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FACTORS INFLUENCING TECHNOLOGY ACCEPTANCE IN THE BANKING SECTOR: A BINARY RECURSIVE PARTITIONING APPROACH

Vinay Changati*, Purva Kansal**

Abstract *Public and private sector banks have both given up trying to resist technology-based systems. However, for four years, the conservatism school of thought exhibited by banks, has given rise to this conclusion and conservatism to experimentation by customers. These customers choose to side with resistance and skepticism for the management and their holdings.*

However, as the banks are implementing more and more technology-based systems, the deadlock is no longer the managerial and marketing acumen required to implement these systems, but the consumer acceptance. The current paper is an attempt to review the paradigms of technology evaluation to drive a working definition of acceptance. The paper tries to make an attempt of understanding customer perception about self-service banking technologies using binary recursive partitioning methodology.

The results of this study indicate that the original technology acceptance model holds together for the sample studied at the bottom of the pyramid. Furthermore, based on experimental grouping by native place, whether urban or rural, only four out of nine sub-constructs held up to offer salient subgrouping of participants. Overall, the results indicated that, perceived usefulness was of vector variable to divide the participants.

The results of the study will help managers design marketing and managerial acumen which will help them gain higher technology acceptance from the consumers.

Keywords: *Binary Recursive Partitioning, Technology Acceptance Model, Bottom of the Pyramid, Urban and Rural Markets in India*

INTRODUCTION

Systems development, of any organisation, often precedes by technology development and succeeds by technology acceptance. This is because a technology development offers a scope for increased information capture, control and thus aids better management and productivity. Once technology is developed, organisations in order to synergistically imbibe these advantages offered by the technology develop systems and offer the technology to its customers. From customers' viewpoint, the new technology-based systems offer advantages in form of quicker and assured service delivery, and enhance in general the experience of availing services (Pantano & Di Pietro, 2012). New technology-based systems, therefore, help all the stakeholders deal with variability, intangibility, inseparability and perishability characteristics of services and marketing problems thereof, in a more efficient manner.

Therefore, most companies look upon investment in technology as an obvious and generic advancement of an organisation's growth strategy. This advancement is more than often stalled by the resistance to adoption of technology, both internally with employees and externally with customers. This resistance to adoption of technology by stakeholders often results in failure to implement technology and in turn leads to organisations reporting financial losses and dissatisfaction among employees and customers (Godoe & Johansen, 2012).

One perennial reason for such a setback, prominently pointed in the mid-1980s and still relevant, was given by Kraus and Barton. These researchers in their work cited that skilled required for technology development are different from technology implementation. In organisations more than often the managerial personnel are better qualified to

* Kumaraguru College of Liberal Arts and Sciences, KCLAS, KCT Campus, Chinnavedampatti, Coimbatore, Tamilnadu, India. Email: cvk.atreya@gmail.com
** Associate Professor, University Business School, Panjab University Chandigarh, India. Email: purvakansal@pu.ac.in

lead technology development, but often lack the experience to guide its implementation (Leonard-Barton & Kraus, 1993). Therefore, implementing technology requires more managerial and marketing acumen, which apparently is not readily available, either tacitly or explicitly.

However, whether to develop technology or not is not an option that organisations are free to choose anymore. Leveraging these novel technologies help companies gain sustained competitive advantage by offering a certain degree of difficulty in imitability to the competitive capability (Lai, 2017), unlike other resource-based strategic developments. This survival of the fittest in the competitive landscape leads to a degree of inevitability of technology development effort by organisations. In a bid to stay competitive exponentially, these organisations have redefined the variables of success, i.e. how quickly technology can go to market and how much market the technology can appease.

While resistance to technology is a battle no one ever wins, generally, banks appear to become its face. Resistance to technology, in India, is partly because of the regulatory framework that holds the banking system intact. This school of thought is based on a working culture that encourages risk aversion and conservativeness to experimentation. Over the years, this conservatism has given rise to a large base of captive customers who choose to side with resistance and scepticism for the management and their holdings. It appears that such a deadlock situation sustains itself all the time. This deadlock is well exhibited by twin prospects of rise in personal banking via Internet transactions and mobile penetration (Rebello, 2013), with increase in scepticism over the implementation of artificial intelligence that creates concerns over privacy.

This deadlock is posing a particularly difficult and complicated bottleneck in the Indian banking scenario. On one hand this industry in India is reeling from after effects of demonetisation that has not only propelled the use of Internet-based banking transactions, but has also led to upsurge in payment technologies such as BHIM and other Unified Payment Gateways, and a rank in the top 10 countries by mobile banking users. This growth is positive news for the banking industry, but it is leading to deadlock because it is accompanied by a decrease in the confidence in the functioning of the banking systems (Livemint, 2018). This deadlock has led to increase in the calls for a regulatory overhaul in India and need for fortifying the operations of banking systems in general. An inefficient banking system is seen as an impediment for economic growth.

Ironically, the solution to the deadlock is again looked for in technology. Several state-of-the-art technologies, such as blockchain, robotic process automation, artificial intelligence, chatbots, cloud computing and visualisation tools, are seen as a solution to the call for increased security. However, the question that plagues the landscape is not one of whether these can be integrated into the existing operations and systems in the banking sector it is one of customer acceptance.

The customers who are voluntary users of technology by virtue of their education, upbringing, and exposure to technology at early ages are not part of this. The challenge is whether the customer at the last mile is able to accept the technology and use it to derive benefits that the technology is meant to serve. These consumers are reluctant to adopt technology-oriented business processes because it requires significant behavioural change and they have to become co-producers in which case the responsibility for delivery of service and satisfaction becomes partly theirs (Meuter, Ostrom, Roundtree, & Bitner, 2000; Sannes, 2001). These technologies are being referred by the banking sector as self-service technologies.

