone or smartphone provided has created new digital divides among users especially between young and elderly users of household.

Electricity is another significant pre-requisite to use digital technologies irrespective of rural urban divide. Problem of electricity counts more in the villages. Frequent cut in electricity in almost all the sur-

veyed area across Sonitpur District and the ever existing story of electricity for two hours in the morning and evening is responsible for digital divide. This results not only challenges to the diffusion of technologies, but also a gap in accessing digital technologies by householdsand seemingly exacerbated digital divide.

The rural household users have only one third of the purchasing power compared to the two other groups. However, both rural and urban households spend almost the same amount of money on mobile phone. The survey findings bring out that Internet café users in the urban regions of Sonitpur District and Guwahati as compared to Rural Sonitpur District is higher in numbers. On a query related to the means and instrument of accessing internet in rural Sonitpur District in Assam, it is found that many rural youth between the age brackets of 15 to 35 access internet through mobile phone. Village households are found to use Internet café when they have to download any official document and for official transaction through email. A pertinent gap in uses of internet café in rural Sonitpur District is found in the numbers of female and old users, so age and gender are key variables to identify the digital divide in terms of access to internet. Previous study found the positive co relation between educational attainment and likelihood of using the Internet and digital technologies. Higher education has a sturdier effect on internet usage than education in high school level (Seemann, 2003). Cagri (2013) in his survey finds that increasing level of education in English language and computing increase the degree of computer and Internet usage. However, information seeking attitude is negatively co-related with the use of digital technology as per the nature of information requirement by the users.

Looking closer to the combination of the users' profession and the number of alternatives for internet access, survey findings suggest that proportionately large number of government employed adult members and unemployed members in the rural households have alternative internet access at home and at their work place and they do not possess an interest of owning a mobile phone with convergent features.

4. Summary

Keeping with the general trend of access inequality and digital divide intact in both the developed and developing countries that the richer classes are the first to own and use these innovativeservices while the poorer people at first belongto laggard category can have piecemeal access to services of mobile phone value chainsonly as 'trickle-down' effect when they can afford the cost. Affluent people tend to live in places with good telecommunication infrastructure with broadband and wireless networks. Again, the capital-intensive internet kept poor people out of the fringes to purchase the service.

Concerning the main activity of the head of the household, it is found out that most of the people undertaking agricultural or farming activities are digitally poor people in rural Assam, while people undertaking service activities are found digitally educated to certain extent. It is important to note that there are good numbers of unemployed people in the category of the digitally poor individuals.

The study hypothesizes that the lower the poverty level, the higher the likelihood of the household having digital access (internet especially after having mobile phone) which is negated by the survey. From the survey, it is found out that people are more comfortable with the voice technologies embedded with digital medium. Surveyed households'have pleaded for incorporation of low cost voice technologies like text to speech and speech recognition into mobile phone. Resulted technology absorption can effectively deliver internet services on the convergent cell phone with internet applications.

