Creating Financially Inclusive Sector in Hilly Rural India: A Study
on Mobile Banking Adoption

A thesis submitted to the
University of Petroleum and Energy Studies

For the Award of
Doctor of Philosophy
In General Management

By
Anil Mehta

November 2020

Supervisor(s)
Dr Rajeev Srivastava
Dr Ranjeet Mehta

UPES
UNIVERSITY WITH A PURPOSE

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DECLARATION

I declare that the thesis entitled Creating Financially Inclusive Sector in Hilly Rural India: A Study on Mobile Banking Adoption has been prepared by me under the guidance of Dr Rajeev Srivastava, Assistant Professor of General Management, School of Business, University of Petroleum & Energy Studies. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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CERTIFICATE

I certify that Anil Mehta has prepared his thesis entitled "Creating Financially Inclusive Sector in Hilly Rural India: A Study on Mobile Banking Adoption", for the award of Ph.D. degree of the University of Petroleum & Energy Studies, under my guidance. He/she has carried out the work at the Department of General Management, University of Petroleum & Energy Studies.

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ENGINEERING | COMPUTER SCIENCE | DESIGN | BUSINESS | LAW | HEALTH SCIENCES | MODERN MEDIA | SMART AGRICULTURE

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ABSTRACT

In 2017, rural India housed more than 68% of the nation's population and 72% of the workforce (Chand, Srivastava, & Singh, 2017). This amounts to over 700 million people that live, work, and consume in rural India (Census of India, 2001). Even taking the initiative of financial inclusion since 1956, in 2014, over 415 million Indians, rendering India to be one of the world's largest "unbaked" populations (Harjani, 2015). To address this issue, the Indian government immediately set financial inclusion as a national priority (Banerjee, 2016).

The financial inclusion initiatives that followed were successful in providing more rural Indians with bank accounts but have not yet progressed to having rural Indians actually using banking products and services. This is because rural Indians still lack physical access to financial institutions, financial products and services are too costly to use, or simply do not meet the needs of the targeted population who are often helplessly illiterate about financial topics. Due to these challenges, more than 190 million people remain without a bank account (World Bank, 2017) and only 23 percent of the rural Indians who have bank accounts use them regularly (NAFIS, 2017). Thus, financial inclusion remains a pressing problem that hinges on addressing these related issues.

Mobile banking holds the potential to connect rural Indians to local and global supply chains by resolving some of the issues faced by financial inclusion campaigns. As we will make the case, their unique abilities afford mobile banking based solutions to deliver (1) financial products and service digitally to the doorstep, (2) cut down the costs of engaging in financial transactions, and (3) provide more suitable products. Further, mobile banking can help rural Indians to connect to global markets. However, the general capability of mobile banking to resolve these issues does not ensure such efforts will be successful. For example, while mobile banking applications ought to improve access for rural Indians, they have only received marginal adoption (NAFIS, 2017). What is required is an understanding how this unique technology can receive

widespread adoption among a demographic as unique as the rural Indian population

Chapter 1 describes the necessity and motivation for the triangulation study of financial inclusion in hilly rural India and setting the objectives of the study.

Chapter 2 comprise of extensive review of the literature on the applicability of mobile banking with MGNREGA. This chapter also list the findings from the various theories for technology adoption

Chapter 3 explains the research deign and framework followed by the study

Chapter 4 gives the list of constructs and their operational definition which were used to understand the various factors effecting the adoption of mobile banking in hilly rural India.

Chapter 5 explains the inter-relationship using total interpretive structural modelling (TISM) and also validates the results using structural equation modelling (SEM)

Chapter 6 helps in understanding the ranking of the various factors which gives us the most influencing factor to enhance the adoption of mobile banking. Analytic Hierarchy Process (AHP) was used to reach the most influencing factor.

Chapter 7 provides us the strategy to work on the most influential factor so that focused steps can be taken to enhance the mobile banking adoption. Thinking process was used to drive a strategy to increase awareness about mobile banking

Chapter 8 gives us the conclusion and way forward from the study

ACKNOWLEDGMENT

I bow my head humbly to pay heart felt regards to Almighty God for giving me the strengths and blessing in completing this thesis.

It is my proud privilege to have worked with Dr Rajeev Srivastava, Assistant Professor, Department of General Management, School of Business, University of Petroleum and Energy Studies, Dehradun, my Guide, for his esteemed guidance, constructive suggestions and timely help.

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This acknowledgement will remain incomplete without thanking my friend Naveen Upreti, for constantly reminding me of my goal to complete my work to the best of my ability.

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1   Introduction

India is one of the largest and fastest growing economies of the world, but there has been no uniformity in its growth performance and it has been discrete and disconnected with regard to growth and distribution of growth benefits to certain sectors of economy (Dixit & Ghosh, 2013)

Financial inclusion journey in India is actually much older than the formal adoption of the objective. It started with Nationalization of the Imperial Bank of India in 1956 and latest being the Pradhan Mantri Jan Dhan Yojna (PMJDY) in 2014. India still have 41.3% of the population without formal bank account (Yonzon & Oveis, 2016). It is very difficult to measure the financial inclusion due over estimation of the financial exclusion due to voluntarily financial exclusion. Voluntarily financial exclusion refers to a population set that has access to financial services but does not avail the services (Sarma, 2012; Demirgüç-Kunt & Klapper, 2013).

The Global Findex Report 2017, released by the World Bank heralded India's exponential growth in the field of financial inclusion to PMJDY. According to the report, total account holders has grown from 53% to 80% in the span of 3 years i.e. from 2014 to 2017. However, the report also clearly cites that a half of these accounts remain dormant.

Also, financial inclusion index is not just opening a bank account, it is doing actual transactions and using the banking services (Sarma, 2008). In terms of rural sector inclusion, according to (Taksin & Puranik, 2019). Financial unawareness and lack of cooperation from Bank managers in terms of imparting knowledge to unaware beneficiaries in most rural

areas, have forced people from rural economy to maintain distance from formal banking. As per the unbanked places are concerned, the physical strain of visiting the banks have also stopped the rural people from indulging in the financial spectrum of the economy. Hence they find it beneficial to visit money lenders and borrow money via oral dealings.

1. Less adoption of ICTs like mobile banking.
2. Lack of incentives to use banking services by linking them to government welfare schemes like LPG, pension plans, MGNREGA etc.

This research is to highlight the issues and concerns related to technology acceptance for financial inclusion in hilly rural India, particularly under the umbrella of Mahatma Gandhi National Rural Employment Guarantee Act (MGNERGA) in Champawat district of Uttrakhand, India.

Based on the RBI's 2017-18 annual report, mobile banking services witnessed a growth of 92 per cent and 13 per cent in volume and value terms, respectively. The number of registered customers rose by 54 per cent to 251 million at end-March 2018 from 163 million at end-March 2017.

However, the pilot study conducted by (Thatte & Kulkarni, 2019) showed that 61.5 % of the people in rural area are not aware of operating the mobile banking. The percentages of frequency for not using mobile banking in a month is high 55.4%. The study concluded that need of training of mobile banking is necessary. Efforts must be taken to increase an awareness in utility of mobile banking among the rural peoples.

Therefore this research is an attempt to formulate a strategy, by keeping the most important factors at mind, to improve the financial inclusion while bringing mobile banking as technological solution and MGNERGA as the financial assistance scheme to perform real banking transactions and usage of

banking services. Now, under pandemic situation like Covid – 19, Hon'ble Prime Minister has also announced the package of INR 20 lac crore which can reach to last mile through MGNREGA and JAM trinity (Jan Dhan + Aadhar + Mobile). Therefore it becomes more prominent to study mobile banking to enhance financial inclusion under MGNREGA.

The study uses triangulation of Total Interpretive Structural Modelling (TISM), Structural Equation Modelling (SEM), Analytic Hierarchy Process (AHP) and Thinking Process to bring formulate appropriate strategy for enhancing adoption of mobile banking in hilly rural areas of India. Extended Technology Adoption Model (TAM) is the underpinning theory for the study. While this study also reviews other adoption models but found that extended TAM is the most appropriate model to understand the adoption of technology under any setup.

1.1   Financial Inclusion – An Outline

As stated by World Bank, financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way.

Figure 1 – Financial Inclusion

In India, financial inclusion is the process of ensuring access to appropriate financial products and services needed by vulnerable groups such as weaker sections and low-income groups at an affordable cost in a fair and transparent manner by mainstream institutional players. (RBI 2014a).

(Reddy, 2016) clearly mentioned that there are economic objectives like mobilization of savings, large marker for financial systems and social objectives like sustainable livelihood and also political objectives of the financial inclusion. Though rural India constitutes 68% of country's population, only 9-12% of the total deposits and 8-10% of the advances are constituted to rural India. (PrabhuP & Vijaya, 2014).

The correlation between financial inclusion and economic growth has long been widely recognized (Gawalani & Parakhi, 2014; Arun & Kamnath, 2015; Aizenman et al., 2015; Shetty & Pinto, 2015; Sundaram & Sriram, 2016; Kunt et al., 2017; Mindra & Moya, 2017).   It benefits the economy in the following way:

    a. Reduces social and income inequality as it includes the poor in the purview of the financial services.
    b. Financial resources become more efficient for allocations and would disadvantaged groups have access to easy and affordable credit.
    c. There is a better financial stability if the financial activities move from unorganized to organized sector.
    d. Better access to financial services promotes more start-ups which are often the engines of growth by generating employment, higher risk taking and thus, contributing to the process of creative destruction.

Low-income consumers are at greater risk of financial exclusion and being financially excluded, not only prevents people from escaping from poverty, but

can also result in people falling deeper into the cycle of poverty. (Bayero, 2014, Kiliyanni & Siviraman, 2016; Diniz et al., 2012; Gandhi, 2013; Dhillon et al., 2016; Bharati, 2016).

The standard of living can be improved if the financial system offers a continuum of services and the individuals use them at regular intervals (Cnaan et al., 2012). Organized financial sector ensures the availability of standardized financial products like saving, remittance, insurance and credit products. Therefore, increased application of technology ensures better services to customers. But, all in all this put the financially excluded at a disadvantage as they do not get included in such databases. (Leyshon, 1998; Zeller & Sharma, 1998).

(Sarma, 2008) proposes an index of financial inclusion (IFI) which takes into account of the following three dimensions.

a) Banking penetration (measured by the number of bank accounts as a proportion of the total population).
b) Availability of banking services (measured by number of bank branches per 1,000 persons).
c) Usage of the banking system, (measured by the volume of credit and deposit as a proportion of the country's GDP).

The aim of financial inclusion is delivery of banking and financial services in a fair, translucent and impartial manner at reasonable cost to the vast sections of disadvantaged and low-income group. (Kaur, 2014)

Therefore, as banking services are in the nature of public good, the prime objective of public policy should be to provide basic banking services to the public without discrimination. The financially excluded poor group of society use their own limited savings for expenses like education and to start their own

business in order to take advantage of various growth opportunities which results in further inequality of income hence slower economic growth.

Uma et al. 2013, has observed that, the financial inclusion leads to economic growth by improving the living standards of the deprived and poor people of the country.

1.2   Financial Inclusion in India

The history of financial inclusion in India is actually much older than the formal adoption of the objective. The financial inclusion program started from 1956 with the Nationalization of the Imperial Bank of India and latest being the Pradhan Mantri Jan Dhan Yojna in 2014 (Gupta, 2015; RBI 2012; Mamatha, 2015).

Major Milestones in Financial Inclusion in India:
1. 1956 Nationalization of Imperial Bank of India.
2. 1967 Policy of social control over banks.
3. 1968 Setting up of National Credit Council.
4. 1969 Introduction of Lead bank scheme.
5. 1971 Establishment of priority sector lending norms.
6. 1975 Establishment of Regional Rural Banks.
7. 1982 Establishment of NABARD
8. 1992 Launching of Self Help Groups Linkage Program.
9. 1998 NABARD sets a goal for linkage one million SHGs by 2008.
10. 2000 Establishment of SIDBI foundation for micro credit.
11. 2004 Setting up of Khan Commission by RBI.
12. 2007 Proposed bill on Microfinance Regulation introduced in parliament.
13. 2008 Rangarajan Committee report instituted by NABARD.

14. 2009 Raghuram Rajan Committee Report set up by Planning Commission.
15. 2011 Malegam Committee Report by Reserve Bank of India.
16. 2012 Microfinance Institutions (Development and Regulations) Bill by Finance Department, Government of India.
17. 2012 Revised Guidelines on Financial Literacy Centers.
18. 2014 Launch of Pradhan Mantri Jan Dhan Yojna

Since banks were nationalized, the strategy for addressing the banking needs of the poor has been biased toward providing credit, neglecting other aspects, such as building a deposit base, promoting a savings culture, or extending the payment network (Barua et al. 2016; Kishore & Sequeira, 2016).

There are a 100 million 'no-frill' accounts, or accounts with zero or minimum balance and small overdraft facilities, for poor people. Yet, 80–90% of these accounts are dormant, neither operated by the account owners, nor pursued by bankers (Kapoor, 2014; Gupta, 2015; Agarwal, 2014).

In past 2 decades' poverty of India has gone down from 55% to 30%, but still lower income group is 40% in India (Mittal & Shukla, 2014). Although government and RBI have taken lot of step in respect to financial inclusion but still there is need of lot of improvement (Kaur & Kumar, 2016)

It was observed that India is categorized on high Financial Inclusion on demand and low financial inclusion of supply side (Kumar, 2016). On demand side, it includes lack of awareness and financial literacy (Ramachandaran 2012; RBI 2010). From supply side, low income lack of avenues for investment such as poor bank penetration, unwillingness of banks to do financial inclusion or high cost involved in financial inclusion seem to be some likely reasons for financial exclusion (Joseph & Varghese, 2014; RBI-Mundra 2016).

Despite policy measures and technological innovations adopted by RBI and banking sector, the extent and penetration of financial products and services to marginalized sections of the society, the figures are not encouraging (Thyagarajan et al., 2016).

The Basic Savings Bank Deposit Accounts (BSBDAs) have gone up from 73 million in March 2010 to 469 million as on March 31, 2016 (RBI-Mundra 2016). 35A report prepared by PwC in association with IAMAI and PCI, 2015 pointed out that India's unbanked population in 2015 was 233 million. This was half the number it was in 2011, at 557 million, primarily because of the Pradhan Mantri Jan Dhan Yojana scheme aimed at making it easier for people to open new accounts.

No doubt the efforts contributed a lot towards the financial inclusion of financially excluded people in India but still there is substantial part of India not having access the formal financial system and even mere opening of saving or no frill accounts without providing basic insurance as well as credit facilities is called partial financial inclusion but not the financial inclusion. Majority of the no-frills accounts opened under the BC (Branch Correspondent) model are not operational. Opening savings accounts profitably, have not made the desired movement. This has made BC model unviable for the banks to consider this framework further (KollojuN, 2014).

Mere legislation on the right to a bank account is unlikely to help without appropriate products being introduced. Whether required by legislation, or voluntarily proposed by associations of banks, introduction of accounts to unbanked individuals needs to be monitored not by the measures themselves but by tracking of actual increase in number of accounts and their utilization. This is particularly important for developing countries where demand side barriers of lack of financial literacy and psychological and cultural barriers tend to be significant (Sharma & Tuli, 2012; Sachdeva & Gupta, 2014).

Therefore, it required to think of most cost efficient means to enhance the financial inclusion in India by keeping the culture as well as the institutional infrastructure of the nation.

Mere no-frill accounts does meet the purpose of financial inclusion but formal financial institutions has to achieve the faith and benevolence of the deprived through developing sturdy linkages with community-based joint financial ventures and cooperatives (Sharma & Kukereja, 2013).

The effect of various financial inclusion efforts, no doubt, has been significant but not sufficient as the figures released by RBI. Even in the PMJDY accounts, 28% of the accounts are dormant. Also 28.88% of the customer accounts are zero or nil balance accounts (PMJDY Wave III report, 2015). The study indicates that many of the accounts were opened by bank branches mainly to achieve financial inclusion targets.

Furthermore, no guidance was given to the individuals opening the account on how to use them. In some cases, individuals were enticed to open accounts with promises of future benefits in the form of subsidies. Many accounts were opened as a result that all payments under the "Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)" will be made through accounts in banks and post offices (Adhikari & Bhatia, 2010).

1.3   MGNREGA: Instrument to Financial Inclusion

Government of India launched Mahatma Gandhi National Rural Employment Scheme is 2005 to give employment to people especially in rural India. Large portions of the unemployed pie were employed. The wages were mandatorily paid using either a post office or bank account as decided by Government of India in the name of the worker unless exempted by the Ministry of Rural Development.