Self-service banking technologies have been seen as not only solution to the deadlock, but also a solution to the economic growth and Indian Governments dream of financial inclusion. How? Consider the two sets of statistics. First, a study conducted by ASSOCHAM and EY 19% of the India's population is excluded from banking services (ANI, 2017). This makes Indian economy as having the world's second largest unbanked population after China (PTI, 2018). The second set of statistics states that India has one of the fastest growing markets for mobile phone subscribers. According to Telecom Regulatory Authority Of India (TRAI), as of 18 July, 2018, total number of telecom subscribers 1131.01 million of which 625.66 million subscribers were from urban India and 505.34 million subscribers were from rural India (TRAI, 2018). Further, out of these subscribers 291 million urban mobile were Internet users and 187 million rural mobile were Internet users as of December 2017 (Report, 2018). Therefore, for an economy like India, the possible solution is to leverage mobile technology to get banking services to this population.

Therefore, the problem facing Indian economy is financial inclusion and the solution is mobile banking. The conundrum to this seemingly simple equation is the technology acceptance by the consumers. This is highlighted by a simple fact that 90% of the 100 million accounts opened under the financial inclusion plan since 2006 are lying unused (Jain, 2012). The current paper is an attempt to review the paradigms of technology evaluation. An attempt is made to review the theoretical models around technology acceptance to drive a working definition of acceptance. Secondly, the paper sets forth its operational objectives of understanding customer perception about self-service banking technologies; and presents the design of the study, sample, and methods. Lastly, the operational hypotheses are tested, and the findings are discussed with a pointer towards theoretical, managerial implications and concluding with limitations of the study and probable strands for further research.

TECHNOLOGY ACCEPTANCE MODELS: THEORY DEVELOPMENT

The review of literature was undertaken to review the existing paradigms of technology evaluation. The review has been undertaken from the three independent strands of existing literature. First, theories and models of technology acceptance are reviewed which were found to be on a spectrum between focus on technology and focus on user. Second, a review was undertaken of the available research on reasons of acceptance or reluctance to accept technology and nuances exhibited by them. And lastly, a review of technology acceptance in the banking sector, especially in India, was undertaken.

Spectrum of Theoretical Models

Review of literature indicated that there were broadly two perspectives of understanding technology acceptance. One perspective explored the aspects of technology which attracted and motivated the users to adopt while the other perspective was more of a user perspective. This user perspective dealt with the nuances of the individuals who accepted technology - their personalities, forces to use technology, etc. Review of various theories indicated that these theoretical models are split, either in whole or in major part, between these two perspectives, i.e. technology perspective or user perspective.

Theory of Reasoned Action (Ajzen & Fishbein, 1977) has been very extensively used to understand and predict the behavioural intentions of a population. This theory provided an understanding of technology acceptance and adoption from a user perspective. The theory as applied to technology context professes that the intention to use technology depends on attitudes and subjective norms of its users. One glaring condition of this theory that conflicts with disruptive development of technology is that behavioural intentions to use must remain stable over the time of measurement of the behaviour and the performance of the behaviour. Another roadblock in advancing this theory is that it gives the user the volitional control on whether to use technology or find and pursue another alternative. While that control assumption for the user, is by itself not a problem, it tilts towards the user behaviour being more self-driven rather than being amenable for inspiring modifications. Also, the theory assumes an innate capacity of the users in handling technology and has a total absence of technical perspective. Therefore, this theory lies more towards the user perspective of the spectrum.

The review of literature indicated that another popular theory on the landscape of consumer behaviour in case of technology acceptance was theory of planned behaviour. This theory was proposed by Ajzen1985, and it extends the scope of volitional control that the tutorial of reasoned action talked about (Ajzen, 1985). This theory extended the theory of reasoned action by including another variable called the perceived behavioural control to reconcile the branching of favourable technology use intentions only occasionally leading to actual acceptance and use of technology, while on other occasions did not lead to a real acceptance or adoption. The idea of such perceived behavioural control is derived from theories of self-efficacy, acknowledging that perhaps user behaviour must be amenable to modification by some external factors, especially those which assist the users in developing a control belief. The theory advanced in the directions where the construct, belief, was considered to be not monolithic but multidimensional. Thus, a decomposed theory of planned behaviour made way to understand which type of control beliefs can give the users a stable base for not just having a favourable intention to use, but move towards actually using the technology. Here too, the theory slides towards user perspective, with almost no acknowledgement of technology perspective, although some works suggest that such perspective is latent between the attitude and belief constructs.

In order to advance the works of theory of reasoned action, Davis in 1989, proposed Technology acceptance model, to explain the behavioural intention of an individual to use information systems (IS) (Davis, Bagozzi, & Warshaw, 1989). From a technology perspective, Technology Acceptance Model is a more inclusive extension to the theories of reasoned action and planned behaviour. This theory proposes two critical elements, namely perceived ease-of-use (PEOU) and perceived usefulness (PU), which integrate elements of technology with those of user attitude. TAM, over the years has become one of the most widely used mortars in technology acceptance studies (King & He, 2006). Also, the inclusion of PEOU and PU discount the inherent assumption of user’s capacity for handling technology, and also provide a better balance between user and technology perspectives in advancing a generalised understanding of technology acceptance and adoption. An extended version of this theory, popularised as TAM2, added antecedents of perceived usefulness while TAM3 added antecedents of perceived ease-of-use (Venkatesh & Bala, 2008). These extensions came under criticism since they made the underlying theoretical model complex, almost reaching a stage of chaos for any reasonable interpretation and application to be possible, also pointing that research developed better in splinters than through efforts in a unified theory of technology acceptance. Therefore, this theory was more balanced in terms of discussing technology perspective as well as user perspective of the spectrum.