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I-mode users have access to various services such as e-mail, sports results, weather forecast, games, financial services and ticket booking. | [3]LTE, an abbreviation for Long-Term Evolution, commonly marketed as 4G LTE, is a standard for wireless communication of high-speed data for mobile phones and data terminals. It increases the capacity and speed using a different radio interface together with core network improvements. | [4] The App Store offers more than one million apps by Apple and third parties and is ranked as the world's second largest mobile software distribution network. | [5] BlackBerry Limited, formerly known as Research in Motion Limited (RIM) is a Canadian telecommunication and wireless equipment company best known to the general public as the developer of BlackBerry brand of smartphones and tablets. | [6]iPhone is a line of smartphones designed and marketed by Apple Inc. It runs Apple's iOS mobile operating system. The first generation iPhone was released on June 29, 2007. The inbuilt user interface coupled with multi-touch screen, virtual keyboard, iPhone has Wi-Fi and can connect many cellular networks, GPRS, EDGE, UMTS, 4G and LTE. An iPhone can shoot video, take photos, play music, send and receive email, browse the web, send texts, GPS navigation, mathematical calculations, and receive visual voicemail. | [7] WhatsApp Inc. was founded in 2009 by American Brian Acton and Ukrainian Jan Koum (also the CEO) is based in Santa Clara, California. The client software is available for Android, BlackBerry OS, BlackBerry 10, iOS, Symbian Series 40, Symbian Series 60, and Windows Phone. | [8]WeChat is a mobile text and voice messaging communication service developed by Tencent in China, first released in January 2011. WeChat claims to provide a social networking platform that emphasizes user privacy and fast response performance. | [9]LINE is a Japanese instant messaging application for smartphones and PCs launched in Japan in 2011, reached 100 million users within eighteen months and 200 million users only six months later. | [10] Viber provides free call, text, picture sharing with anyone and location sharing with viber users. | [11]Kakao provides an array of services such as Kakao Talk, Kakao Group,Kakao Story, and Kakao Place for Social Networking, Kakao Music for song podcast and download, Kakao Home Provides Home Screen, Kako Album for Photo and Video, Kakao Page and Kakao Style for Lifestyle, ,Kakao Topic for News etc. | [12] QR code or Quick Response Code is the trademark for a two-dimensional barcode first designed for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte / binary, and kanji) to efficiently store data. | [13] Mobile payment, also referred to as mobile money where instead of paying with cash, cheque, or credit cards, a consumer can use a mobile phone to pay for a wide range of services and digital or hard goods. | [14] BRIC is an acronym for the group of countries -Brazil, Russia, India and China, all four of which are at a similar stage of newly advanced economic growth. | [15] Semi-closed mobile walletsis the weapon of financial inclusion and they do not require the user to have a bank account. One noticeable drawback is that a user can add cash but can't draw it out. | [16] I-mobile is ICICI bank's mobile banking applications that offers services such as transfer of funds, pay bills, book tickets. | [17]NGpay is the mall on mobile, the application has to be downloaded to book air, rail, bus, shop for favorite brand, recharge mobile and DTH set, for round the clock convenience. | [18]Tatawalkys is available only in Delhi & NCR market. It combines effortlessly the functionality of mobile and the stability of landline. It offers wireless desktop phone let users talk and SMS by enabling internet connection. It has opened the provision of making payments over phone with Mcheck. | [19] Mobile wallets are digital products that can be loaded with cash, usually through a mobile payment provider or telecom operator such as Airtel or Vodafone, and can be used to purchase goods electronically. A mobile wallet makes everyday bill payments and other money transfers easy and secure by using a mobile phone. The mobile wallet module empowers financial institutions and banks to connect consumers in rural areas and increase their reach at a lower cost. | [20] Airtel money is a convenient way to pay, send and recharge directly via mobile phone. There are over 7000 merchants who support transactions using Airtel Money. The user has to dial *400# to register and load cash at your nearest airtel money outlet or online at www.airtel.in/money. It helps to send money, pay electricity bill, shop online, recharge DTH, and recharge mobile, book movie ticket, book train ticket. | [21]State Bank of India has launched Mobicash Easy, a prepaid mobile wallet service that allows users to transfer funds and make bill payment among others. The service has been initially launched in Delhi and Mumbai. | [22]Oxigen is a wallet apps to provide the service such as recharge, money service, payment for telecom, banking etc. This app has to be downloaded by the user to get access the services. Oxicash is one stop shop that satisfies payment requirement. | [23]Zipcash is a digital currency allows to shop online and offline in a safe secure manner. | [24]MPOS has transformed iOS and Android smartphones into card accepting POS terminals at merchant outlets through a small card reader and mobile app on the handset. Numerous mPOS devices and services such as Swipeon, OxiShaan, MTS mPOS ,PayPOS etc. are launched with collaboration with banks in the last 12 months. Point-of-sale (POS) is the place at which a buyer makes a payment to the trader in exchange for goods or services. In return, buyer will get a receipt for transaction from the trader. In various retail industries, POS uses customized hardware and software as per their requirements. | [25]mGurujee (India) – allows users access to content in areas of engineering, management, civil services and medicine; school syllabi of CBSE and ICSE boards as well as skill development, vocabulary and general knowledge tutorials IGNOU (India) – Exam alerts, available in five regional sectors with a network of 30,000 – 50,000 students | [26]English Seekho (Tata DoCoMo) - allows users to take conversational English language lessons on their mobiles through an interactive voice response (IVR) application that guides the user through audio clips. It offers short lessons followed by interactive lessons which enable users to practice what they have learnt through the mobile's keys or through speech recognition. |