As the payments are made through the bank/post office accounts, in 2017-18, nearly 11crore bank/post office accounts have been opened under MGNREGA. The opening of accounts has brought the poor into the organized sector and in some cases provided them with better access to credit, an unprecedented financial inclusion initiative. (Chhabra, 2017; Hundekar, 2017)

The crux of the Act lies in payment of statutory minimum wages, provision of legal entitlements to labour on working hours, rest, drinking water, medical aid and crèche facilities and the provision for unemployment allowance upon inability to provide the guaranteed days of work. A survey was undertaken as a part of special request made by the Ministry of Rural Development Ministry to ascertain the success of its NREGA scheme. Thus, the Comptroller and Auditor General (CAG) undertook a review of the Act and found many loopholes in the implementation of NREGA in various parts of the country (CAG, 2007).

In Uttarakhand, the MGNREGA was launched in 3 phases, initially launched in 3 districts i.e., Chamoli, Champawat and Tehri in Phase – I (2006-07), in Phase – II (2007-08), Haridwar and UddhamSingh Nagar were included and in Phase – III remaining state was included. Since, then MGNREGA has positive impact on poverty reduction and sustainable livelihood of the citizens (Singh et al., 2014; Negi et al., 2015; Samant 2015; Rani & Pokhriyal, 2016; Benni & Nagaraja, 2017; Kharkwal et al., 2017).

As compared to other parts of the country the scheme has not worked very well and have performed moderately in the villages of Uttarakhand (Saha & Bhatt, 2016).

In Uttarakhand, 74 per cent population is rural, out of which about 41 per cent population belongs to BPL, having low educational, health and nutritional status. Work participation rate is merely 37 per cent and 63.1 per cent are non-workers in the state. Due to difficult terrain and dependency on rain makes it

difficult to rely on agricultural income and therefore schemes like MGNREGA are important for reducing poverty and improve sustainable livelihood (Kharkwal et al., 2017).

MGNREGA proved to be as one of the schemes which constantly contributed towards the financial inclusion (Adhikari & Bhatia, 2010; Morawczynski et al., 2010, Gupta et al., 2014).

1.3.1   Barriers of Financial Inclusion in MGNREGA

Financial Inclusion has been researched on by a lot of agencies and researchers. Previous studies have indicated a list of barriers to achieve financial inclusiveness (Beck et al., 2010) in their survey of five large banks in 99 countries; developed indicators of access barriers to savings, loans, and payments services. It included indicators of physical barriers such as geographical branch and ATM penetration per population in a region/nation. In addition, minimum account balance, documentation required for account opening that is required and annual fees charged were included (Beck et al., 2007) presented the last two indicators relative to the respective country's per capita GDP in order to accommodate for the affordability of the products.

As expected, the results relating to geographical and demographic permeation show wide differences in access barriers across nations. The number of documents required to open a savings account swayed from one for 13 countries, to more than four in the specific case of Bangladesh and Zimbabwe. While in India, the document requirement was between two to four (Mohan, 2006). Wherein, an important point that needs to be highlighted about the survey by (Beck et al., 2007) was that it was conducted from 2004 to 2005.

Thus, in case of India in November 2005 the RBI introduced the concept of no-frills accounts thus, reducing the document requirement even further. In case of

minimum account balances 18 countries had a zero-opening balance requirement but in case of Nepal it was as exorbitant as 74 percent of the per capita GDP. In the case of Indian sub-continent, the requirement was about five percent of the per capita GDP which tumbled down to zero after the no-frills account policy (Collard, 2007; Allen et al., 2012). In the study, the indicators of access barriers show a negative causal relationship with the actual use of financial services confirming that they can exclude individuals from using bank services (Beck et al., 2007).

Indeed, in India access to bank accounts is perhaps easier than in many other developing countries, because of the creation or existence of no-frills type accounts and post office accounts. Arguably, therefore, this aspect of financial inclusion in India has moved beyond access to basic accounts to access to useful services and products (Singh, 2017).

MGNREGA while planning and implementing the disbursement of wages devised alternate options to cater to these problems. As the scheme was to be launched across India and especially in rural areas to employ people, the payment structure was carefully designed (Sameeksha, 2006). The barriers related to financial inclusion also was based on diffusion of correct technology in the rural areas. Studies have proved that it was a lack of reach of technology and appropriateness of technology which led to slow progress towards the inclusion of people.

Studies found that, no technology have penetration as mobile phone technology in India over and above internet, which has laid the foundation of mobile banking and therefore expecting a potential growth in mobile banking in India (Unnithan & Swatman 2001; Tare, 2014; Malik, 2014).

ICT therefore had to play an important role in catering to this problem (Johnson & Johnson, 1996; Venkatesh & Davis, 2000; Legris et al., 2003; Edmunds et

al., 2012). Studies also pointed out that, transfer of technology was at a slow pace because of behaviour intention of the target customers (Venkatesh & Davis, 2000). The study also indicated that technology transfer was one of the key players in enhancing financial inclusion of a country. It was also found out that awareness about that technology and perception of end users towards the same was important to successfully launch and use a technology.

It is therefore, important to understand the theories leading to diffusion of technology and extract variables which will be responsible for enhancing behavioural intentions of the end users.

1.4 Role of Mobile Banking in Financial Inclusion

1.4.1 Mobile Banking – An overview

The world is undergoing a dramatic transformation. It's been exactly 21 years since mobile and internet came into India and since then technological evolution in the country is on fast track and getting faster with each passing year.

The mobile internet is creating entirely new businesses and business models, as well as transforming traditional companies. All kinds of businesses are using mobile technologies to improve operations, cut costs, and reach new markets and customers. In the same lines, banking across the globe is no longer the same traditional business now. Mobile technology has revolutionized the banking sector (More, 2016)

The mobile banking is defined as "the provision of banking services to customers on their mobile devices": specifically, the operation of bank current and deposit or savings accounts (Kansal & Sharma, 2012). Mobile Banking technology has the potential to improve people's quality of life and to bring efficiency to banks (Malaquias & Hwang, 2015).

The adoption of mobile phones has occurred at perhaps the fastest rate and to the deepest level of any consumer-level technology in history (Jack & Suri, 2011). Figure below illustrates the speed of adoption of mobile phone in comparison with a variety of product innovations.
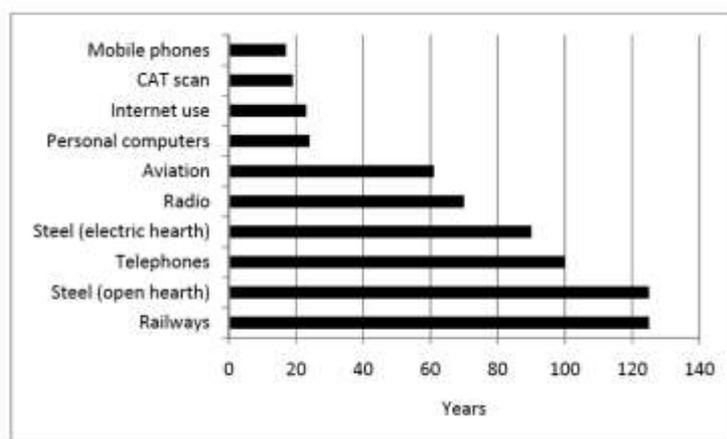
Figure 2 - Number of year various technologies took to reach 80% coverage

The services offered by mobile banking includes the following:

Financial Services	Non-Financial Services
Bill Payments	Balance Enquiry
Peer-to-Peer Payments	Mini-bank statement
Fund Transfers	PIN Change
Remittance	Check book Request
Shopping and Donations	Due alerts for payments
Mobile Balance Recharge	Locate ATMs

Table 1 – Services offered by mobile banking

Mobile Banking can be broadly classified into Bank-led model and Mobile Service Provider Led Model. The Mobile Service Provider Model is totally different from bank-led model; in this the mobile customers those who don't even having the access of traditional bank account can do banking transactions through their mobile service provider. These services can be accessed through mobile applications, mobile browsers, tablet applications, and short messaging services (SMS). The first three routes require an Internet connection on the

mobile device; SMS relies on standard Global System for Mobile Communication (GSM) networks (Shaikh & Karjaluoto, 2014; Devadevan, 2013).

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                          ┌─────────────────┐
                          │ Mobile Financial│
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         ┌────────────────────────┼────────────────────────┐
   ┌───────────────┐      ┌──────────────────┐      ┌───────────────┐
   │ Mobile Payments│      │Mobile Microfinance│      │ Mobile Banking│
   └───────────────┘      └──────────────────┘      └───────────────┘
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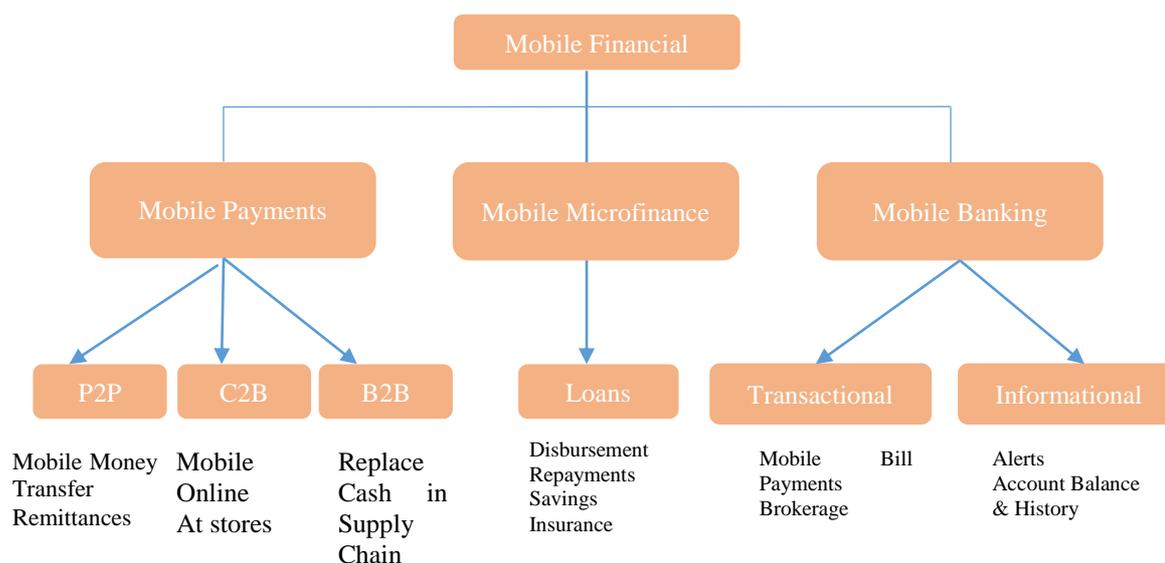
Figure 3 - Mobile Financial Services

Based on the comparison of features of ideal banking, brick and mortar banking and mobile banking it can be accepted that ubiquitous mobile banking shows almost all features of ideal banking except few exemptions (Aithal, 2016).

1.4.2 Status of Mobile Banking in India

Internet technology is regarded as the third wave of revolution after agricultural and industrial revolution. However, in spite of an intensive penetration of mobile technology, the adoption of mobile banking has not been very promising (Behl & Pal, 2016; Singh, 2015; Nayak et al, 2014; Bamoriya & Singh, 2011; Bank of America Merrill Lynch Report, 2016; Upadhyay & Jahanyan, 2016; Magotra, 2016). The most important concern is that there is a significant percentage of financially excluded population and the potential of the mobile phone to extend them financial services is still to be tapped (Vijayakumar & Jayachitra, 2013).

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(Nielsen-Mobile Payment Survey, 2016) says Asia-Pacific exceeds the global average when it comes to self-reported participation in mobile-banking activities, while response rates are lower in Europe, Africa/Middle East and Latin America. Approximately 1.5 billion people with a mobile phone subscription do not have access to a bank account, which means that nearly half of the unbanked population has access to a mobile phone (Boor et al., 2014). When it comes to adoption of mobile banking, India ranks number five worldwide, ahead of all the G7 countries but behind China, South Africa, South Korea and Singapore. And if we compare the Indian mobile banking status with USA we found that only 7% users are dependent on internet/mobile banking services (Malviya, 2016)

Despite of good mobile transaction, only 7,000 transactions, amounting to Rs73 lakh, in November 2016 through the Unstructured Supplementary Service Data (USSD), which uses mobile networks, and not the Internet, making it the least used digital payment platform by number and value of transactions (RBI Monthly Bulletins, 2016). And most of the unbanked population uses mobile phones having no internet connection. Even when m-banking adoption tendencies among customers were strong in other parts of the world, only 5% of all mobile subscribers are registered users of mobile banking in India and more significantly, only 0.5% of them are active mobile banking users. These are also primarily restricted to information-based services (Reji & Ravindran, 2015)

The penetration of cellular services has been pervasive in general, the adoption of such value-added services like that of mobile money is surprisingly low. This is particularly true for a country like India which has the second largest mobile phone subscriber base with mobile phone subscribers (903 million) comprised nearly 96 percent of the total telephone subscribers (1,048 million) till the end of January 2012 (Yadav et al., 2014).

81% of the Indian population have mobile connections. The country's internet user base will cross 500 million by 2018. India's internet economy will grow to $200 billion by 2020 and will contribute 5 per cent to the gross domestic product (GDP) of the country. Boston Consulting Group (BCG) and Internet and Mobile Association of India (IAMAI)-2015. Despite of being the 2nd largest population in the world of mobile phone users and 3rd largest of smartphone users, mobile banking share in India is at 0.1% of the total banking share (Bank of America Merrill Lynch Report, 2015).

1.4.3 Mobile Banking Use and Acceptance

The current research critically analyses the well-researched and accepted theories in order to derive a comprehensive list of factors which are relevant for the adoption of mobile banking technology.

Looking at the comprehensive list of user acceptance theories, theories like, Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA) are the most researched and critiqued theories (Venkatesh, 2000; Edmunds, 2012; Park et al., 2011). These theories have been tested with a diverse set of technologies and in diverse conditions. Theory of Planed Behaviour (TPB) on the other hand is yet another theory which follows the model based on attitude and behaviour of the end users when introduced with any technology. Both TRA and TAM also have constructs which try to measure the perception and behavioural intention of the end user. Therefore, the usage of these theories and deriving constructs from them forms the first step in this section (Venkatesh, 2000; Legris, 2003; Hsiao & Yang, 2011).

Financial inclusion was also given major thrust by launching policy program MGNREGA in 2005 by Government of India. The implementation of MGNREGA has raised the number of rural bank accounts to a large extent and

this inclusion has therefore led to a great rise in the inflow of money in the banking system. The use of the technology in financial inclusion has provided financial institutions with a remote distribution channel. Now, by virtue of the advanced technology, consumers are able to conduct their financial transactions virtually without ever going themselves to the banks (Thorat, 2006; Muralidharan et al., 2014).

The latest advancements in technology have enhanced efficiency and service quality in the area of banking and finance. ICT has not only made the process easy but also contributed towards smoothing the process of transacting money from one end to another. The potential of ICT in changing the face of the financial world has been studied in depth (Singh & Tigga, 2012).

Informal channels for cash transfers exist but are expensive and inefficient compared to electronic methods. Thus, a critical aim of the inclusion agenda is the provision of a robust payment system that minimizes the use of cash. This involves the convergence of banking, digitization, and mobile phones as invoked in the JAM Number Trinity solution (i.e., Jan Dhan Yojana, Aadhaar Cards, and Mobile Numbers) proposed in the (Economic Survey 2014–15) that allows the state to transfer subsidies to poor households in a targeted manner.
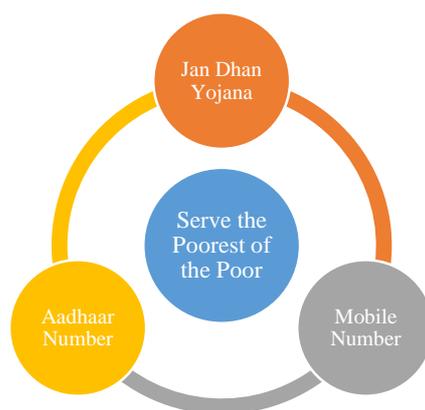
Figure 4 – JAM Trinity Solution

During several years, mobile banking has been considered a good example of an almost completely utilitarian service, related to functional, economic,

rational and practical functionalities (Martínez-López et al., 2014) providing a means to an end: pay bills, transfer money, manage savings, etc. Since there is no restriction of time, space hence the convenience of banking anytime anywhere is providing the concept of mobile banking a huge potential (Bhardwaj & Agarwal, 2016).

With Indian telecom operators working on offering services like money transaction over a mobile, it may soon be possible for a bank to offer phone based credit systems. This will make credit cards redundant and also aid in checking credit card fraud apart from offering enhanced customer convenience. The use of mobile technologies is thus a win-win proposition for both the banks and the bank's customers. (Sharma, 2015; Sharma, 2016). The above facility can be made better by using personalized communication (Nandhi, 2012).