Another attempt to explain individual performance is Task Technology Fit model. Theory of Task-Technology Fit (Goodhue & Thompson, 1995) propounds that technology is more likely to have a positive impact if the capacities it offers match with what its user intends to do regardless of the attitude towards the technology. This theory begs for a finer understanding of characteristics of task and technology, while at the same time evaluating the utilisation of technology and its impact on performance on the task. The model is based on two different complimentary schools of thought, i.e. attitude is the predictor of utilisation and task technology fit is the predictor of performance. The technology fit model explicitly talked in terms of task characteristics which take into consideration individual abilities to adopt the technology. It further states that developing an understanding of the characteristics of the task and evaluating the utilisation of technology on the performance of the task would develop a feedback loop which then (i) will allow the users to suggest changes to technology and (ii) assist the developers of technology to make it a better fit for the task at hand. This theory too clearly falls in the technology perspective, although the user perspective is gathered but limited to the preferences of functionality of technology, rather than the personality of the users. While the theory holds importance in bespoke technologies, regulated and standardised technologies such as in Banking impel gauging deeper insights about user preferences, non-intrusively.

Theory of Diffusion of Innovations, popular theory and has been used in several disciplines such as political science, public health, communications, history, economics, technology, and education (Dooley, 1999), was proposed by Rogers, 1995(E. M. Rogers, 1995). He identified four parameters that enable widespread acceptance of innovation. Applied to acceptance of technology, these four parameters are: (i) the technology itself, (ii) the communication channels through which it is promoted, (iii) the timing of infusion of technology, and (iv) the social system comprised of individuals whose attitude towards technology could vary from voluntary early adoption to involuntary rejection or worse not being even aware. The user perspective is subsumed by an overarching social systems view, where Rogers refers to social systems as "interrelated units engaged in joint problem solving" (p. 23), thereby giving more attention to networks that drive systems, and the roles that individuals may take in those networks, such as opinion leaders. Therefore, this theory refers to technology as hardware and software (E. Rogers, 2003) is categorised as a theory which lies more towards technology perspective of the above mentioned spectrum.

The distribution of these theoretical models between perspectives may be represented as in the figure below, with technology acceptance model being the centre of balance.

Fig. 1: Distribution of Theoretical Models

The reason behind theories populating such a wide spectrum is the motivation to try and best explain what and who of technology. Businesses expect research to inform why certain technologies gain acceptance while others don't, and business developers keenly look out for cues to understand what kinds of technology they should be developing and who would be its takers. Accordingly, the efforts of research in this field have been spread over the entire spectrum, producing context-specific inputs, more often derived from experience than prognosis. Therefore, the literature has also defined the term acceptance over the entire spectrum differentiating it from adoption. Adoption has been defined as a wider process which starts with the cheese of technology and ends with the user embracing and making full use of the technology. Acceptance has been defined as an individual's behavior stage between purchase and full adoption.

Based on the review the concept of acceptance has been operationalised, for the current study, as "the demonstrable willingness within a user group to employ technology for the tasks it is designed to support". The premise of the study is limited to the acceptance as use of technology. It is accepted that there may be differences in intended use and the actual use of technology, but for the current study such differences are considered insignificant to conclude acceptance so long as the use of technology is exhibited. Though such a definition is basic, the study of such acceptance will help determine the success of any technology implementation.

The model development of the current paper necessitates study into the second strand of literature which talks in terms of reasons of acceptance or reluctance to accept technology.

Who may not accept technology and why

One of the pre-requisites of a technology being a success or a failure is acceptance of the technology by the users. TAM posits that behavioural intention is determinant of actual use and behavioural intention is in turn determined by perceived ease of use and perceived usefulness and that perceived usefulness of a technology increases as it is perceived as easier to use (Davis, 1989; Davis et al., 1989; Davis & Venkatesh, 1996). Therefore, the company might highlight, perceived ease of use, perceived usefulness, task usefulness and performance elevation by use of technology, however, all the performance impact with the lost if the user does not accept the technology. One of the major strands of technology acceptance literature deals with factors which influence technology acceptance.

Review of existing research highlighted a bunch of variables which would affect the acceptance of technology. One such variable associated with technology acceptance has been perceived risk be it ecommerce, online purchase or online banking (Featherman & Pavlou, 2003; Lee, 2009; Pavlou, 2003; Zhang, Yang, Wang, Zheng, & Sia, 2015). Another variable which effects technology acceptance has been indicated as Trust. Researchers have indicated that in case of online consumers trust had a significant impact technology acceptance (Bhattacherjee, 2002; Gefen, Karahanna, & Straub, 2003; McCloskey, 2006; Pavlou, 2003). Researchers have also indicated that in some cases perceived cost of using the technology influences the technology acceptance (Karnani, 2006; Pitta, Guesalaga, & Marshall, 2008). Some studies have highlighted consumers lack willingness to use a technology due to perceived lack of control over technology (Parasuraman & Colby, 2014) while others have tested and supported the notion of perceived compatibility with values a significant variable for technology acceptance (Kapoor, Dwivedi, & Williams, 2014; Peng, Wu, & Liao, 2014). Review indicated that technology acceptance also depends upon trialability (Deng, Lu, Zhang, & Wang, 2008; E. M. Rogers, 2010); support (Makame, Kang, & Park, 2014); social pressures to use innovative technology options (Davis, 1993; Y. Wang, Meister, & Gray, 2013) and relative advantage new technology is perceived to have over the new technology (Oh, Park, & Lee, 2014).

Therefore, it is argued that factors like perceived ease of use, perceived usefulness, perceived cost, perceived risk, trust, technology discomfort, compatibility with values, trialability, support, social influence and relative advantage will influence who may accept and may not accept technology.

Another important aspect of who may accept and may not accept technology is a set of moderating variables.