The biggest advantage of mobile banking is enablement of payments to be transacted regardless of place and times. Also, customer don't have to visit bank again and again for various types of transactions and same can be done through mobile banking (Pant, 2012).

Despite the existing list of benefits, studies have noticed that level of usage of mobile banking are limited and are governed by various factors. The behaviour of customers towards the launch of such technologies is an area which needs to be studied in depth. It is important to understand the likeliness of adoption of such technologies especially in a rural setup where the number of potential customers is relatively very high in comparison to urban areas. There is a dearth of literature available to understand this complex relationship especially for a rural setup (Beck et al., 2007; Demirgüç-Kunt & Klapper, 2012).

(Park et al., 2012) found that trust and accessibility is one of the key barriers in the adoption of a new information system. Transaction speed and convenience

is one of the major factor influencing the adoption of mobile banking (Jannat & Ahmed, 2015; Safeena et al., 2012).

Studies related to explore barriers for usage of ICT also indicate that their perception of accessibility is the most important barrier (Davis, 1989; Hsiao & Yang, 2011; Brown et al., 2012; Al-Qeisi et al., 2014). It is also observed that there is a statistically significant positive relation between perceived accessibility and Perceived Ease of Use (Hsiao & Yang, 2011).

Security is another concern which the customers are worried about while using any technology which handles their bank accounts and deals with financials. (Bhatt & Bhatt 2016), found that security is one of the key variables to measure the rate of acceptance of mobile banking among customers.

In addition, factors derived from TAM i.e. Perceived Ease of Use and Perceived Usefulness play a vital role in evaluating the rate of adoption and studying the behavioural intention of customers in adopting mobile banking (Aboelmaged & Gebba, 2013; Sharma et al., 2017; Kumar et al., 2017).

It is therefore found out that there are multiple factors related to acceptance of mobile banking in India and across the world. The studies quoted above gives a broad picture of prospective variables which may be responsible for behavioural intention of usage of mobile banking. There is a need of identifying the right set of variables which are applicable in rural India for the diffusion. This study aims to identify those set of variables. It also broadly aims to build a theoretical model and test it using primarily collected data from the field.

1.5   Motivation of Research

Financial Inclusion is major challenge for the country due to difficulty in reaching far flung areas of the country comprising 600 thousand villages. This

has huge implications on economic development of the country. Researches shows that, across globe mobile banking helped in getting last mile connectivity.

There is an urgent need to have a dedicated focus on the mobile banking adoption in Rural India. This has motivated to study and to strengthen the reach of mobile banking facility to Rural India. Also, the challenges increases in hilly area due to the obvious geographical and demographical landscape.

1.6   Business Problem

RBI has reported that the financial exclusion in India leads to the loss of GDP to the extent of one per cent (RBI, Working Paper Series (DEPR): 8/2011). If we calculate our loss in last 10 years, it comes out to be more than 200 billion USD and it can be removed by just bringing people into gamut of financial inclusion. Even the latest INR 20 lac crore economic package announced by GoI, would need JAM (JanDhan + Aadhar + Mobile) to reach last mile in our country.

S.NO	YEAR	GDP IN USD BILLION	1% LOSS OF GDP
1	2009-10	1341.88	13.42
2	2010-11	1675.61	16.75
3	2011-12	1823.05	18.23
4	2012-13	1827.63	18.27
5	2013-14	1856.72	18.56
6	2014-15	2039.12	20.39
7	2015-16	2103.58	21.03
8	2016-17	2290.43	22.90
9	2017-18	2652.24	26.52
10	2018-19	2718.73	27.18

*Source - World Bank

Table 2 – Loss to GDP in last 10 years

2 Literature Review

2.1 Search Process

With intent to probe the existing literature and also obtaining a comprehensive view of the previous studies conducted in the topic and for developing the framework for the present study. Research articles were reviewed under financial inclusion and inclusive growth to have a clear understanding and deep insight into the broad area of study. The literature from the published reports and working papers of international agencies in the area of finance and economics, national and international journals, books, newsletters and bulletins of central banks were the major sources of data for this section.

Literature collected from the various sources is thematically collated as:

1. Status of financial inclusion in India
2. MGNREGA as financial inclusion scheme
3. Effect of mobile banking on financial inclusion
4. Status of mobile banking in India
5. Factors affecting adoption of mobile banking

2.2 Status of Financial Inclusion in India

Easy and Cheap access to basic financial services for low income strata of Indian society is main objective of Financial Inclusion (Apurva & Chauhan, 2013, Souza & Devaraja, 2016, Kohli, 2015, Say et al., 2013).

Khan, 2011, Rajamohan, 2012, Bhanot, 2012 and Gupta, 2014, emphasize on the timely availability, whenever need arise for the basic financial services, as not only availability would meet the target, but to avail the financial services is the real end to financial inclusion in addition to the adequacy of these financial services. Basic financial services for poor, disadvantaged people doesn't mean to open a savings accounts or deposits, withdrawal and transfer of money only, in broader sense credit facility to meet small short term and long term needs (Uma et al., 2013) and Insurance facility to secure the bread and butter for remainders of the insured has also been forced upon as the main pillars of financial inclusion (Bhanot, 2012, Gupta, 2014, Fatima and Sukanya, 2014, Hannig and Jansen 2010).

Rangrajan Committee, 2004, introduced financial inclusion in India, as delivering financial products, at reasonable costs to segments of deprived and low-income sections of society. The sustainable growth of weaker section of the society has always been the pre-condition for inclusive growth of a nation (Sharma and Kukreja, 2014).

As defined by World Bank, real financial inclusion means, the access to full range of financial services without pricing barriers. Supporting the facts, (Uma et al., 2013), has also emphasized on social as well as the economic growth of poor strata of society through financial inclusion to lead the economic growth of a nation. Various efforts to include the fully and partially excluded within the ambit of formal financial sector of the economy have been initiated at national and international fronts.

In India, RBI and GOI, from time to time initiated various schemes and programmes like liberalized branch opening for under banked and other districts and compulsion of having at least one account of each household in the bank in service area, Business Correspondent Model (Souza & Devaraja, 2016), Swabhimaan Campaign, setting up of Ultra Small Branches (USBs), banking

facilities in unbanked Blocks, expansion of ATM network, No frill accounts (Ranganath and Rao, 2013, Kolloju, 2014)), simplified branch authorization, PM Jan Dhan Yojna, PM Jan Jeevan Bima Yojna, PM Suraksha Beema Yojna, PM Mudra Yojna (Mishra, 2016), LPG Subsidy PAHAL, Direct Benefit transfer, (Sharma and Kukreja, 2014, Apurva & Chauhan, 2013), Self Help Groups (SHG) (Venkataramany and Bhasin, 2009, CNAAN, 2012), Micro Finance Institutions (MFI) (Bhanot et al., 2012), additional efforts, Financial Inclusion Fund (FIF), Financial Literacy, Uniform Progress throughout India (Gupta, 2014) have been initiated with lots of enthusiasm.

Comparing Financial Inclusion efforts worldwide, Arya et al., 2015, has studied initiation of Financial Inclusion in countries of Bangladesh, California, Dubai, Brazil, Canada, India, Indonesia, Kenya, Mexico, Peru, Philippines, South Africa, United Kingdom and United States and concluded that the developing countries try so hard to improve their financial inclusion position, but still they has not matched the developed countries. (Kunt & Klapper, 2012), based on Global Findex of 148 economies has analysed that worldwide only 50 percent adults use services of formal financial institutions to open an account and that's too vary regionally.

The efforts of Reserve Bank of India and Government of India, no doubt played very important role in inclusion of unbanked and under banked population within the ambit of formal banking facilities.

Number of BSBDA as on March, 2017 stood at 533.2 Million, comparing to United Nations Organization estimates of revised population of India in 2017 i.e. 1,339.2 Million, only about 40% of population has been touched to open basic account. Even comparing this figure of March 2017 to Census 2011 population of India i.e. 1,210.2 Million, it has been still 44%. So a result of financial inclusion efforts has been appreciable during the seven years from 2010 to 2017, but not satisfactory in comparison to the population of India. The

main objective of all-inclusive growth of all the strata's of the Indian society lapse somewhere.

As per Census 2011, 58.7% households are availing banking services in India and there are 1,02,343 branches of Scheduled Commercial Banks (SCBs). Even the CRISIL Inclusix score at an all-India level had improved to 50.1 in 2013 from 40.1 in 2011. The CRISIL Inclusix score has a relative scale of 0 to 100 representing nil to ideal position of a state based on three critical parameters of branch penetration, credit penetration and deposit penetration as basic financial services.

No doubt the efforts contributed a lot towards the financial inclusion of financially excluded people in India but still there is substantial part of India not having access the formal financial system and even mere opening of saving or no frill accounts without providing basic insurance as well as credit facilities is called partial financial inclusion but not the financial inclusion. Majority of the no-frills accounts opened under the branch correspondent) model are not operational. Opening savings accounts profitably, have not made the desired movement. This has made BC model unviable for the banks to consider this framework further (Kolloju N., 2014).

Mere no-frill accounts does meet the purpose of financial inclusion but formal financial institutions has to achieve the faith and benevolence of the deprived through developing sturdy linkages with community-based joint financial ventures and cooperatives (Sharma & Kukereja, 2013). Looking backward into the definition of financial inclusion only adequate and timely availability of basic financial services has not meet its objective, but to use the same has been the other side of coin called financial inclusion.

Thus the challenges in the path of financial inclusion objective achievement have been demand side in relation to users of facilities and supply side in

relation to providers of facilities both. Lack of financial literacy, personal reasons like illiteracy and poverty and psychological reasons like shyness, lack of trust in banks or financial institutions has been the user related challenges. Less penetration of bank branches, various formalities, high costs, profitability profiling etc. have been providers related challenges (Apurva & Chauhan, 2013; Srikanth and Narayana, 2014; Kohli, 2015). The poor, illiterate, shy people from far places not able and willing to reach the bank branches and even for banks to reach them have been costly and unprofitable business (Radcliffe and Voorhies, 2012).

The studies on overview of financial inclusion analysed various reasons and there recommended solutions. The regulatory enforcement of various schemes by RBI and GOI on formal banking sector (Gandhi, 2013) and technology led solutions like internet banking and mobile banking (Sharma, 2009, Handoo, 2010) provide access to cheap and easily available banking facilities round the clock anywhere. At the same time for banks also technology led solutions (Fatima and Sukanya, 2014) has been profitable opportunity to increase their customer base through alternate delivery channels like POS machines, ATM, Biometric ATM, Micro ATM, CBS branches, mobile banking, internet banking, Plastic Money etc. (Ranganath and Rao, 2013).

(Sasidharan, 2016) inferred that SHG is a viable tool for financial inclusion. It is observed that a society can grow up economically and socially only if the weaker section turns out to be financially independent. Thus SHG plays an important role in the financial inclusion objective of women community

(Khan, 2015) observed that the objective of financial inclusion includes extending formal banking services to the less privileged and thus protecting them from informal money lenders. It focuses on equipping them with various information on financial products and services, thereby enabling them to make informed financial decisions. The study suggested that access to financial

services and financial education must happen simultaneously and continuously. An appropriate business delivery model is important in financial inclusion.

(Devasenapathi and Sundaram, 2015) evaluated the role of banks in financial inclusion. Though the country's financial sector has experienced revolutionary changes, the less privileged class is excluded from its advantages. Majority of India's population depend on agriculture. Therefore, banks are advised to take up policy measures to remove the poverty of the sector by extending credit to the low income groups and for the development of rural area.

(Kesavan, 2015) made a comprehensive analysis on the role of financial inclusion in India as a road map towards growth of initiatives and achievements. A strong financial system is very much essential to ensure sustainable development of any nation. It is suggested that access to financial services should be increased through SHG, MFI and MSME. RBI, Government and NABARD can enforce their initiatives more effectively.

(Mamatha, 2015) evaluated the various policy initiatives of RBI in financial inclusion. He pointed out several modes of financial inclusion including, SHG Bank linkage programs, No-frills accounts, simplification of KYC norms, KCC, GCC, State level banker's committee, MFI, postal savings and remittances, savings bank accounts with post offices and insurance services. RBI has adopted a bank led model with minimum bouquet of products and services which are technology driven. They take up a combination of branch and BC structure.

(Arun & Kamath, 2015) analysed the policies and practices in financial inclusion. Financial architecture of an economy should be sound to ensure development. It is made possible through ensuring accessibility of the poor and vulnerable group to various financial instruments like savings, remittances and credit.

(Gupta & Agarwal, 2015) observed that professional education does not make a difference in financial literacy, i.e., even working women are unaware of banking and home makers are all the more same. As women constitute the group who save the most, different women centric programs need to be organized to educate them on various banking and financial services and the CSR initiatives of Indian banking sector should focus on financial inclusion and financial literacy initiatives.

(Somasekhar, 2015) made an analysis on financial inclusion through SHG for rural livelihoods. Inclusive growth ensures social and economic justice to common people. Several initiatives are taken up in this regard including priority sector lending, service area approach, GCC, KCC etc. NABARD has taken up the endeavour of starting up an innovative programme in 1992 by linking banks to SHG groups of rural poor. SHG''s play an important role in developing thrift habit and providing credit when required.

(Babu & Ahmed, 2015) made a comprehensive review of the performance of rural credit schemes as an initiative of financial inclusion for the development of rural economy. In India, majority of the population depends on agriculture and around 70 percent of the people are living in rural areas. Rural credit is an important source for the up-liftment of the weaker section of society which will ensure the development of rural economy and alleviation of poverty.

(Garg, 2014) observed that banking sector is one of the notable sectors of the Indian economy where technological revolution is at its peak. Indian banks have started embracing technology in its banking products and services since economic liberalization. It is observed that there is a large rural-urban divide where the rural population is way behind in terms of technological penetration and financial inclusion. This gap can be reduced by deploying some innovative business models which will enhance customer satisfaction.

(Satpathyet al., 2014) analysed the transformation from class banking to mass banking through inclusive finance. The strategies of rural transformation in India focused on improving the standard of living of rural population. But a vast chunk of rural population still suffers from social and financial exclusion which results in high incidence of poverty, rising unemployment etc. It is observed that Indian banking industry has reoriented from class banking to mass banking approach to bring the excluded population into its main stream economic activity.

(Mehrotra et al., 2013) made a comprehensive analysis on financial inclusion. Banks play an important role in this regard by taking up various initiatives like No-frills accounts, financial literacy, expansion of ATM networks etc. The study suggested that setting up of financial literacy centre and credit counselling on pilot basis, launching financial literacy campaign etc. can be initiated to foster financial inclusion.

(Mishra M, 2013) analysed the concept, nature and determinants of urban financial inclusion and observed that financial inclusion has been prevailing in India for past 44 years. The nationalization of commercial banks and establishment of RRB's along with banking sector reforms after 1991 led to an increase in the number of branches and thereby population per branches declined rapidly.

(Chakraborty and Mukherjee, 2012) opined that promotion of financial inclusion has been an important social and financial need across countries. The primary responsibility of financial inclusion in India lies with the commercial banks subject to the guidance of RBI. But in a country like India with diversity and huge size of population the commercial banks have been taking the assistance of various social and financial entities.

(Diniz et al., 2012) observed that an ICT – based platform, specifically ICT enabled branchless banking in developing countries supports financial inclusion greatly. This would ultimately result in social inclusion which will result in poverty reduction, and enhance the economic growth in the country. However, it is also observed that although accessibility of poor to financial services will result in economic development, it should be accompanied by other strategies like financial education so as to make it more effective.

(Gupte et al., 2012) has observed that financial inclusion will ensure participation of weaker sections in the financial system. RBI initiatives in this direction includes relaxed KYC norms, No-frills accounts, GCC for small deposits and credit since 2005-06.

(Engelbrecht, 2011) made a comprehensive review of global financial crisis. The study observed that institutional financial inclusion and the facilitation of micro level social work interventions are essential in order to make a meaningful contribution to the creation of financial capability for vulnerable households.

(Rachana, 2011) examined financial inclusion in rural areas, reasons for low inclusion, satisfaction level of the rural people toward banking services and the performance of the banks which are working in the rural areas. The results of the survey conducted among 200 people residing in Ambasan, Jotana and Khadalpur villages of Gujarat shows that there is lot of opportunity for the commercial banks to explore the rural unbanked areas. Though Regional Rural Banks (RRBs) and Primary Agriculture Credit Societies (PACS) have good coverage but most of them are running into losses. Commercial banks should seize this opportunity rather than looking at it as a social obligation.

(Ardic et al., 2011) identified hat 56 percent of adults in the world do not have access to formal financial services. The situation is even worse in the

developing world with 64 percent of adults unbanked. Nevertheless, high income countries also have to worry because approximately one in every five adults is unbanked. They observed that informal financial services are at least 5-10 times more costly and less reliable than formal ones. Hence, making formal and affordable financial services available for the unbanked would definitely have positive consequences in the lives of these people.

(Anand & Saxena 2010) made an analysis of the technology based initiatives by Indian commercial banks towards financial inclusion. IT plays a vital role in the process of financial inclusion. Commercial banks have introduced various electronic payment methods. Which includes net banking, mobile banking, telebanking, ATM, biometric ATM"s, Mobile ATM"s, Common service centre (KIOSKS), SMART CARDS. Though several modes of electronic payments exist customers are more conservative in using these channels. The study has suggested that banks must address the anxiety of customers by educating them.

(Leeladhar V. 2005) has made a comprehensive review on taking banking services to the common man and observed that banking industry has shown significant improvements in areas of financial viability, profitability and competitiveness, but the banks have not been able to include the under-privileged.

(Kalita, 2018) observed that there is progress in the indicators used to measure the social empowerment of women after their SHGs linked to commercial banks for credit extension under SHG Bank Linkage. It also revealed that the SHG Bank Linkage has positive impact upon the self-confidence of women members and enhanced the possibility for gainful employment for members of the SHGs.

(Sharma & Goyal, 2017) observed that level of income, sources of financial information, and awareness of inclusion schemes are very much influential in the process of financial inclusion. The study revealed that there is an association

between demographic variables and level of awareness of PMJDY among the rural households. It is identified that rural households are more likely to be financially included at closer distances from Bank.

(Dutta & Das, 2017) analysed the approaches adopted by different banks in financial inclusion and the response of customers towards the banking approaches. They observed that there is full compliance of RBI norms from the part of banks in terms of opening of new branches, offering No-frills accounts, KCC and simplifying KYC norms but lot more is needed to achieve the goal of financial inclusion. The ultimate objective of financial inclusion needs combined efforts from the three pillars - RBI, all the banks and general public.

(Wang & Guan, 2017) measured the state of financial inclusion across the countries by using the financial inclusion index and the Global Findex database of World Bank. The analysis revealed that developed European and North American countries enjoy higher levels of financial inclusion than the less developed countries of Africa and most of Asia. The spatial econometric research identified individual's income, education, and use of communications equipment are important factors that explain the level of financial inclusion.

(Ouma et al., 2017) analysed the scope of mobile phone technology in enhancing savings mobilization in sub Saharan African countries. They observed that availability of mobile phone technology in financial services boost the likelihood of savings and it has a significant impact on the amount of savings among the poor and low income groups with constrained access to formal financial services.

(Ghosh & Vinod, 2017) analysed the interface between gender and financial inclusion in a comprehensive manner. They observed that there exists significant disparity in both the access to, as well as the use of finance by gender. On average, female-headed households are eight percent less likely to access

formal finance and six percent more likely to access informal finance as compared to households that are headed by males.

(Swain, 2016) in the research report for Centre for Rural Credit and Development Banking observed that huge disparity is there in the performance of zero balance accounts across regions, states, bank groups, and at branch levels. The proportion of zero balance accounts in the total number of accounts increased initially at a steady rate but decreased subsequently and the decline was noticeably sharp from mid - 2015.

(Verma & Garg, 2016) examined the effectiveness of PMJDY by evaluating the awareness about the scheme among the target group and effectiveness of financial literacy initiatives under PMJDY. The study was conducted among the households of Bandrasindri village in Ajmer district of Rajasthan. Even though the mission mode project PMJDY scheme targets on universal access of banking, the grass root realities show that continuous efforts are needed to eradicate the financial untouchability in the real sense.

(Munyegera & Matsumoto, 2016) traced that mobile banking offers facility to bridge the financial services access gap. This recent innovation in the financial sector reduces the average cost of remitting funds across households greatly. The households using mobile, experience a significant increase in per capita consumption and this will ultimately help in reducing poverty and vulnerability especially among the rural poor.

(Yadav & Sharma, 2016) developed a composite index on financial inclusion by applying technique of order preference by similarity to ideal solution (TOPSIS), using the three broad parameters of penetration, availability and usage of banking services. The study revealed that the value of financial inclusion for India on composite IFI has been increased by 0.045 points during the study period.

(Ghosh & Vinod, 2016) studied the interface between gender and financial inclusion. It is revealed that female headed households are 10% less likely to access formal finance as compared to households that are headed by males. Similar is the case with the use of finance in business as well. It is observed that financial counselling regarding the suitability of financial products can be extended to women which will thereby improve the performance of women owned business.

(Vijayakumar et al., 2016) observed that KCC is a pioneering credit delivery innovation for providing adequate credit to the farmers under single window. It is a flexible and simplified procedure. 1262 lakhs of KCC have been issued by banks till the end of 2012-13. Commercial banks have issued the highest number of KCC followed by co-operative banks and RRB's.

(Goyal, 2016) analysed financial inclusion and indebtedness in rural Punjab and observed that opening of bank accounts and availing loan on regular basis is a strive towards financial growth. It was revealed that 84 percent of respondents of rural Punjab had a bank account of which majority of them had with public sector banks. However, 81% of them could not avail any credit from any source.

(Mohapatra & Sahoo, 2016) examined the individual, household and environmental characteristics that determine participation in a self-help group (SHG)-bank linkage programme in Odisha. A probit binary model is used for the analysis and a composite index of women empowerment is developed by using three indicators - autonomy, economic empowerment and the gender relationship. The study revealed that participation in microfinance has a positive and significant impact on women empowerment.

(Poonam, 2016) observed that Pradhan Mantri Jan Dan Yojana focused only on the supply side by providing banking facility in villages with population greater than 2000, but the entire geography was not targeted and the initiative was not

focused on households. Moreover, a large number of bank accounts remain inactive. Therefore, it is suggested that a comprehensive plan is necessary to keep the accounts active and it should be used as an instrument of some economic activity leading to livelihoods.

(Devi, 2016) observed that one of the important indicators of financial inclusion is the availability of banking services. With the initiative of SWABHIMAN campaign, Government of India and RBI are taking up several initiatives for promoting financial inclusion. However, despite the initiatives taken, only less than 40 percent people are under the ambit of financial inclusion since its inception. It is inferred that the basic goal of financial inclusion is still unattained.

(Kumar & Joseph, 2016) analysed the financial inclusion initiative of Basic savings bank deposit account (BSBDA), formerly No-frills accounts for the rural households. The study revealed that socio - economic model of basic savings bank deposit account emphasizes significant association of variables like education, monthly income and occupation with the banking usage behaviour. Therefore, the study suggests banks to take up the initiative in organizing awareness programs and financial literacy campaigns for the benefit of the rural poor.

(Sethy, 2016) made a comprehensive review on Indian banking sector reforms and the current status of financial inclusion. The study revealed that when compared to pre - reform period, the post - reform period shows better performance of proportion of households having accessibility to savings. However, the study suggests community based financial ventures, which will generate trust and goodwill of the poor than merely opening up of No-frills accounts.

(Barman & Adhikari, 2016) assessed the performance of SHG- Bank Linkage programme in North Eastern states of India. The growth performance of the programme in the region in terms of per SHG saving and loan disbursement is not satisfactory compared to all India level. It is observed that there is no significant difference across the states of NER in terms of all the selected parameters except per SHG Non-Performing Assets. However, it is better in the case of SHG loan outstanding per head and NPAs.

(Oveis & Mariappan, 2016) traced out that only a few financial service products are invariably known to people in Anantnag, the southern district of Kashmir and were not aware of the technological services provided by banks and other financial institutions. There exists a significant difference in the awareness and satisfaction level of banking services with regard to demographic variables. They observed that financial literacy is important in a country like India where large section of the society is deprived of basic savings bank account due to the lack of knowledge about the banking services or products.

(Birla, 2016) made a comprehensive analysis on the role of commercial banks in financial inclusion with respect to Indian economy. In the study the impact of financial inclusion scheme on Indian economy is measured in terms of quality of life index, social progress index, where to be born index, human development index and GDP/GNP progress and growth forecast. The study revealed that lack of availability of financial services to the poorer community is due to lack of awareness, absence of financial literacy, lack of interest and absence of banking and savings habit. It is where commercial banks play a major role by opening up new branches in rural areas, setting up more ATM‟s, introducing new investment schemes, opening up financial education centers.

(Garg, 2015) examined the role of banks in financial inclusion. It is observed that since late 1960‟s commercial banks played a vital role in financial inclusion. With the advent of banking sector reforms, it gained a faster pace.

The various initiatives taken by commercial banks in this respect include No-frills bank accounts, business correspondents and business facilitators, General Credit Cards, expansion of ATM networks, financial literacy etc. However, in spite of these efforts the study found that financial inclusion is very low.

(Paramasivan & Kamaraj, 2015) analysed that the Commercial Banks Performance on Pradhan Mantri Jan Dhan Yojana. They observed that the scheme has created an impressive response in the banking system and was capable of bringing the poor into the formal net irrespective of geographical limitations. But, there should be continuous efforts from the formal institutions to achieve the real objective of the scheme apart from the mere opening of savings accounts.

(Jaiswal & Bhasin, 2015) observed that there still exist credit gaps in rural areas as commercial banks are essentially urban focused. Credit delivery of commercial banks to rural areas is therefore beyond its activity. Gap between financially excluded sections of society can be reduced by providing financial literacy and strengthening credit delivery mechanisms. It is observed that only a financially independent population can result in economic development.

(Kumar & Kumar, 2015) observed that though several initiatives are taken by RBI and Government of India for promoting financial inclusion, the outcomes are not satisfactory. For achieving the goal of financial inclusion in a developing country like India, the financial institutions including bank, regulators and government should work together and more financial inclusion rules should be framed in the country.

(Unnikrishnan & Jagannathan, 2015) estimated the current values of global financial inclusion and its relationship with economic growth and human development. The study revealed that merely possessing high income in terms of GDP does not enable balanced growth in an economy. There is still no

established relationship or correlation between Human development and financial inclusion in higher middle income countries.

(Kalra et al., 2015) observed that financial education is low among the poor and vulnerable section of society which emphasizes low levels of money management knowledge. It is detrimental to the clients of micro finance as they are unable to understand and utilize the range of products and services available.

2.3 MGNREGA as financial inclusion scheme

India is a country which has its 74% of its population residing in 6,38,365 villages (Census, 2011). The source of income of most of them is agriculture and other allied activities. Sources also reveal that most of them lay below the poverty line as well which is an alarming signal. There have been multiple schemes launched by Government of India to alleviate the socio-economic status of them. The scheme varies from giving subsidies in agriculture to the distribution of grains at as low as Re 1/kg.

The schemes also vary from enhancing their literacy to giving employment to them. In other words, the agenda of such schemes is to address the socio-economic needs of the people keeping in mind the development of rural sector of India. The schemes cover multiple dimensions of rural development i.e. social security, self-employment, building rural infrastructure, direct employment etc. The central theme of such scheme has been usually poverty alleviation. As discussed, the scheme tends to target a multifaceted dimension. The Mahatma Gandhi National Rural Employment Scheme (MGNREGS) is one such scheme which aims at ensuring employment as a legal right (Das, 2012). It is observed to the largest ever public policy program visualized in human history (Sameeksha, 2006). This scheme ensures guarantee of job thereby leading to both social and economic protection of the enrolled worker.

The scheme ensures in enhancing livelihood security in rural areas of India. The salient feature of the scheme is providing 100 days of guarantee wage-employment in a financial year to every household whose adult members volunteer to do unskilled manual work at a statutory minimum wage rate.

Another feature which is worthwhile to note is that it ensures a guarantee of 68 providing the work within 15 days of application received by a wage seeker enrolled under this scheme. The job seekers are engaged in public work as defined in the scheme (Sameeksha, 2006).

The aim of this scheme is to create a short-term casual employment in the rural areas thereby creating a sustainable livelihood for the rural people in India. The inclusion of banks and non-banking financial companies for distribution of wages also makes this scheme a tool for enhancing financial inclusion (Tiwari et al., 2011; Vij, 2011). The scheme, therefore, gives a dual advantage of solving the problem of poverty alleviation and financial inclusion.

A third perspective of the scheme is the development of infrastructure. Thus, the scheme works 360 degrees towards sustainable development (Pellissery & Jalan, 2011; Ghose, 2011). Unique features of the Act include, time bound employment guarantee, and incentive disincentive structure to the State Governments for providing employment as 90 per cent of the cost for employment provided is borne by the Centre or payment of unemployment allowance at their own cost and emphasis on labour intensive works prohibiting the use of contractors and machinery.

The roots of this scheme were laid 30 years before its existence when its precursor started its operation under Maharashtra Employment Guarantee Act where there was no record where an unemployed sector of society was guaranteed employment.

On the contrary, MGNREGS covers the basic lacunae of its predecessor. The scheme covers a major portion of its operation in the rural India which results in the social inclusion as well. The act also mandates 33% women participation as workers. Thus, it aims to cover the basic issue of disparity in gender and income in the country. The scheme gives an added advantage in covering add sections of the society whether they belong to any caste, creed, gender, and place of residence. Thus, the scheme attempts to upscale the development of the country.

With more than six decades after India's independence, almost 80% people suffer from problems of malnutrition and social disparity (Esteves et al., 2013). The concern becomes double folded as the urban sector does not invest in rural areas due to a low rate of return and lesser efficiency. The rural India, therefore, needs solace from scheme like MGNREGS which would target only in that section of society. The uniformity in the application of the scheme also process to an added advantage in enhancing the quality of life of rural India (Singh, 2012; Das. 2012). The uniformity also brings a sense of equality amongst workers and helps them to feel them treated uniformly.

With these benefits in line, MGNREGS has an immense potential to change the rural scenario and face of the country. There are numerous studies which have reflected the bright and the dark side of the scheme. On one side, where the scheme attempts to include willing workers to be a part of employment force and helping them monetarily, the flip side showcases corruption in the scheme. The studies have also pointed that illiteracy and unawareness of workers were used as tools for the stakeholders to fudge data and earn money out of the scheme (Kanungo, 2012).

Enhanced Wage Earning and Financial Inclusion

MGNREGS has contributed towards a sustainable income source to the rural households. The scheme provides employment to 5 crore households approximately, annually which can be equated to about one quarter rural population of India.

Another success story of the MGNREGA can be stated as its ability to have created 1575 crore person –days of employment since its launch. The scheme has distributed an enormous sum as wages of about 1,54,000 crores which makes up 70% of its expenditure between a time frame of April 2006 to December 2013. The wage rate for the works has seen a constant soaring trend across all Indian States.

It began with distributing Rs. 65 per person per day and has almost doubled by the end of 2013. The rate of payment has not only added to additional income for these workers but also ensures 100 days of the job thus, helping the rural poor to hone their skills. It has also acted as a single source of guaranteed income ensuring monthly per capita expenditure, greater food security, savings etc. for the agrarian economy of India which is paralyzed with seasonal employment. Results of the MK group study indicate that spending in the rural areas outpaced the spending in the urban areas consecutively for two years (2009-10, 2011-12) which has never been observed before.

In the Pre- MGNREGS era, infrastructural development was being controlled by contractors who hired a specific set of labours which led to the violation of the principle of equity. The scheme has therefore helped in bridging the gap between the poor and the needy while, paving a way for inclusive growth in the Indian Economy.

Payment through Banks and Post Offices and Financial Inclusion

MGNREGS is public policy program which ensures minimum 100 days of employment and the wages are paid using bank channels or post offices. Government of India (GoI) mandated that the payment of wages should be routed through either of the two channels in order to maintain transparency. The directions from GoI clearly states that all wages will be deposited in the accounts held either in banks or post offices unless exempted by MoRD.

This has resulted in an infusion of more than 10 crores in the banking system. The figure corresponds to more than 80% of the transactions routed through these formal channels. The inclusion of poor people in the formal sector is an achievement in itself and thus MGNREGS has been contributing towards financial inclusion as well (Narayan & Das, 2014; Chabra et al., 2010).

The growth in the number of accounts and continuous inflow and outflow of cash from the accounts has included a major portion of the unbaked class into the bankable sector. The scheme solves the double problem of employment and financial inclusion of the country simultaneously. It is worthwhile to note that the behavioural intention towards using these formal channels is an area which needs to be explored. Also, the rate of diffusion of usage of technologies and awareness about bank accounts is a weak link, but strategizing these two aspects can cause wonders (Patidar & Gupta, 2012; Reddy & Reddy, 2014).

Inclusive Growth

MGNREGS is in its third phase of implementation and in the past decade, it has contributed towards the inclusive growth of the country. The scheme has not only contributed towards employment aspect but also has included all social caste and gender into the scheme. The scheme has given employment to socially weaker class and women as well. Thus, social inclusion is also taken into

account while functioning of the policy is taking place (Krishnan & Balakrishnan, 2012).