Review of literature indicated that one of the earliest analysis of empirical literature undertaken by Zmud in 1979 regarding the impact of individual differences like demographics, gender, age, level of education and personalityon technology acceptance (MIS)(Zmud, 1979).

Some research was found to support the argument of gender being one of the individual differences which influence technology adoption right from the risk dimensions to the perception of capability (Karjaluoto, Riquelme, & Rios, 2010; Y. S. Wang, Wu, & Wang, 2009) and perception on technology (Gefen & Straub, 1997). Evolutionarily, technology has been seen as gendered, in so much as treating that men actively engage with technology, whereas women are more likely to be passive beneficiaries of it (Bray, 2007), a perspective which finds support in the reduced proportion of women population in technology-based jobs. Explanations for such gender differences appear to be attributed to reasons ranging from technological incompetence to alienation of women from development of technology. Allegations pervade making such gender difference more or less an academic truth (Gendered Technology, 2009), therefore, barely acknowledging the consequences of such differences and thrusting a uni-gendered perspective on diversified world, leading to cultural isolation of women, at least in a digitally social world (Green & Singleton, 2013). This gender differences in technology acceptance are important in a Patriarchal society like India. Masculinity is associated with independent, career oriented, hardworking, courageous (Basu, 2010) and more technology savvy (Ong & Lai, 2006). Therefore, based on review of literature, it can be argued that in a patriarchal society like India, male would have a technology inclusive education and therefore, will accept technology more readily as compared to females.

Another moderating variable, highlighted during review of literature, was age. Review indicated that though age has received less attention in technology acceptance research yet age as a variable influenced the strength of relationship between performance expectancy and intention and acceptance (Venkatesh, Morris, Davis, & Davis, 2003). Meta-analytic studies in different age groups indicate that the technology acceptance of older adults is only partially explained; that a model such as TAM too does not cover for variables specific to that subgroup such as biophysical and psychosocial characteristics which may influence the acceptance and use of technology (Chen & Chan, 2011; Sun & Zhang, 2006). This is not to stereotype that older adults are less likely to accept technology (Mitzner et al., 2010), but that their acceptance depends on the general public acceptance of technology, the assistance they get in building their capacities to cope with technologies, the perceived usability of the technology, and their satisfaction in using it (Wang et al., 2011). Also, older adults seem to prefer socialising assistance rather than tech-based assistance (Ezer, Fisk, & Rogers, 2009). Therefore, it is argued that technology acceptance would be higher in younger respondents than in the elder respondents.

Some research was found to indicate that among other moderating variables education and income were also significant. Empirical studies indicated that the technology acceptance is lower in less education and low income groups too (Porter & Donthu, 2006). Income appeared to influence the subjective norms, which then influenced the intention to use technology (Brown & Venkatesh, 2005). Education influenced skills, which then influenced the decision to try or use technology (Van Dijk, 2006).

Therefore, based on review of literature, it is argued that multiple moderating variables would influence the technology acceptance construct. For the present study these are age, gender, income and education. Therefore, current study is an attempt to extend the original Technology Acceptance Model, operationalising External Control Variable into sub-constructs selected based hypothesised influence on intentions to use technology.

The third strand of literature reviewed for current paper was in context on technology acceptance in banking sector in India. Review has indicated that in past few years there has been a convergence of communication technology and banking, and this has led to development of vehicles like mobile banking which boast of advantages like independence, convenience, cost saving and promptness to the customer (Masinge, 2010). These technology-based vehicles (like mobile banking) have been referred to as a win-win solution to brick and mortar-based traditional banking methods as average costs for mobile financial transaction is about 20 US cents, compared to US $1.45 at branches (GSMA, 2013). However, the market seems to have hit a snag in terms of technology acceptance by the masses. Past research indicates that consumers are reluctant to adopt technology oriented business processes because it requires significant behaviour change in which at times they have to become co-producers in which case the responsibility for delivery of service and satisfaction becomes partly theirs(Meuter et al., 2000; Sannes, 2001). Further, review of literature indicated that a majority of research in services has focused on developing frameworks to understand and predict a consumer's technology adoption (Aggelidis & Chatzoglou, 2009; King & He, 2006; Schepers & Wetzels, 2007) however, not much has been done to comprehensively study the external constructs influencing the acceptance of technology. Therefore, this study is an attempt to extend the original Technology Acceptance Model, operationalising External Control Variable into sub-constructs selected based hypothesised influence on intentions to use technology in the banking sector.

In the Indian context of after-effects of demonetisation, regulatory thrust to move banking transactions to the digital platforms, increased penetration of Internet and mobile telephony, volume of investments going into development of payment gateways and procurement of license to operate as prepaid instruments and payments banking operators, the furore about the legitimacy of business correspondence model that allows banks to hire agencies to operate on their behalf to achieve last mile connectivity while reducing operational expenditure; it becomes a pertinent question to ask - whether technology can steer banking into better waters. Whether users of banking are ready to accept such technological developments is thus imminent and begs for an answer. The current study places itself here at this juncture, to identify across heterogeneous user groups, what indications there can be of who is likely to accept technology and who isn't, and explore the reasons why.