The scheme has benefited the marginalized class as the scheme includes work carried out in private lands. The scheme has given shelter to more than 10 lakh households by employing them. Researches have shown that MGNREGS has contributed towards the four pillars of the rural society (Farooquee, 2013; Sarkar & Kumar, 2011).

It has contributed towards the increment in the household income and simultaneously improved the intensity of cropping. The scheme has also helped the farmers to raise their holding from small to marginal class and improved the quality of assets held by them. The scheme has therefore not only helped them towards the financial stability but also paved them a path towards completely sustainable development.

The scheme has offered a secondary source of income to the farmers at a competitive wage as offered by labours in cities. The trade-off of this extra income is carefully taken care by the government of India. The rural households enrolled under the scheme can now contribute towards the extra income. The absence of this scheme forced all the family members to work in the fields and small farms never required such a high capacity of workers in it. The launch of this scheme has given an option and choice to the rural households to decide and work in their fields or under the scheme (Sarkar & Kumar, 2011)

Livelihood and Income Security

Poverty is a vicious circle that has been chocking the growth of the country. The earlier section of this chapter has pointed out that there were several schemes before the launch of MGNREGS which aimed at addressing the issue of poverty using various viewpoints. MGNREGS is also one such policy which has been

aiming the same. The angle and viewpoint of this scheme are through employment. This section of the chapter gives a glimpse of how the scheme has contributed towards eradicating poverty thereby contributing towards a sustainable socio-economic and poverty ridden sector.

Studies have proved that MGNREGS has contributed towards the poverty alleviation of the country (Sarkar & Kumar, 2011, Sameeksha, 2012). The scheme includes rural workers which are enrolled to work. The scheme, therefore, contributes towards the successful usage of manpower to eradicate the problem of poverty.

The scheme also ensures a security of 100 days of income, when enrolled. The distinction is not done on the basis of gender or social status. Therefore, it gives an equal opportunity to every individual to be a part of the scheme and earn money for their work.

The scheme has contributed towards improving the conditions of the workers and their families. Studies have also observed that the rural men do not shift to cities for work. The concern for them was to manage their family in the rural area while the male member was working in the city. The security of their family and their livelihood is also taken care by the scheme. Therefore, the scheme has helped the families towards the growth and stopped the migration of labours from rural to urban areas.

Household Income

The scheme has contributed towards the household income of the workers. It is observed that the male members of the family used to work in their fields during agriculture season and migrate to a city during the off season.

In this process, the source of income is still the male member. The counterpart has the responsibility to take care of the family. The scheme allows the better half of the family to work and contribute to an extra 100 days of income in the house. This income initially acted as a bonus income for the household, but slowly has transformed into savings of the family.

This extra income becomes a source of starting a small venture by the family or acts as an investment towards the betterment of the state of living of the family. In a survey conducted for more than 1500 households in three states of India, it was found out that the income earned through MGNREGS had a significant contribution in the family income of the household (Kelkar, 2011; Prasad, 2012). The results showcase that Andhra Pradesh reflected 17 percent household income through MGNREGS followed by Rajasthan and Maharashtra with 10 % and 7 % respectively.

Although the study took a sample of the state, but the results in general point out a role of income from the scheme as a secondary source of income for families. In an another survey in the Medak district in Andhra Pradesh, 12 percent of the households indicated that their household income had increased as more members of the same household were not employed.

Some of the interesting results from the survey conducted in Birbhum district of West Bengal indicated that MGNREGS has played a key role in rural entrepreneurship. The results indicate that 17 percent of the respondents highlighted the fact that the money earned from the scheme was utilized to start, grow or run a small to medium scale of rural business.

Therefore, MGNREGS has also proved to be a mini bank which could act like finance for their small and marginal farmers and their household to encourage them to be a start-up.

Alternate Employment Options (AEO) and Opportunity Cost of Time

Research studies have suggested the need to deduct the opportunity cost of time from MGNREGA (cost of the next best alternative foregone) in order to estimate MGNREGA's impact on income more accurately (Verma, 2011; Nair et al., 2013).

In Rajasthan, among female-headed households, the share of MGNREGA earnings was found to be nearly 15 per cent of household income; that is slightly higher than twice as that of male-headed household.

This particular result implies the substantial importance of this source of income for the female headed households. In contrast, the shares are high for both male- and female-headed households in Andhra Pradesh (19 per cent and 16 per cent, respectively). Using the same measure, among landless households, the share is 20 per cent in Andhra Pradesh, followed by Maharashtra and Rajasthan with a nearly equal share of about 7 per cent.

A parallel measure to estimate the viability of MGNREGS is to evaluate and assess alternate employment opportunities. The basic function of demand and supply and managing a trade-off between them is important.

The basic understanding process that availability of lucrative and accessible AEO would diminish the relevance of MGNREGS as it would prove to be a competitor for the scheme. Results derived from National Sample Survey Organization (NSSO) 65th round indicate that the study conducted in three states have a marginal availability of alternate sources of income. It was found that not more than 14 percent respondents from Rajasthan reported availability and accessibility to such options. The numbers were comparatively very less in Andhra Pradesh with 6 percent respondents and Madhya Pradesh with 2 percent.

An important view point is to calculate and evaluate a number of work days available to the workers other than MGNREGS. The results from Andhra Pradesh indicate that an average worker had an opportunity to work for 16 days @ Rs. 74/day or for 20 days @ Rs. 89/day. Similar results were found in Rajasthan and Madhya Pradesh where per day wage under MGNREGS was higher than the other options available. Also, the number of work days a worker can be enrolled under this scheme was higher than the other alternatives (Lakha, 2011).

The results from NSSO confirmed the earlier studies conducted in Medak district which shows that more than two-third of the respondents were relying on MGNREGS as their alternate source of income. The reasons could be guaranteed work and stabilized wage structures. Another important reason could be the accessibility of work in close proximity of their house which saves their time to commute as well.

Monthly Per Capita Expenditure

A fresh dimension to study the impact of MGNREGS on the level of poverty in India is calculating monthly per capita expenditure. The relationship shows a linear graph between the impact of scheme and increase in expenditure on food and basic necessities because of increase income. Thus, a household which is engaged in the scheme and has an extra source of income tends to spend more.

Studies indicate that states like Rajasthan, Gujarat and Maharashtra has experienced a growth in per capita consumption to the tune of minimum 10 percent each due to high enrolments and work undertaken under MGNREGS (Sudarshan, 2010).

The distribution of expenditure has seen a significant increase in non-food items and other consumables by around 23 percent. Rajasthan exceptionally saw

investment and expenditure in education, clothing and health care which has not been experienced in any other state. The results also act as a proxy for understanding the relation between consistent source of income and investment/expenditure pattern of the rural households.

The results were tested in Andhra Pradesh as well and the difference in pattern of expenditure was seen from 2004 to 2010. The results derived from data collected from more than 2500 households confirm the results attained from Rajasthan as well. MGNREGA seems to provide poor households the ability to withstand economic shocks and deal with inflation. In a study conducted in Chhattisgarh, Jharkhand and Odisha, most sample households reported that had MGNREGA not been implemented in the study areas, most of the households would not have had the capacity to purchase enough food grains (Prasad, 2012; Sameeksha, 2012).

Inter-State Variations

The launch of MGNREGS in India also accounted for a different wage structure for every state. The difference in it had justified reasons while the inter-state variations in participation of women are a concern which is raised in this section.

Kerala over the years has witnessed the highest rate of women participation which is closer to 90 percent followed by Tamil Nadu and Rajasthan with 75 percent and 68 percent respectively. The arrangement of the states in their descending order of their women participation indicates that nine states had lesser than one third of their women participants under the scheme (Narayanan & Das, 2014; Das, 2012).

The results are skewed towards the southern half of the country while the northern half does not have high rate of enrolment of women in the scheme.

Some of the prominent and possible reasons responsible for their skewed result could be:

1. Existence and operations of Self Help Groups
2. Wage difference between private sector and MGNREGS. The scheme offers better wage rate which adds to a reason of their loyalty.
3. Acceptance of culture among the female workers enrolled under MGNREGS.
4. Awareness and effective institution applied by the local and state government to promote female workers.
5. Higher rationing in poorer states such that there are still a higher percentage of women in casual wage.

Rationing could also be due to a lack of awareness in the poorer states, or also due to a high demand and limited supply of work opportunities wherein women are forced to compete with men for employment, and the latter are usually favoured for manual labour. However, in places where the market wages are higher than MGNREGA, men undertake jobs in the market and women seek employment under the Scheme. (Sameeksha,2012).

Governance and Process Challenges

MGNREGS marks a change in the functioning of employment programs in terms of balance between demand and supply and designing a legal framework. The scheme however, has faced own set of challenges in governance and policy related matters. As the application of the scheme in each state is different, the degree of intervention by local governance is different.

The quality of governance in each state and in each block to be precise plays an important role in implementation of MGNREGS. This results in difference in performance of states and indirectly the wages of the people.

Demand in any state is driven by the available resources and feebly by actions taken by local governance. It is seen that poorer states tends to have a greater degree of demand under MGNREGS. On a parallel track, observations also confirm that greater unmet demand and higher rationing rates prove to be key highlights of the scheme. The reason could be the less efficiency of state government to implement the scheme. The difference in demand and supply in the states causes a deficit in the level of performance.

Studies have also indicated a set of other policy related issues like low capacity of Gram panchayat, lesser participation of women, low quality and durability of assets, lesser completion rate of work, delay in payment of wages, delay in opening of accounts and fake filling of muster roll leading to corruption issues (Sameeksha, 2012; Sameeksha, 2006; Ahuja et al., 2011; Sarbavidya & Karforma, 2012).

Thus, auditing the scheme on a regular basis is important and plays a crucial role in the efficiency. Comptroller Auditor General (CAG) of India undertakes audits but the frequency of the audit varies close to 3 to 4 years. The time period of such audit weakens the argument of successful deployment of governance practices in the state and the central government.

The reports submitted by CAG impacted the performance of the states as well. Some of the states took the results seriously and introduced preventive measures to undertake and promote transparency in the scheme. In a study conducted for six states – Rajasthan, West Bengal, Jharkhand, Maharashtra, Bihar and Uttar Pradesh; it was found improvements in record maintenance for a study undertaken for a month.

Record management plays a vital role in enhancing the level of transparency and helps reduce the level of corruption. The audit reports have impacted the performance of the states and initiatives have been taken by the state to modify the practices undertaken under the scheme. The launch of Management Information System (MIS) and collating data through it was one of the ways to reduce the flaw in fudging of the data.

Awareness and Planning

This is one the areas which government is lacking and its importance even known is not been acted upon. The workers enrolled in the scheme are unaware of the facilities provided to them. This limited sharing of information leads to corruption and malpractices. It is also found out that infrequent meetings and limited participation by the members of Gram Sabha also leads to delay in work and reduces the efficiency as well. The planning and monitoring of work hand in hand, but MGNREGS lacks this coordination as well.

Awareness of the scheme is one of the prime areas which are one of the central ideas of this research. The parameters of awareness are not restricted to awareness among the workers enrolled in the scheme. The requirement for awareness is equally important for potential workers as well. It is been seen that the level of awareness among the potential workers is relatively low which affects the number of enrolments for the scheme. People are not aware of the benefits and process of enrolment in the scheme. The results found from National Sample Survey Organization (NSSO) panel survey on MGNREGA conducted in Madhya Pradesh, Rajasthan and Andhra Pradesh are:

- Low degree of awareness about unemployment allowance:

  The results revealed that in Madhya Pradesh, more than 18 percent households did not know about the legal provisions for unemployment. The results were less than 12 percent for both Rajasthan and Andhra Pradesh. The results are an indicator of the fact that the people enrolled under the scheme are either not told about the provisions or they do not know about the exactness of the provisions.

- Low awareness about work on demand:

  MGNREGS has a provision about offering job to people who are enrolled under the scheme within 15 days on their enrolment. The results from study indicate that close to 72 percent people in Rajasthan were aware of this fact and the fact that they can demand work at any time of the year. The number was drastically low for Madhya Pradesh and Andhra Pradesh where hardly 47 percent and 29 percent workers knew about their right of demanding work. The results are a proxy of the fact that there is no such awareness campaign held by the government or MGNREGS officials to make the workers understand their rights and benefits. The initiative is also not taken at the Gram Panchayat level.

- Low awareness about grievance redressed mechanisms:

  The survey also asked questions related to grievance redressed mechanism in these states and the results indicate that more than 35 percent workers in Andhra Pradesh had no clue regarding the process and option of lodging a complaint in case of any trouble. The numbers were 28 percent and 16 percent for Madhya Pradesh and Rajasthan respectively. The results also indicate that workers were not motivated to lodge a complaint. On the contrary, they are

given verbal assurance that it would be resolved rather than following the exact channel.

Planning at the Gram Sabha

The Act mandates that the selection and prioritization of works to be taken up during a Financial Year (FY) under the Scheme, be done by the GS. Planning and prioritization of the works by the GS ensures that the development needs of each village are addressed through active participation of the villagers. The Act also prescribes that works be allotted in a way that at least 50 per cent of the total works (in terms of costs) be undertaken by the GPs. This is to provide the GPs a substantive role in the implementation of works.

However, field studies identify some constraints in the process, viz.
1. GSs are held infrequently,
2. There is low participation at GSs for selection and prioritization of works,
3. Sometimes work selection is not done according to the priorities or demand of the GS,
4. The proportion of the work undertaken by the GP was less than 50 per cent of the total cost of the scheme in the district.

At the planning stage, the CAG audit10 found that:
1. Around 80 GSs had not been convened across 12 states including, Andhra Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Odisha.
2. In 11 of the surveyed districts in eight states including Himachal Pradesh, Jharkhand, Odisha, Tamil Nadu, Uttar Pradesh less than 50 per cent of the total works (in terms of costs) were executed by GPs.

Other field studies had similar findings. A study in five districts of Uttar Pradesh found that for selecting the works to be undertaken, only 45 per cent of the 784 respondents (beneficiaries and non-beneficiaries) said that meetings of the GS were held and only 42 per cent respondents reported that the selection of works was done according to priorities of the GS. This percentage was found to be high (as noted in awareness levels above as well) in the case of states like Maharashtra.

Out of 200 respondents interviewed in two districts of Maharashtra, 83 per cent in Thane and 60 per cent in Akola reported that GSs were held to discuss MGNREGA.

In a short span of 10 years, MGNREGA has focused not only towards employment, but also contributed towards including a large portion of the unbanked people in the financial sector. The scheme has helped the workers operate a bank account of a post office account which has made them connected to the financial sector and simultaneously helped them in understanding the importance of saving through proper awareness.

2.4   Effect of Mobile Banking on Financial Inclusion

Inclusive growth if targeted systematically may lead to financial stability, asset building and economic mobility and empowerment of the low-income group people. To transfer funds at a distance, particularly small amounts of money, m-banking/m-payments methods are generally less expensive than many of the alternatives available to poor households (Donner & Tellez, 2008).

In terms of financial inclusion, the position of banking industry is not excellent in India. The lots of Indian population till date have not their personal bank accounts (Agarwal, 2014). Even Pradhan Mantri Jan Dhan Yojna (PMJDY) has not yet resolved is the last-mile connectivity essential for financial inclusion

(Bannigol & Hundekar, 2015). Financial inclusion is no longer a policy choice today but a policy compulsion and banking is a key driver for financial inclusion/inclusive growth (Ravikumar, 2014). Among banking technologies, mobile banking appeared as a possible solution for financial exclusion with wide mobile phone coverage. Mobile devices are the most promising way to reach masses and to create a tie-in among current customers, due to their ability to provide services anytime, anywhere, high rate of penetration and potential to grow (Anyasi & Otubu, 2009; Bhatt & Bhatt, 2016; RBI, 2012; Jamal, 2013; Jenkins, 2008; Dermish et al., 2012).

Despite of policies around Financial Inclusion and Mobile Banking, India haven't achieved desired results neither with rural nor with urban population (Mishra & Bisht, 2013).

Mobile banking is driven by the same determinants than traditional banking (Zins & Weill, 2016). There is also need to generate awareness about the mobile banking so that more and more people use it for their benefit (Gupta et al., 2013). According to (Jack & Suri 2010) mobile banking is enabling remittances to increase risk sharing and improve consumption smoothing. It reduces the cost and risk inherent in dealing with cash.

Banks are profit oriented entities and must be able to recover the costs which they incur in providing services like deposits, credit, remittance, insurance etc. Otherwise the model would be unstable and may collapse one day (Handoo, 2010). The larger base of mobile subscribers has not been tapped for financial inclusion (Dash et al., 2015)

Research indicates that the number of footfalls at a bank's branch has fallen down drastically after the installation of ATMs. As such with mobile services, a bank will need to hire even less employees as people will no longer need to visit bank branches apart from certain occasions (Pandey et al., 2012)

Unbanked economies have tapped the potential of digital technology, particularly in the mobile space, to gauge the impact of technology-driven inclusion. India, with its unbanked population of approximately 47 per cent and 900 million mobile subscriber base, sees only 1 to 1.5 per cent of mobile subscribers using mobile money actively (KPMG, 2015).

While studies on financial inclusion have tackled the issue from variety of viewpoints, with the exception of conceptual studies, the focus is seemingly on finding out the relationship between financial inclusion with awareness, digital technology and constraints to access (Costa & Ehrbeck, 2015).

As per the NREGA operational guidelines (MoRD, 2008) the wages are paid through banks or post offices but, due to staff shortages and other processing delays in most cases the payment is delayed (Ambasta et al., 2008; Vanaik & Siddhartha, 2008)

2.5   Factors Affecting Mobile Banking Adoption

Pioneer works by (Venkatesh & Davis, 2000; Brown et al., 2012) show that most of the technologies could not survive for a longer duration due to its slow adoption rate by the end users. Researchers also focused that it's not only installation of technology but also the end user behavioural intention which plays a far more important role in making the technology a successful investment (Brown et al., 2012; Al-Qeisi et al., 2014).

The researchers have argued on the comprehensive list of drivers which enhance and enable technology adoption. The unique and peculiar commonality between the existing literatures is that they have numerous actors leading to one independent variable which is in lines with "Intention" of the end user (Taylor and Todd, 1995; Lu et al., 2003; Thong et al., 2006; Teo & Noyes, 2014).

2.5.1 Theory of Reasoned Action (TRA)

TRA is a combination of conceptual and working model which intends to study the social psychology of end users when introduced with any new technology (Fishbein & Ajzen, 1975). The model was developed to understand how behavioural factors contribute as barriers in the adoption of technology (Ajzen & Fishbein, 1980). The theory was based on an assumption that users behave rationally and their belief on any technology is dependent on the existing belief of other users (Ajzen & Fishbein, 1980; Madden et al., 1992).
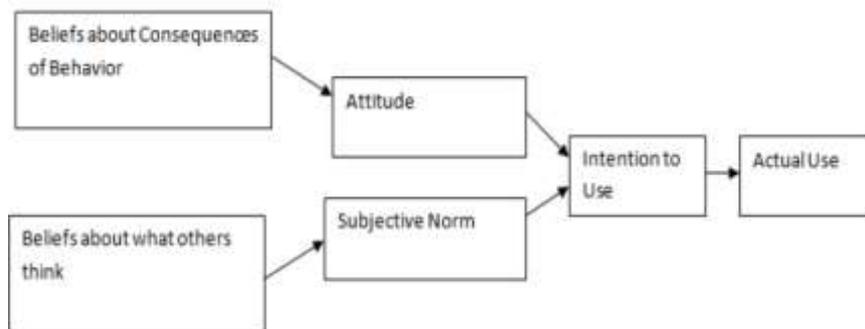

Figure 5 – Theory of Reasoned Action Framework (Fishbein and Ajzen, 1975)

TRA hypothesized that behavioural intention (BI) is jointly determined by Subjective Norm and Attitude towards performing of Behaviour.

TRA has been applied to various situations to predict the behavioural intentions of the individuals. Studies depict its usage in education (Fredricks & Dossett, 1983), predicting turnover of a company (Prestholdt et al., 1987) examination of breast cancer (Powell et al., 1991). The theory has proved over years and in vivid situations and its utility and contribution towards understanding behavioural intention has been significant (Sparks & Sheppard, 1992; Kim et al., 2011; Bagozzi et al., 2000).

The theory was further extended by a new theory i.e. "Theory of Planned Behaviour" which had its foundations based on TRA but the model presented was an improved model to rely on.

2.5.2 Theory of Planned Behaviour (TPB)

It was found that TRA did not segregated behavior with the intention of the end user (Ajzen, 1991). The model depicts that Usage and Actual Behavior are governed by three major factors i.e. PBC, attitude towards the technology and subjective norm.
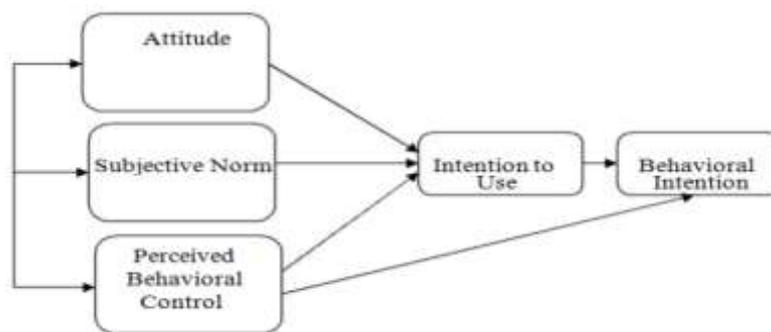
Figure 6 - Theory of Planned Behavior Framework (Ajzen, 1991)

The model helped in understanding the generic factors which lead to human behaviour and how can they be resolved (Armitage & Conner, 2001; Francis et al., 2004).

The construct Perceived Behavioral Control (PBC) is important to study the actual usage and intentions behind the usage as suggested by studies (Mathieson, 1991; Taylor & Todd 1995; Francis et al., 2004). The construct plays a vital role in studies where the application of TPB was related to technology diffusion.

TPB has been extensively used in a lot of existing literary studies which predicts behavioral intention of users. Studies using this approach vary from measuring

behavioral intentions of users towards caffeine intake (Francis et al., 2004) to understanding recycling of paper (Cheung et al., 1999) to food consumption decision (Ajzen, 2015).

2.5.3 Reformed Theory of Planned Behavior

Theory of Planned Behaviour (TPB) managed to give a framework which segregated intentions with behaviour. Further research on this model predicted that to understand the relation between the belief of the user and the attitude, attitudes needs to be broken down into further smaller classifications (Taylor & Todd, 1995).

Diffusion of innovation theory (Rogers, 1983) which split the attitude of the user into parameters like complexity, relative advantage, and compatibility. The constructs used in the model of Rogers were better and empirically more powerful than existing models earlier. Thus, the innovation led technology for financial inclusion i.e. Mobile Banking can be much more justified with the revised and decomposed theory rather than the previously discussed ones. Therefore, the current research proposes to use complexity, relative advantage, and compatibility as constructs.
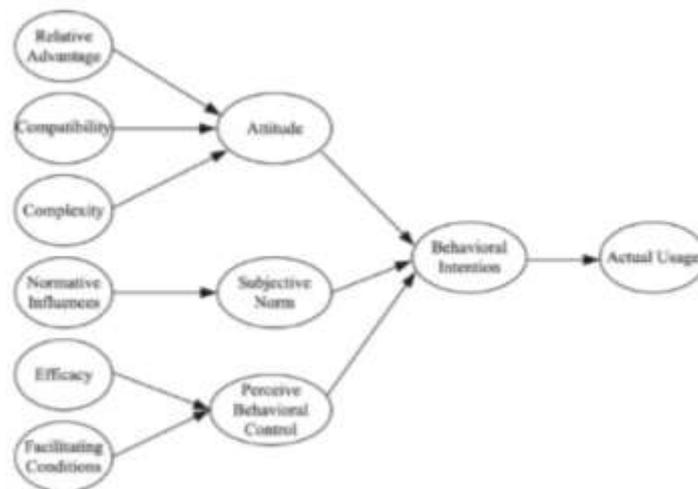

Figure 7 – Decomposed model of theory of planned behaviour (Shih & Fang, 2004)

2.5.4 Technology Acceptance Model (TAM)

The theory laid by TRA (Theory of Reasoned Action) was adopted by (Davis 1989) to base the foundation of Technology Acceptance Model.

TAM incorporated a lot of constructs which were relevant and practically testable. It focused on finding the interdependence of factors leading to acceptance of technology (Venkatesh & Davis, 2000; Lu et al., 2003; Brown et al., 2012).

This was a customized way to representing the same theory but with specific outputs. This new tailor-made approach aims at exploring the constructs specific to acceptance of any technology and justifying it with profound theoretical concepts. The key objective of this technique is to give a holistic coverage of effect to external factors to an internal state of end user thereby making a particular technology user friendly or not. TAM proposes two major constructs i.e. Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). Behavioural Intention of the end user is an end result of combined contribution of PU and PEoU as internal factors and external factors as well. The revised model (Davis, 1989) as claimed was more precise and gave better results and justifications when applied by other researchers. The revised TAM model hypothesizes that PEOU and external factors determine perceived usefulness (Szajna, 1996; Wu & Wang, 2005). Simultaneously it was also hypnotized that PEOU might have a direct impact on PU. The model gives significant importance to the external factors.
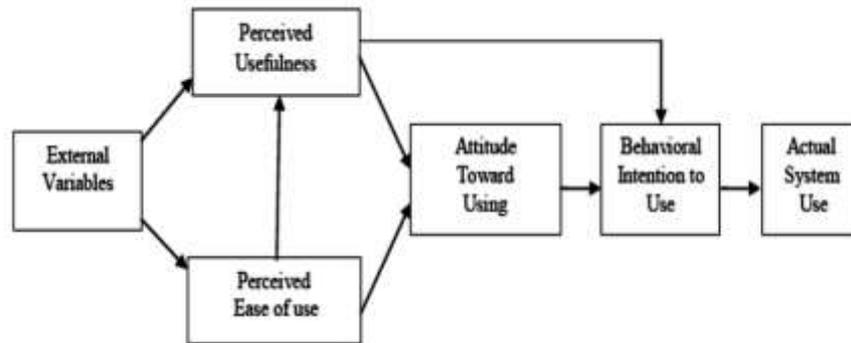
Figure 8 – Technology acceptance model framework (Davis, 1989)

TAM was initially used on subjects who were as simple as word processing software (Gefen et al., 2003; Rauniar et al., 2014). Over the years, TAM has been implemented to understand complex ICT like Internet Banking, ATM, M-Banking and much more complex 36 systems (Giovanis et al., 2012; Sundarraj & Manochehri, 2013, Giovanis & Athanasopoulous, 2017).
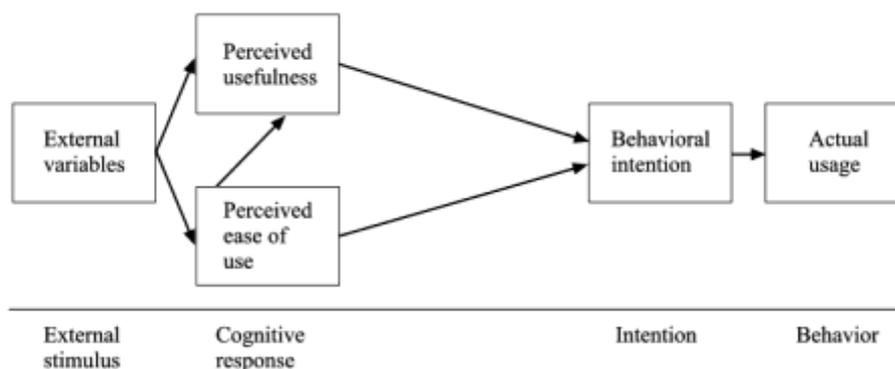
Figure 9 – Revised technology acceptance model framework (Davis, 1989)

Researches even tried used PU and PEOU as independent constructs to understand their individual contribution to the behavioral intentions (Rigopoulos & Askounis, 2007). Most of the researchers proved that both the constructs were highly and significantly correlated with intention to use and actual usage of the technology. TAM was initially used on subjects who were as simple as word processing software (Gefen et al., 2003; Rauniar et al., 2014). Over the years, TAM has been implemented to understand complex ICT like

Internet Banking, ATM and much more complex 36 systems (Giovanis et al., 2012; Sundarraj & Manochehri, 2013).

TAM on the basis of their empirical evidence which showed that the attitude did not mediate the influence of the core beliefs (i.e. PEOU and PU) on the behavioral intentions in the TAM (Igbaria et al., 1996; Lopez & Manson, 1997; Szajna, 1996; Venkatesh and Davis, 1996; Agarwal & Karahanna, 2000; Venkatesh and Morris, 2000; Hong et al., 2002; Gefen et al., 2003). Therefore, the attitude variable is excluded from the model proposed in this research study.

2.5.5   Unified Theory of Acceptance and Use of Technology (UTAUT)

Combining the various theories and models of technology acceptance, (Venkatesh et al., 2003) developed a unification theory in which they integrated the components of eight technology acceptance models and theories: TRA, TAM, the motivational model, TPB, combined TAM-TPB, the model of PC utilization, innovation diffusion theory and social cognitive theory. The UTAUT model used four main determinants of usage and intention; these are performance expectancy, effort expectancy, social influence and facilitating conditions. These stand alongside four moderators of gender, age, experience and voluntariness of use.
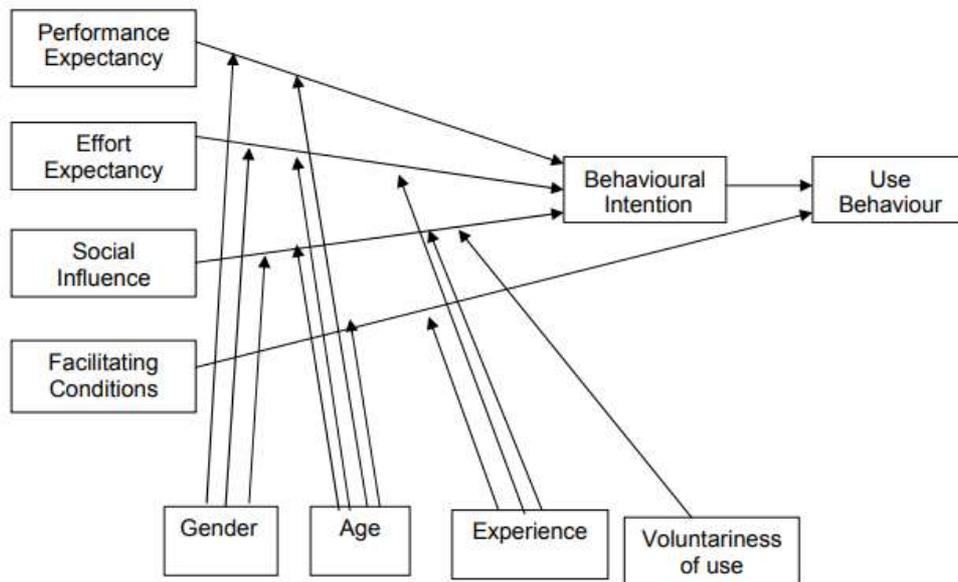
Figure 10 – Unified theory of acceptance and use of technology model
framework (Venkatesh et al. 2003)

This theory has been criticized for having too many independent variables for
predicting intentions and behavior (Bogozzi, 2007).