This study differs in its striving to find a balance between the technology and user perspective in picking these sub-constructs. These sub-constructs as they may be visualised in extending TAM can be seen in the figure below:

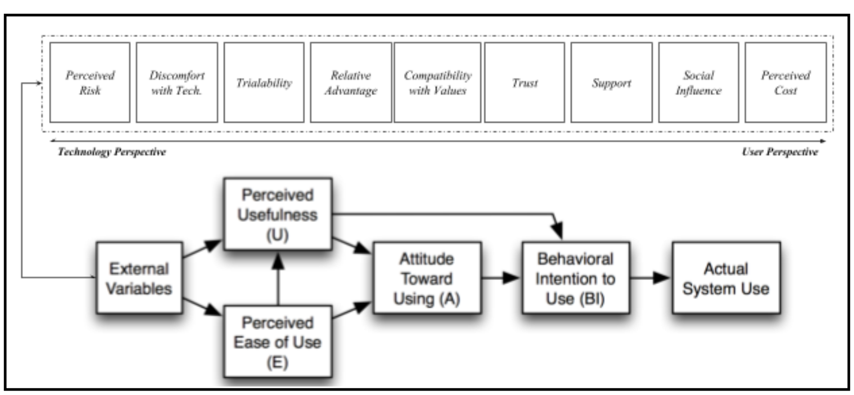


Fig. 2: Variable Model for the Study

The placement of sub-constructs on the continuum can be contentious. However, this study being exploratory in nature was open to admitting the continuum, which is amenable for modifications, improvements, and even customisation to other contexts. One glaring omission known at the beginning of the study were external factors such as geography, availability of infrastructure and access to technology. These were not considered since the objective of the study was more geared towards classifying individuals and exploring the characteristics that make them accept technology or otherwise.

RESEARCH METHODOLOGY

The current study was undertaken to identify across heterogeneous user groups, what indications there can be of who is likely to accept technology and who isn't, and to explore the reasons why. An exploratory research design was adopted to find whether the selected sub-constructs indeed affect perceived ease-of-use and perceived usefulness. The conceptual representation of the relationships to be tested is given below:

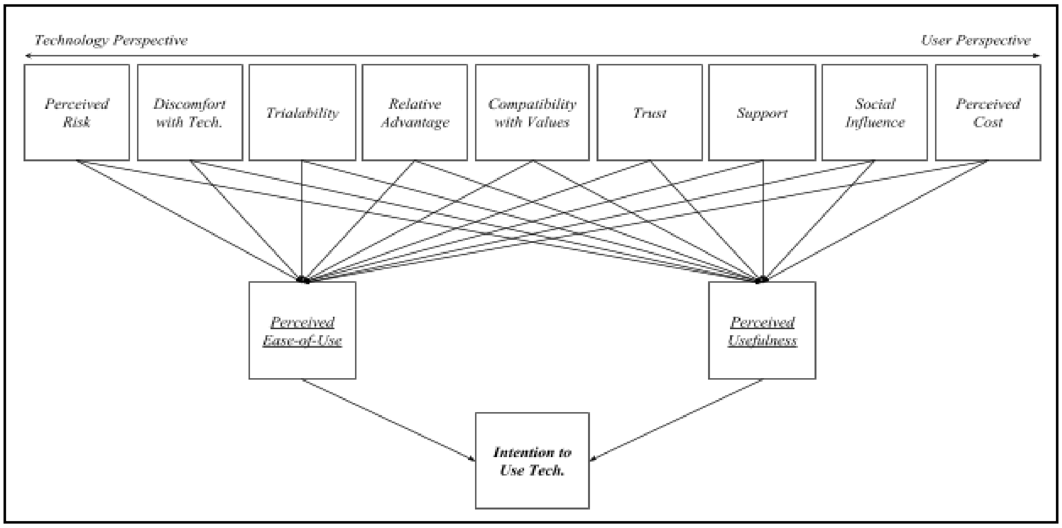


Fig. 3: Theory Perspective For the Study

The study was undertaken using a survey method. Schedule was developed for data collection, compiling items from prevalidated instruments, on a five-point Likert scale, eliciting agreement or disagreement for the behaviours indicated by items. Two versions, one in English language and the other in Hindi language were prepared, so that responses may be collected from educationally diverse population. There were filter questions in the schedule to weed out responses from voluntary participants who did not fit the criteria of population for the study. The references to the sub-constructs imported in this study is given below:

#	Sub-constructs	Scale
1	Perceived Ease-of-Use	Davis, 1985; Lee, 2009
2	Perceived Usefulness	Davis, 1985; Lee, 2009
3	Intention to Use	Kim et al., 2007
4	Perceives Cost	Wu & Wang, 2005; Luarn & Lin, 2005
5	Perceived Risk	Lee, 2009
6	Trust	Bhattacherjee, 2002
7	Technology Discomfort	Parasuraman, 2000
8	Compatibility	Gounaris & Koritos, 2008; adapted from Moore & Benbasat, 1991
9	Trialability	Gounaris & Koritos, 2008; adapted from Moore & Benbasat, 1991
10	Support	Goh 1995; Tan & Teo, 2000
11	Social Influence	Taylor & Todd, 1995
12	Relative Advantage	Gounaris & Koritos, 2008; adapted from Moore & Benbasat, 1991

In order to meet the objective of the study the population for this study was considered as all individuals who satisfy three characteristics: (i) own a mobile phone with facility to access Internet and banking applications, (ii) have a bank account, and (iii) have an annual household income of less than 3 lakhs in urban India and less than 1.6 lakhs in rural India. Unitus Ventures defines these as a limit for the bottom of the pyramid population and stated that this market represented 835 million people and $360 billion in disposable income in 2012[1]. Therefore, these screening questions would help tap into the characteristics of a mass untapped population.

Additionally, to make the study more relevant to gaining insights on last mile users, the population had to be restricted to individuals coming from places considered rural. For the purpose of the study, participants for experimental group were selected from tier 2 cities of two states, i.e. Haryana and Punjab; using judgmental and snow ball sampling. A list of tier cities was generated from maps of India website which was based on grading structure used by Government of India for its House rent allotment (HRA). Union territory of two states, i.e. Chandigarh and one tier 2 cities in each of the two states was chosen for data collection, i.e. Faridabad and Ludhiana. In all, there were 316 responses of which 271 were complete and valid for analysis.

The data was analysed R, Version 3.4.3.

The sample consisted of majority of respondents who for earning less than two lakh rupees for year, only 83 respondents were found to be in the income slab of Rs. 250,000 to 300,000 rupees per annum (table 2). Therefore, the sample was representative of the population that was desired for the study in terms of income. Statistics for age indicated that majority of the respondents were in the age group of 21 to 30 years old (126) (table 2). Number of respondents less than 20 years was only 9 and more than 50 years was only 12. Descriptive statistics into the educational background of the respondents indicated that majority of the respondents were 10th class pass, with 141 belonging rural and 130 belonging to urban area. Gender profile of the respondents indicated that of the total respondents 51 females and 220 means indicating that the data was skewed towards males. Majority of the respondents (94.2 per cent) had a bank account and were using banking facilities. However, data indicated that only 25.6 percent of the respondents were using mobile banking and 71.2 were using services of brick and mortar banks. Data indicated that out of the 25.6 percent respondents who used mobile banking used the services 65 percent were using it to check the status of the bank account and not for any form of actual transactions.73.5 percent of the respondents were in some form of employment and 85.6 percent of these respondents were in full time employment. Thereby, indicating that the sample was representative of the population for the study. The data also indicated that the respondents were reluctant to use mobile banking affluently thereby making them adequate for the study.

Table 2: Distribution of Sample

Annual Household Income		Education	
<1,00,000	48	Graduate	69
1,00,000 - 1,50,000	65	Matric	115
1,50,001-2,00,000	34	Post Graduate	8
2,00,001 - 2,50,000	41	Senior Secondary	79
2,50,001 - 3,00,000	83		
		Gender	
Age		Female	51
<20 years	9	Male	220
>50 years	12		
21-30 years	126	Place	
31-40 years	89	Rural	141
41-50 years	35	Urban	130

Following previous research, the analysis of the psychometric properties of the instrument included an analysis of its content validity, face validity, reliability and factor structure (Bagozzi, Yi, & Phillips, 1991; Kostova & Roth, 2002).

The survey instrument was translated in Hindi and Punjabi (local languages) and was pre-tested on a small sample of 40 respondents. Face validity and content validity of the instrument and its items were concluded by various researchers with experience in conducting surveys. The internal consistency and reliability of the scale was measured using Cronbach coefficient alpha. For purpose of exploratory research, a Cronbach alpha of 0.70 or higher is sufficient (Nunnally, 1978). Cronbach alpha for the adopted scale met this limit. It was found that a Cronbach alpha value for all constructs was higher than .70.

ANALYSIS AND FINDINGS

In order to meet the objective of understanding the indicators for technology acceptance and the reasons why Unbiased binary recursive partitioning methodology was used. This study was an attempt to advance the use of Unbiased Binary Recursive Partitioning for the purpose of exploring the sub-constructs that indeed influence perceived ease-of-use and perceived usefulness.

1 https://unitus.vc/updates/updated-india-base-of-the-economic-pyramid-bop-statistics/ March 17, 2012

More often parametric statistical tests involve the researcher slicing the data into subsets by using some variables as anchors. For example, ANOVA involves slicing the data into groups to enable comparison of means across groups. Such method inherently involves an element of researcher bias that creeps in through the cuts within the anchor variable. If one were to study, for example, whether income level makes a difference in satisfaction, researchers are likely to be vulnerable to errors in determining slabs of income levels. Binary recursive partitioning allows the researcher to avoid the problem, because the method assumes no slicing of data a priori, and is capable of achieving cuts that bring out differences that are latent. In the earlier example of income levels, the levels at which there may be significant differences in groups is automatically determined by the binary recursive partitioning procedure, since it tries out all permutations and combinations of slicing, algorithmically. It could be said therefore, that recursive partitioning is more akin to stepwise regression, which takes multiple variables as input and then eliminates or enters them into the model based on their statistical significance. The input to recursive partitioning technique is (i) a dependent variable, or function that can derive the relationship between multiple dependent variables, and (ii) multiple independent variables, either categorical or numerical.

Therefore, for the current study Unbiased binary recursive partitioning methodology was done using R Version 3.4.3 using the partykitpackage. Out of the two packages available for Unbiased Binary Recursive Partitioning, i.e. rpart and partykit; party kit was chosen for current study because *rpart* (Version 4.1) is based on family of regression models and therefore has the general assumptions of data normality; and *partykit*(Version 1.2) is based on the family of CHAID models and therefore is more immune to assumptions of data normality. Although recursive partitioning has variants that allow for more than two-categories at a level, this study chose to extract most prominent variables in identifying sub-groups, hence opting for binary partitioning, which tilted the choice towards using *partykit*. Within the package's documentation, the method is identified as developing conditional inference trees, shortly called by the command *ctree*.

The data was divided into two sub-groups a priori based on the native place: urban (control group) and rural (experimental group). Urban group was treated as the control group while the rural group was treated as the experimental group. Independent ctrees were produced for both subgroups of data, separately with perceived ease-of-use and perceived usefulness as dependent variables, with the study's sub-constructs along with other demographic variables becoming the whole set of independent variables. The four output decision-trees are shown in the figure 4.