2.5.6   Technology Acceptance Model – 3 (TAM 3)

The TAM was further modified by (Venkatesh & Bala, 2008) to give a higher
level of significance to 'perceived ease of use'. They also added the dimensions
of computer self-efficacy, perception of external control, computer anxiety and
computer playfulness. Two adjustment variables have also been added, which
are perceived enjoyment and objective usability. TAM3 is constructed on a
theoretical framework of four classifications which Venkatesh and Bala claim
is a synthesis of all prior TAM research (2008). These four classifications are
individual differences, system characteristics, social influence and facilitating
conditions (Howard et al., 2010). According to this model, the perceived ease
of use is determined by computer self-efficacy, computer playfulness, computer
anxiety, perception of external control, perceived enjoyment and objective

usability. The perceived usefulness is determined by subjective norms, job relevance, result demonstrability and image.
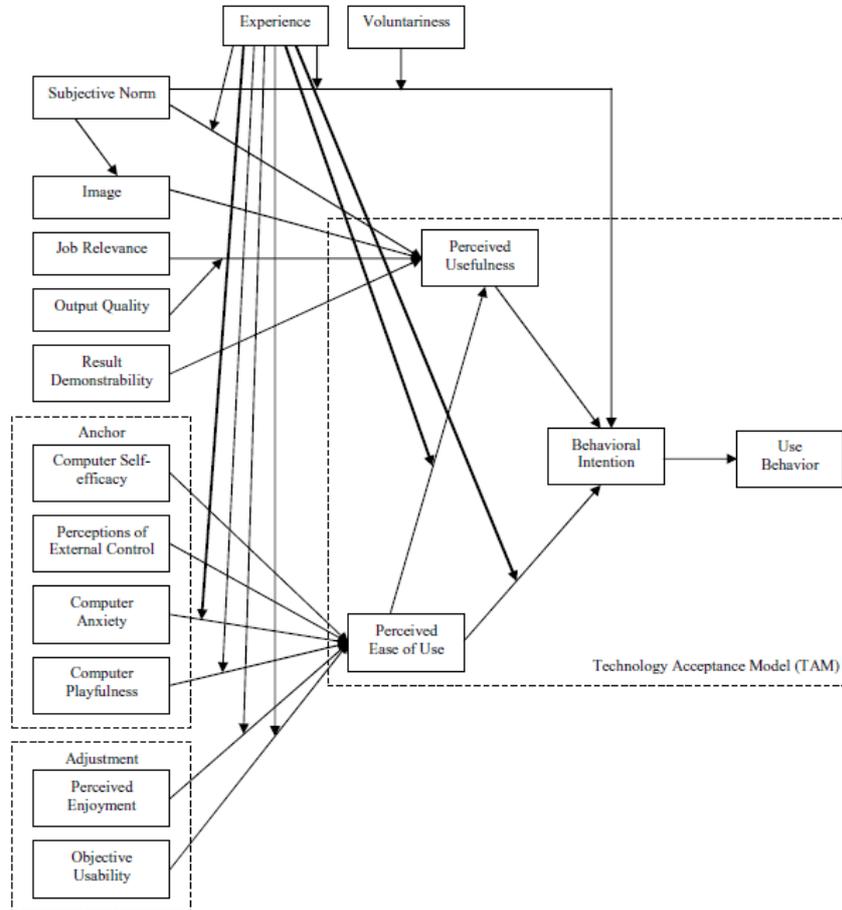
Figure 11 – Technology acceptance model (TAM3) (Venkatesh & Bala 2008)

However, one of the criticisms of the model is that there are too many variables and too many relationships between the variables (Alomary & Woollard, 2015)

2.6   Research Gaps

Although in existing literature, various studies pertaining to financial inclusion and mobile banking have been conducted. However, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is being one of the major policy towards financial inclusion and mobile banking being a major enabler of financial inclusion, no major study has been undertaken to understand the

mobile banking adoption for financial inclusion in Hilly Rural India with special reference to MGNREGA.

1. Constructs to mobile banking adoption in hilly rural India is not known
2. Holistic studies covering inter-connections among the constructs in adoption of mobile banking in Hilly Rural India is not known.
3. Most influencing construct in adopting mobile banking is not known.
4. Measures to enhance the adoption the mobile banking is not known.

2.7   Research Problem

Awareness as an external factor to influence perceived ease of use or perceived usefulness never got studied under Technology Acceptance Model (TAM)

2.8   Research Questions

This study will help in addressing the following research questions, which have been came up during the literature review. Answering these research questions is significantly required to enhance mobile banking implementation in Hilly Rural India.

1. What are the constructs in mobile banking adoption in hilly rural India?
2. What are the interrelationships among the identified constructs in the adoption of mobile banking in hilly rural India?
3. Which of the identified constructs is most influencing?
4. How to enhance the mobile banking adoption in hilly rural India?

2.9   Study Area

Hilly Areas are the most affected by financial exclusion as compared to other rural areas due to deterrents like sparsely populated areas with poor infrastructure and physical access to banks (Thorat (RBI), 2007; Bhave & Shitole, 2017). Champawat is one of the least urbanized districts in the state having on 14.77 per cent of the population in urban areas i.e 85.23% population resides in rural area (Directorate Of Census Operations Uttrakhand, 2011).

Figure 12 – Map of Champawat, Uttrakhand

Despite of launch of MGNREGA in Champawat within 1st Phase during the year 2006 and Uttrakhand being one of the highest state with Banking Branch Penetration, the Champawat district is having 49.3% population under financial inclusion.

Overview of the distribution of banks in various blocks of Champawat, Uttrakhand. These banks have accounts of workers enrolled under MGNREGS. The table also signifies the 53 different branches of banks are included in the

disbursement of wages of these workers with 32115 accounts under MGNREGA.

As compared to other parts of the country the scheme has not worked very well and have performed moderately in the villages of Uttarakhand (Saha & Bhatt, 2016)

Table 3 – Block wise banks in Champawat (having MGNREGA accounts)

S.No	Blocks	No. of Banks
1	Barakot	10
2	Champawat	19
3	Lohaghat	13
4	Pati	11
	Total	53

Source: www.nrega.nic.in

Financial Inclusion is one of the most important factor to improve the economy of the country. The first step towards Financial Inclusion is having a bank account. Second step to the same is having continues usage of the same account for savings, remittance, credit etc. Studies have shown that this can be encouraged by sending the government help to bank accounts directly for quick access and also to avoid corruption in between.

MGNREGA is one of the biggest scheme to elevate the last mile citizen to the sustainable livelihood and to provide direct benefits. MGNERGA workers will get wages directly in the bank account and hence best scheme to study the mobile banking adoption in rural area. Currently our country is running on bank-led model for financial inclusion and therefore basic need is to have the bank account before using mobile banking technology.

One of the major issues for both banks and customers are low banking penetration and this problem rises in hilly areas due to unprecedented distance. Therefore, it's very important for banks to reach out to customers in cost effective way and that can be done only through technology. Mobile technology can be one of the major steps to achieve the financial inclusion.

Uttrakhand as a state comes under the high financial inclusion rating based on CRISIL Inclusix, a rating formula developed and published by CRISIL with Ministry of Finance, Government of India and Reserve Bank of India in the year 2015.

The state was scored almost 60% of inclusix score and ranked 13th among all the states in India. As per data from www.nrega.nic.in, none of the Panchayats in Uttrakhand are exempted from payments through banks or post offices.

3 Research Design and Methodology

This chapter projects the research objectives, hypothesis and research methodology incorporated in this study. The chapter gives a detail description of research design used in this research. This chapter also reflects the answer to the research question i.e. "Is there a relationship between Behavioural Intention and mobile banking for financial inclusion in rural India with reference to MGNREGA.

The chapter defines the operational definitions of the constructs selected for the research and discusses in detail methods used to integrate these constructs and answer the research question by testing the hypothesis developed from objectives of the research.

The present study attempts to develop a research design to find answer to the research question and test the hypothesis. The chapter discusses in detail the methods used in the study and justifies the usage of the same to resolve an objective of developing a conceptual framework for enhancing the adoption of mobile banking for financial inclusion in India with reference to MGNREGA

This study uses "triangulation" from sociology, which refers to the application and combination of several research methods in the study of the same phenomenon (Altrichter et al., 2008; O'Donoghue & Punch 2003). (Cohen & Manion, 2000) define triangulation as an "attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint. (Denzin, 2006) identified four basic types of triangulation

- Data triangulation: involves time, space, and persons.
- Investigator triangulation: involves multiple researchers in an investigation.
- Theory triangulation: involves using more than one theoretical scheme in the interpretation of the phenomenon.
- Methodological triangulation: involves using more than one method to gather data, such as interviews, observations, questionnaires, and documents.

"Triangulation" is used to overcome the intrinsic biases by combining 4 research methodologies and bring in a strong strategy to increase the adoption of mobile banking and enhance financial inclusion subsequently.


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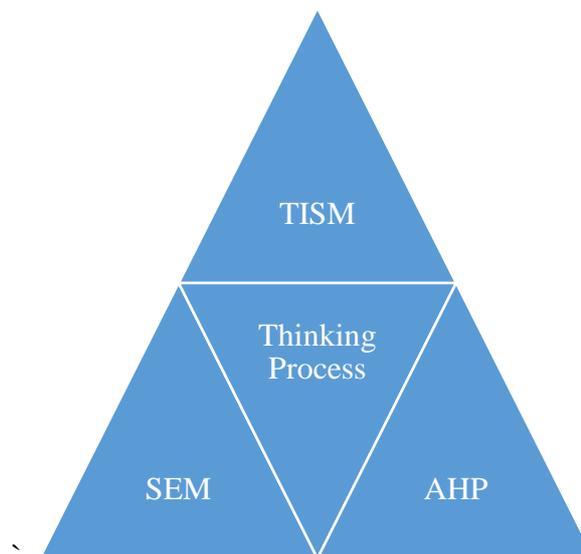
Figure 13 – Methodological triangulation

3.1   Objectives

1. To list all the constructs of mobile banking adoption in hilly rural India.
2. To develop and validate the interrelationship model of identified constructs for mobile banking adoption in hilly rural India.
3. To identify the most influencing constructs among the identified constructs.

4. To develop strategies to enhance the adoption of mobile banking in hilly rural India with respect to MGNREGA.

An attempt would be made to identify the inter-relationships between the identified constructs in mobile banking adoption. Later, these constructs will be prioritized to ascertain the most influential constructs. Furthermore, various strategies will be suggested to enhance the adoption of mobile banking. The proposed study has laid to a foundation for addressing and assessing ways to identify mobile banking adoption which in turn will assist the banking and policy makers to enhance mobile banking for financial inclusion in hilly rural India.

3.2   Underpinning Theory of the Research

This study has summarised the technology acceptance models and theories, including the factors relevant to each model and found that TAM has been widely used in information and communication technology research to help understand as well as explain user behaviours.

The versatility of TAM has been shown through various studies including e-mail and graphics (Davis, 1989), spreadsheets (Mathieson, 1991), voice-mail and word processors (Adams, Nelson & Todd, 1992; Chin & Todd, 1995), database management systems (Szajna, 1994), group support systems (Chin & Gopal, 1995), adaptive technology for the physically challenged (Goette, 1995), negotiation support systems (Lim, Gan & Chang, 2002), mobile commerce (Saljoughi, 2002), eGovernment (Gefen, et al., 2002), and the world wide web (Lucy & VanLengen, 2002).

One of the TAM model's great strengths is that it works well in varying technological and organisational contexts (Subramanian, 1994). Technology Acceptance Model is the foundational theory for this research.

(Hendrickson et al., 1993) found that the TAM model's scales of the perceived ease of use and perceived usefulness constructs demonstrate a high degree of test-retest reliability.

3.3   Research Framework

In order to depict various planned phases and steps of the research accompanied with the methodologies the accomplishment of research objectives, each phase has been explained in detail in this section.

3.3.1   Develop an inter-relationship model of identified constructs

The objective is fulfilled by first developing a model using Total Interpretive Structural Modelling (TISM) based on TAM for hilly rural India and then using Structural Equation Modelling to validate the same. The data was collected from the citizens enrolled for MGNREGA.

The study utilizes Total Interpretive Structural Modelling (TISM), an extension of ISM. TISM has an advantage that interprets relationships among variables, which are applicable in real life situations. One of the advantages of using TISM in this study is its ability to classify constructs identified into most driving and most dependent constructs. The methodology was conducted in three steps:

Step 1: Identification of constructs through comprehensive literature review

A set of identified constructs will be utilized to understand various interactions among them. Therefore, each construct can be represented as ci, where i represents number of constructs undertaken in the study:

$$i = 1,2,3, 4,……n$$

Step 2: Development of Hierarchical Model of constructs using TISM

In this step, a systematic procedure to develop TISM model has been discussed in detail.

- Identification of relationships among constructs:

  The contextual relationships among constructs, identified in the previous step of Phase 1 of research, will be established by understanding whether a construct *A* is influencing construct *B* or not. The relationship between two constructs is established by responding to the questions i.e. whether construct *A* is influencing or enhancing construct *B*. If the response is '*Yes*', then the matrix of *nXn* will be developed with $a_{ij} = 1$, else $a_{ij} = 0$. Thus, the relationship matrix will be represented as follows

$$R = \begin{bmatrix} \tilde{a}_{11} & \cdots & \tilde{a}_{1n} \\ \vdots & \ddots & \vdots \\ \tilde{a}_{m1} & \cdots & \tilde{a}_{mn} \end{bmatrix}$$

  where,

  $b_i = i$th construct in the system

  $a_{ij} = $ relationship between the *ith* and *jth* construct

  $R = $ Relationship Matrix

  Total pairwise comparison will be calculated by *n X (n-1),* where n is the total number of constructs in the study.

- Interpretation of relationships among constructs:

  One of the advantages of using TISM over ISM is that TISM provides logical reasoning among constructs. Such interpretation helps the decision makers to understand the underlying reasons of relationships between constructs. In order to interpret the relationships among constructs, experts will be asked an interpretive query for each relation represented by 1 in matrix R 'in what way construct *A* is influencing or enhancing construct *B*. The responses of the experts will be used to develop an interpretive logic knowledge-base.

- Formulation of Reachability Matrix:

The initial reachability matrix can be calculated using Eq. 1 as shown below

$$D = R + I \ldots\ldots\ldots\ldots\ldots\ldots\ldots. \text{Eq. 1}$$

and the final reachability matrix will be constructed with the help of Eq. 2 as shown below

$$D* = D^\wedge k = D^\wedge k+1 > 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq. 2}$$

where,

I = unit matrix

k = powers

D* = Final Reachability Matrix

The Final Reachability matrix is constructed by considering indirect relationship between. For example, if construct *A* is influencing construct *B* and construct *B* is influencing construct *C,* then construct *A* will also influence construct *C.* Such indirect relationships are represented by *Transitivity* denoted by *.

- Level Partitions of Construct:

In this step, level will be allocated to each construct by formulating reachability set, antecedent set and intersection set. Reachability set is calculated using Eq. 3

$$S (t i) = \{ t j| m' i j = 1\} \ldots\ldots\ldots\ldots\ldots\ldots.\text{Eq. 3}$$

where S = Reachability set

t = construct under the study

m_{ij} = value of ith row and jth column

i = row of the matrix D*

j = column of the matrix D*

Similarly, antecedent set is constructed using Eq. 4

$A(t_i) = \{t_j | m'_{ij} = 1\}$ ………………………….Eq. 4 where A = Antecedent set

The common construct between reachability set and antecedent set will form to formulate intersection set as shown in Eq. 5

$I(t_i) = S(t_i) \cap A(t_i)$ …………………………...Eq. 5 where I = Intersection set

- Construction of Diagraph: A diagraph represented by nodes and arrows is formed. Each node represents constructs and arrow between constructs represents direction of relationship between those two constructs. The indirect relationship is also represented by dotted arrow.

- Development of Interpretive Matrix:
  The final reachability matrix obtained using Eq. 2, will be used to develop interpretive matrix. In this matrix, the interpretation for direct as well as indirect relationships between constructs given by experts in the interpretive knowledge-base will be written.

- Formation of TISM-based Model:
  In the final step, A TISM-based framework has been developed using step 5 and step 6. This framework clearly comprehends the most driving most dependent construct as well in the Mobile Adoption in Hilly Rural India.

Step 3: MICMAC Analysis for driving and dependence power of each construct:

The constructs are further classified based on their driving and dependence power that have been calculated from the Final Reachability Matrix. The driving

and dependence power of each construct are graphically represented using MICMAC analysis as shown in Figure.

The Y-axis and X-axis in the graph represents driving as well as dependence power respectively. The graph has been divided into four regions A, B, C and D. The constructs in the first region A represent Autonomous construct. Any construct in the region A indicates that it is not linked to other construct and is more or less independent in the system. Constructs in the second region B are influenced by another construct.

Thus, such constructs are named as Dependent constructs. Construct in region C are named as Linkage Constructs. These constructs act as a connecting link between other constructs in the system. Constructs in region D are named as independent constructs as they drive other construct and are not influenced by other constructs in the system.

Independent Constructs   Linkage
Constructs

Autonomous Constructs   Dependent Constructs
Dependence Power ➡
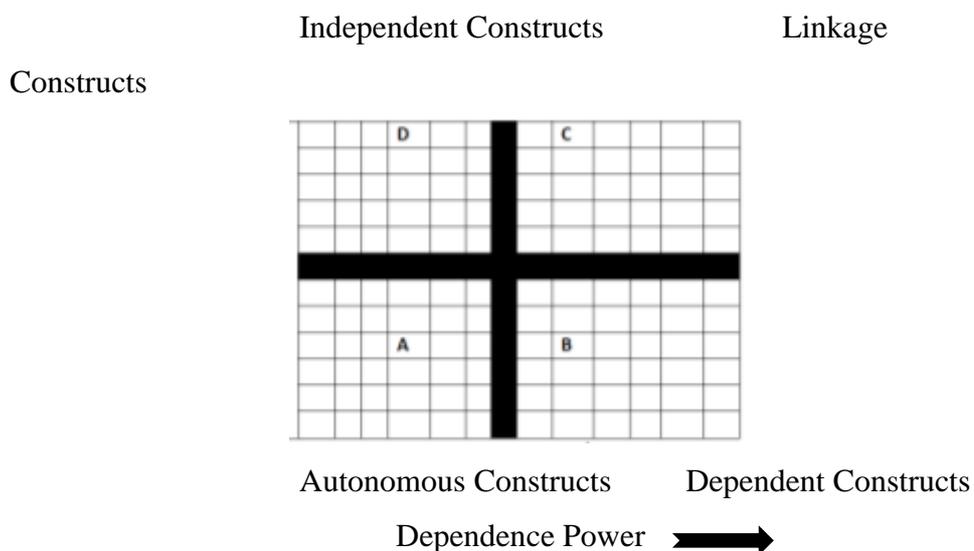
Figure 14 – MICMAC Analysis

3.3.2 Validate inter-relationship model of identified constructs

Structural equation modelling (SEM) is a second-generation multivariate analysis technique that is used to determine the extent to which an a priori theoretical model is supported by the sample data (Raykov & Marcoulides, 2000; Schumacker & Lomax, 2010). More specifically, SEM tests models that specify how groups of variables define a construct, as well as the relationships among constructs.