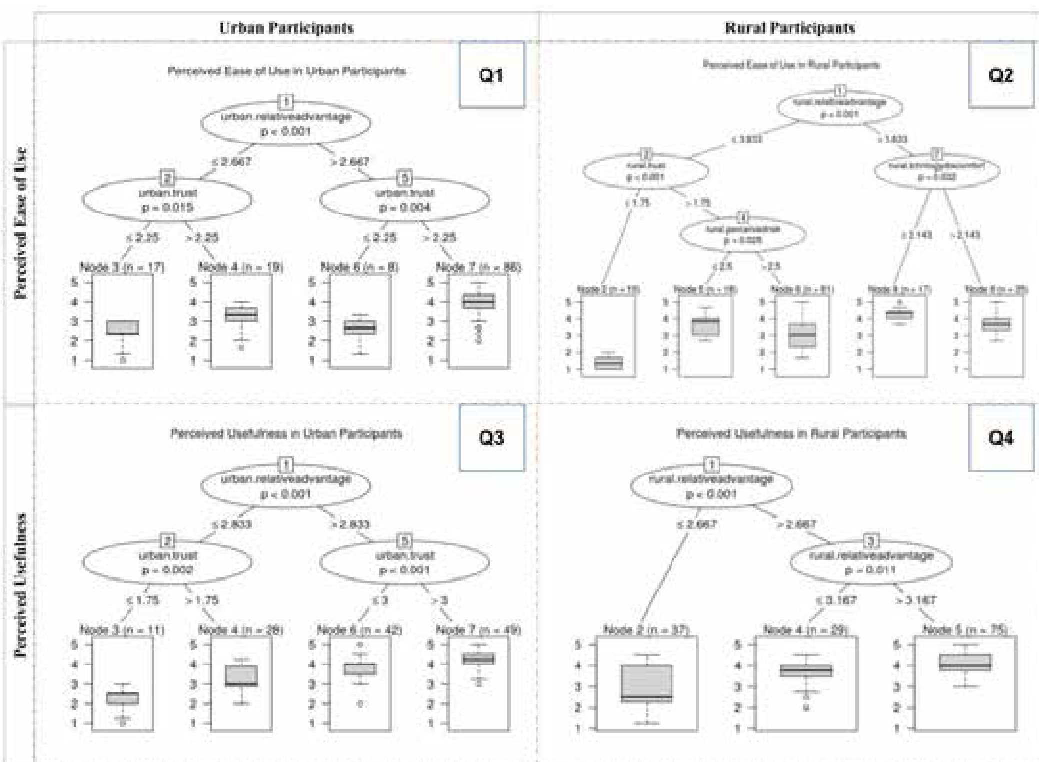
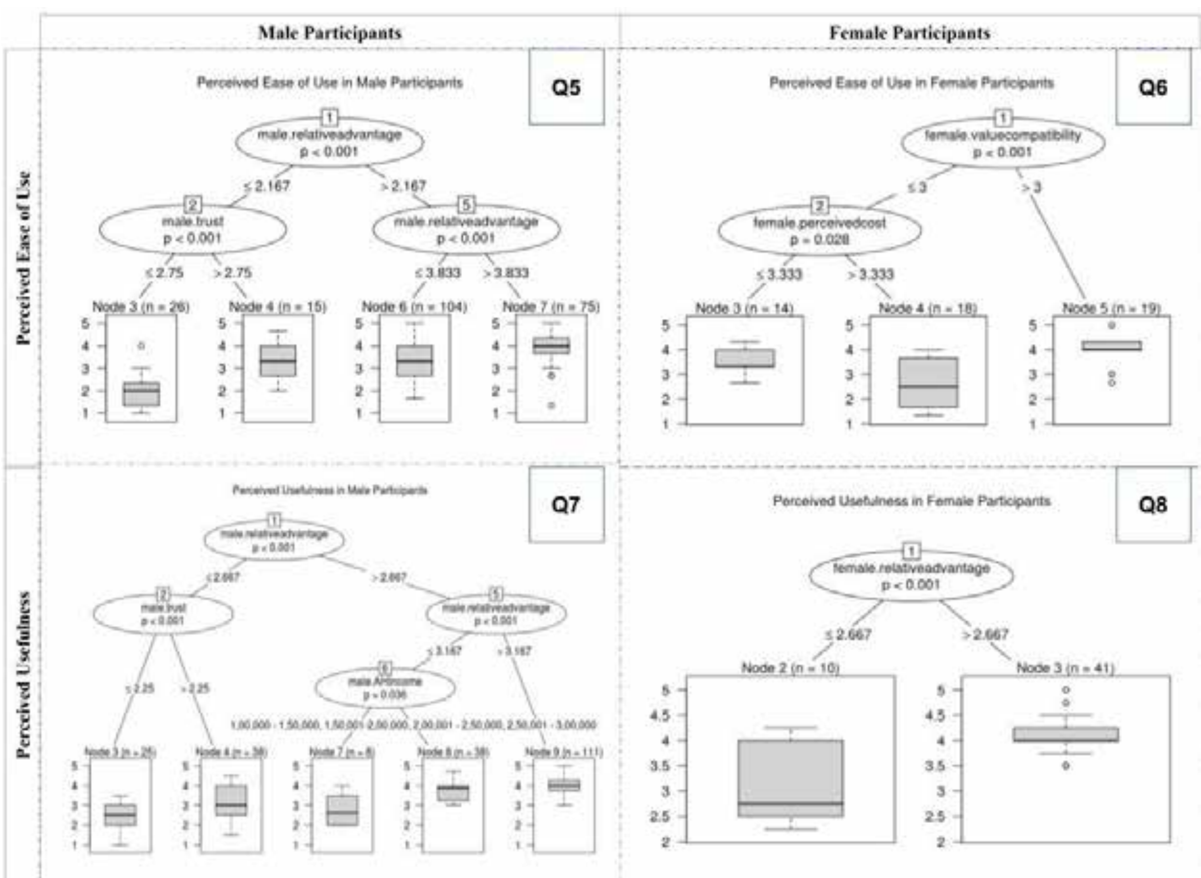


Fig. 4: Binary Portioning Output for Urban and Rural

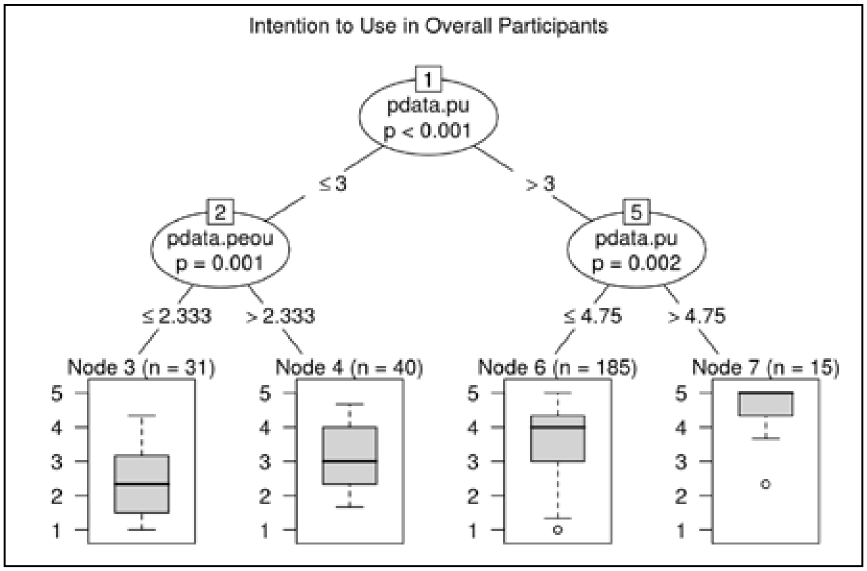
For the urban participants, observing Q1 and Q3 from the figure 4, it may be noticed that both perceived ease-of-use and perceived usefulness are a function of (i) the root node, relative advantage that the technology offers, and (ii) the intermediary nodes, the trust the users have on technology. It may also be noticed that the higher the trust and the higher the relative advantage the technology offers, the higher the perceived ease-of-use and the higher the perceived usefulness.

For the rural participants, observing Q2 from the figure, it may be noticed that perceived ease-of-use is a function of (i) the root node, relative advantage that the technology offers, (ii) the first level intermediary nodes, the trust the users have on technology, and the discomfort in using technology, and (iii) the second level intermediary node which is the perceived risk. The grouping here becomes more intricate than in the case of urban participants. The following may be noticed: (i) higher relative advantage the technology offers generally relates with higher perceived ease-of-use; however there are further differences by how comfortable users are with technology-higher the discomfort, lower the perceived ease-of-use, and vice-versa, (ii) even when relative advantage offered by the technology tends to be low, higher trust leads to higher perceived ease-of-use, which is further differentiated by perceived risk-higher the perceived risk, lower the perceived ease-of-use, and vice-versa. Also, observing Q4 from the figure, it appears that perceived usefulness is only a function of relative advantage offered by the technology which becomes the root node, and the intermediary node too, breaking up effectively into three levels in itself.



The analysis was repeated replace native place as the experimental variable with gender, and the other procedures being the same. Q6 and Q7 present unique results. In female participants, perceived ease-of-use is a function of value compatibility and perceived cost, whereas in male participants, perceived usefulness is a function of relative advantage, trust and annual income. This variant of the analysis induced one more sub-construct, perceived cost, and a demographic variable, annual income.

Taking the aggregate data, with intention to use as dependent variable, and perceived ease-of-use and perceived usefulness as dependent variables, another ctree was produced to inspect if the original variables of Technology Acceptance Model can both survive to be meaningfully developing sub-groups of respondents. As can be seen from the figure below, both variables indeed survive. However, perceived usefulness became the root node, thereby indicating that it is the variable that more prominently divides overall participants.



CONCLUSIONS AND SCOPE FOR FURTHER RESEARCH

The study tried to extend the technology acceptance model by operationalising external variable in the original model into nine sub-constructs spread between the technology and user perspectives. The study had two significant observations. First, that the validity of the original technology acceptance model holds together in the sample studied. Second, in this study based on experimental grouping by native place, whether urban or rural, only four out of nine sub-constructs appear to offer salient subgrouping of participants. This is not to say that the other sub-constructs are insignificant but just that they may be contributing to differences that are not salient from a primary separation enforced by native place. For example, when the data were separation by gender, one more sub-construct entered the decision-tree, as also did a demographic variable in annual income.

What do these observations mean for the organisations? The paper began by making an argument that implementation of technology requires more managerial and marketing acumen. Here, this method called binary recursive partitioning offers an intuitive mechanism that can cascade into segmentation, targeting and positioning strategies. Consider a technology being implemented for a population dominated by rural participants, where the issues that may need addressing include technology discomfort and perceived risk. Similarly, if the technology were implemented for a population dominated by female, the marketer may have to plan the communication around how the technology sis well with the values of the community. Also, when the population is heterogeneous involving several demographic and socio-psychographic variables, marketers may be able to benefit by this method in finding out which ones offer most salient differences, so that they may target the market accordingly.

Theoretically, the method offers a workaround for eliminating, at least where valid in exploratory studies, the researcher bias that may come through apriori hypothesising effects. The theory of technology acceptance is nudged towards a better understanding of individuals demographic and socio-psychographic properties. Such an advance was needed to understand technology acceptance in contexts where the users at large may not directly contribute towards the development of technology or its changes. Earlier extensions to the theory focused on making technology a better fit for tasks, or relied on anchor points that can compel the users to adopt technology by designing it to suit their purposes. While these are important, in the banking sector, these are driven more by regulation than by user feedback, although it is they who are influential in success or failure of the technology and the purpose it was intended to serve.

There are some limitations carried in this study. Firstly, it was acknowledged that not all external factors discovered from the literature were accounted in this study. But this was more by design and the intention of the study to move towards an understanding of individuals. Secondly, the study uses a method that is midway on the continuum of CHAID-model to Random Forests. Although it is not the latest advancement in the family of methods which could have helped in answering finer questions, it was adopted since its results would be readily readable to wider audience; and it appears to be among the first applications in the field of management in general.

LIMITATIONS

Factors external to users such as geography, availability of infrastructure and access to technology are not accounted in this study.

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