In essence, SEM uses hypothesis testing to improve our understanding of the complex relationships that occur among observed variables and latent constructs. Observed variables (i.e., indicator variables) are variables that can be directly measured using tests, assessments, and surveys, and are used to define a given latent construct. Latent constructs cannot be directly observed or measured and, as a result, must be inferred from a set of observed variables.

SEM was derived from the evolution of three particular types of models: regression, path, and confirmatory factor (Schumacker & Lomax, 2010).

The first step toward SEM development was linear regression modeling. Linear regression modeling is concerned with observed variables only and attempts to predict a dependent, observed variable from one or more independent, observed variables. Regression models use a correlation coefficient and least squares criterion to estimate the parameters of the model by minimizing the sum of squared differences between observed and predicted scores of the dependent variable.

Second step is path analysis, another precursor to SEM, is also concerned with observed variables, and predicts relationships among observed variables by solving a series of concurrent regression equations. Path models permit the researcher to test relationships among multiple independent and dependent

variables. Overall, path analysis allows for the testing of more complex models than linear regression analysis.

The third and final step that contributed to the development of SEM is the confirmatory factor model. CFA assumes that items on an inventory correlate with one another and yield observed scores that measure or define a construct. Confirmatory factor models seek to validate the existence of theoretical constructs by empirically testing the relationships between observed and latent variables.

SEM is a confirmatory approach with combination of factor analysis and regression. It directly links between path diagrams and equations and fit statistics. Models contain both measurement and path models.

The terms which are frequently used in SEM would help to understand the methodology better.

- Measured variable
  - Observed variables, indicators or manifest variables in an SEM design
  - Predictors and outcomes in path analysis
  - Squares in the diagram
- Latent Variable
  - Un-observable variable in the model, factor, construct
  - Construct driving measured variables in the measurement model
  - Circles in the diagram
- Error or E
  - Variance left over after prediction of a measured variable
- Disturbance or D
  - Variance left over after prediction of a factor
- Exogenous Variable

- o Variable that predicts other variables
- Endogenous Variables
  - o A variable that is predicted by another variable
  - o A predicted variable is endogenous even if it in turn predicts another variable
- Measurement Model
  - o The part of the model that relates indicators to latent factors
  - o The measurement model is the factor analytic part of SEM
- Path model
  - o This is the part of the model that relates variable or factors to one another (prediction)
  - o If no factors are in the model then only path model exists between indicators
- Direct Effect
  - o Regression coefficients of direct prediction
- Indirect Effect
  - o Mediating effect of x1 on y through x2
- Confirmatory Factor Analysis
- Covariance Structure
  - o Relationships based on variance and covariance
- Mean Structure
  - o Includes means (intercepts) into the model
- Single-headed arrow →
  - o This is prediction
  - o Regression Coefficient or factor loading
- Double headed arrow ↔
  - o This is correlation
- Missing Paths
  - o Hypothesized absence of relationship
  - o Can also set path to zero

SEM models combine path and factor analytic models allowing for the incorporation of both observed and latent variables into a model. SEM procedures ultimately determine the plausibility of a theoretical model by comparing the estimated theoretical covariance matrix P to the observed covariance matrix S (i.e., the matrix derived from the sample data; Schumacker & Lomax, 2010). Many SEM software programs are currently available to researchers. These include LISREL1, AMOS, EQS1, Mx, Mplus1, Ramona, and SEPATH1. Many of the SEM software programs allow researchers to statistically analyze raw data and provide procedures for managing missing data, outliers, and variable transformations. Programs, such as AMOS and LISREL1, offer researchers the option to construct a path diagram that can be translated by the software program into the mathematical equations needed for analysis

Steps to conduct SEM Analysis

SEM Step	Description
Model Specification	This step involves the specification of a theoretical model that utilizes applicable, related theory and research to determine the latent and observed variables of interest and the relationships among them. In particular, researcher must specify a measurement and structural model. A path diagram can be constructed to visually represent the hypothesized relationships among variable in the theoretical model
Model Identification	This step helps the researcher to determine whether the specified model is capable of producing actual results that can be estimated in SEM analysis. Models must be identified and able to generate a unique solution and

	parameter estimates. O'Brien's (1994) criteria can be used to establish whether a measurement model is identified. To determine whether a structural model is identified researchers can use Bollen's (1989) recursive rule and the t rule
Model Estimation	This step involves the use of an iterative procedure (i.e., fitting function) to generate the theoretical covariance matrix $\sum$, as well as minimize the differences between the estimated theoretical covariance matrix $\sum$ and the observed covariance matrix S. Maximum likelihood (ML) and generalized least squares (GLS) are the most commonly used fitting functions
Model Testing	This step involves the analysis of both the measurement and structural models in order to determine (a) the global fit of the entire model, and (b) the fit of individual model parameters. Multiple indices of fit (i.e., absolute, comparative, and parsimonious) should be analysed to determine the degree to which the theoretical model fits the sample data. The λ^2 difference test can also be used when working with nested models to compare the plausibility of the theoretical model to viable alternative models. It should be noted that the measurement model must yield a good fit to the data before the structural model can be analysed
Model Modification	The final step involves using theory trimming or the addition of new parameters to attempt to improve the theoretical model's fit to the data. Researchers should be advised to model modification is an exploratory procedure and is based on the sample data instead of the

	extant literature. Specified models will need to be cross-validated with a new sample

Table 4 – Steps for SEM Analysis

3.3.3 Identification of most influencing constructs

AHP was developed in the 1970s by Thomas L. Saaty and has since been extensively studied, and is currently used in decision making for complex scenarios, where people work together to make decisions when human perceptions, judgments, and consequences have long-term repercussions (Bhushan & Rai, 2004).

The application of AHP begins with a problem being decomposed into a hierarchy of criteria so as to be more easily analyzed and compared in an independent manner. After this logical hierarchy is constructed, the decision makers can systematically assess the alternatives by making pair-wise comparisons for each of the chosen criteria. This comparison may use concrete data from the alternatives or human judgments as a way to input subjacent information (Saaty, 2008)

The comparison table, SAATY scale – The comparison between two elements using AHP can be done in different ways (Triantaphyllou & Mann, 1995). However, the relative importance scale between two alternatives as suggested by Saaty (SAATY, 2005) is the most widely used. Attributing values that vary from 1 to 9, the scale determines the relative importance of an alternative when compared with another alternative.

Scale	Numerical Rating	Reciprocal
Extremely preferred	9	1/9
Very strong to extremely	8	1/8
Very strongly preferred	7	1/7
Strongly to very strongly	6	1/6
Strongly preferred	5	1/5
Moderately to strongly	4	1/4
Moderately preferred	3	1/3
Equally to moderately	2	1/2
Equally preferred	1	1

Table 5 – Saaty Scale

This stage gave the most influential construct on which if worked well can enhance the mobile banking adoption in the hilly rural India.

3.3.4 Strategies to enhance mobile banking adoption in hilly rural India.

This phase will mainly focus on enhancing the influential constructs in mobile banking adoption. Subsequently, an attempt will be made to identify various strategies that must be adopted, which can help the system to enhance the constructs. The strategies to enhance influential constructs will be identified using Thinking process. These strategies will help to enhance the extremely influential constructs in the system. At this phase, various strategies are identified and their impact in terms of maximizing constructs will be studied.

This technique is logical "thinking tools", which can be used in standalone situations or in a coherent problem-solving and change management. The main purpose is to translate intuitions that can be discussed rationally, questioned without offense and modified to fully reflect the understanding of the situation. It caters to the three questions of any system a) what to change, b) what to

change to and c) how to change. Thinking Process (TP) uses only 1, 4 and 5 out of the 5 focusing steps of TOC.

In this study, the constructs of mobile banking adoption will be treated as variables that need to be worked upon to make the system work efficiently.

Thinking Process (TP) of the TOC will help in answering three questions i.e.

a)   What to change in the system for enhancing the constructs?
b)   In what form the changes will have to be made such that the constructs get enhanced?
c)   How this change can be brought upon?

This process will first allow us to assess the current situation of mobile banking adoption with the help of graphical representation or cause-effect diagram and linkages among various issues that lead to a particular construct within the system.

The next step will be to work on the root causes that lead to a construct, with the help of identification of proposed actions require to enhance the construct. It also assists in identifying some of undesirable effects that may arise by taking a particular action. This will prompt system the trade-offs of taking that particular action. Furthermore, it will also bring focus on the obstacles while implementing the actions.

In short, a complete knowledge tree in the graphical form is prepared that indicate construct of the system with proposed strategies. Additionally, it will assist in articulating thoughts or explicit/implicit knowledge of experts into more structured form.

Under TP, following defined steps are used to enhance the constructs in the system:

a)   Step 1 -- The Current Reality Tree (CRT) - The CRT is a sufficiency-based logic tool that is used to describe a current situation of the system.

Its key purpose is to understand how the various issues and problems it faces are related to each other, to their policies, measurements, and practices and to the root conflict identified through evaporating cloud.

b) Step 2- The Evaporating Cloud - The core of almost any problem or decision that any system faces are the dilemma of doing one thing or another, pursuing one direction or another, going for D or for D'. The evaporating cloud indicates that there really isn't a choice involved at all, it's only a matter of examining the assumptions that make you think there is a choice.

c) Step 3 -- The Future Reality Tree (FRT) - The FRT is similar to the CRT in structure, but with new proposed actions, policies, and behaviors injected into it in order to create a new vision of the future reality of the system.

d) Step 4 -- The Negative Branch Reservation (NBR) - In the Thinking Processes, a situation exists that if system acts on an injection in the Future Reality tree, there will result a BRANCH that leads to an undesirable, NEGATIVE result. Hence, the "Negative Branch Reservation" or NBR.

e) Step 5 -- The Prerequisite Tree (PRT) - The Prerequisite Tree (PRT) takes advantage of people's natural propensity and ability to point out why something can't get done. The first step in building a PRT (after identifying the team's ambitious objective) is to collect all the obstacles that the group can come up with. Then each individual identifies an "intermediate objective" (IO) that would overcome or make moot the obstacle they raised.

f) Step 6 -- The Transition Tree (TRT) - It is a simple repetitive sufficiency logic construct that puts the actions/tasks in context with the objectives. Based on simple, "if-then" links, the Transition Tree includes the need for action, the action, the rationale for the action (why we expect the action to provide the desired result), that desired, expected result (or intermediate objective - IO), and then reason for the next need in a graphical format.

3.4 Research Objectives and Methodologies

Research Objectives	Proposed Methodologies
Listing of Constructs	
Identification of constructs for mobile banking adoption	Literature Review
Modelling of Constructs	
To develop and validate the inter-relationship model of identified constructs of mobile banking adoption in hilly rural India	Total Interpretive Structural Modeling (TISM), Structural Equation Modeling (SEM)
Identification of the most influencing constructs	Analytic hierarchy process (AHP)
Strategies Identification	
To develop strategies to enhance mobile banking adoption in hilly rural India.	Thinking Process

Table 6 – Research objectives and methodologies

4 Identified Constructs in Adoption of Mobile Banking

After extensive literature review, following constructs were identified which are followed by the respective operational definitions:

1. Perceived Ease of Use	8. Terminology
2. Perceived Usefulness	9. Trust
3. Accessibility	10. Government Support
4. Subjective Norm	11. Technical Support
5. Self-Efficacy	12. Behavioral Intention
6. Output Quality	13. Actual Usage
7. Responsiveness	

Table 7 – List of constructs

4.1 Operational Definitions of Constructs

The operational definition of identified constructs are below:

Variables	Definition	Source
Perceived Ease of Use	"the degree of belief a person perceives the working with given system is effort less"	Saji & Paul 2018; Al-Qeisi et al., 2014; Brown et al., 2012; Hsiao & Yang, 2011; Gu et al., 2009; Johnson & Johnson, 1996; Davis, 1989

Perceived Usefulness	"the measure of belief which an individual has perceived that his/her work will improve by using a given system"	Ma et al., 2017; Teo & Noyes, 2014; Lim&Ting, 2012; Gu et al., 2009; Anderson & Schzwager, 2004; Davis, 1989
Accessibility	"the degree of ease through which information can be taken and used from given system"	Alsabawy 2016; Debei 2014; Tella & Saka, 2014; Musa, 2006; Davis et al., 1989
Subjective Norm	"individual's perception about opinion of other individual, whose perception and beliefs are important for him or her, to use the given system"	Al-Busaidi, 2013;Vermeulen et al., 2011; Brouwer et al., 2009; Francis et al., 2004; Ajzen, 1991;
Self-Efficacy	"the measure of belief which an individual have in his/her capability to perform the given task"	Zheng et al., 2018; Picha & Howell 2017; Holden & Rada, 2011; Lamb et al., 2014; Mun & Hwang, 2003; Bandura 1986
Output Quality	"the degree to which a task performed by system matches job in hand."	Putra et al., 2018; Lee et al., 2018; Venkatesh and Davis, 2000;
Responsiveness	"degree of timely response from a system on request of information"	Pai & Huang 2010; Tam & Tsang 2007; Wixom & Todd 2005
Terminology	"the body of terms and words used by the system"	Kim, 2006; Vaidyanathan et al., 2005; Hong et al., 2002

Trust	"An individual's willingness to depend on another party because of the characteristics of the other party"	Marakarkandy & Dasgupta 2016; Gu et al., 2009; Gefen 2000; Mayer et al., 1995
Government Support	"the degree of legal and infrastructural support provided by Government to influence the adoption"	Tan and Teo 2000; Moon & Bretschneider 1997
Technical Support	"the degree of ease in accessing technical infrastructure and resources"	Chung & Kwon 2009; Taylor & Todd 1995;
Behavioural Intention	"degree of intent to use a system or behave specifically"	Hu et al., 2019, Park et al., 2012; Thong et al., 2006; Lin & Lu, 2000; Davis, 1993
Actual Usage	AU is defined as "actual behavior of people w.r.t usage frequency and volume based on users' self-report"	Wang & Liu 2009; Moon & Kim 2000;

Table 8 – Operational definition of the constructs

5 Develop and validate the inter-relationship model

This chapter will establish the relationships between the constructs identified and will also validate the results through data collected.

5.1 Develop the inter-relationship model using TISM

Mobile phone has been used from mobile commerce (shopping, banking etc.) to entertainment services, therefore mobile technology has been the favourite piece of researchers to verify and validate the application of TAM and understand the user adoption. (Wessels & Drennan 2010; Wu & Wang, 2005; Luarn & Lin, 2005; Nysveen et al., 2005).

It is implicit to adopt anything we need to have access to it. (Kim et. al, 2019; Al-Qeisi et. al, 2014, Brown et. al, 2012, Park et. al, 2012, Hsiao & Yang, 2011, Lin&Lu, 2000; Davis, 1989) indicated that accessibility is an important influence on the adoption of information technology. (Ives et al., 1983), introduced convenience of access as factor impacting adoption of information systems. Various studies undertaken to understand the adoption of mobile and e-learning system observed accessibility as major influencer. (Almaiah & Alismaiel, 2018; Salloum & Shaalan, 2018; Debei, 2014).

Accessibility removes the physical and spatio-temporal limitation of a service and the statistical correlation linking Perceived Accessibility and Perceived Ease of Use (PEoU) was observed by (Hsiao & Yang, 2011). (Suoranta M, 2003), found that accessibility as one of the most significant triggers for the adoption of mobile banking.

Another most studied construct in technology adoption is the influence of society. Subjective norm have been embedded in TAM as influencer of behavior intention to adopt technology. (Samodra & Mariani 2013; Legris et al., 2003; Venkatesh & Davis, 2000;). The subjective norm refers to "individual's perception about opinion of other individual, whose perception and beliefs are important for him or her, to use the given system" (To et. al 2018; Yean et. al, 2015). There were many studies which shows the influence of subjective norm towards the intent of using mobile banking (Binaymin et al., 2018; Tan & Lau, 2016; Sripalawat et al., 2011; Dasgupta et al., 2011; Puschel et al., 2010; Riquelme & Rios, 2010; Amin et al., 2008).

(Park et al., 2012) points out that trust is yet another construct to understand the better rate of diffusion of technology. On the same lines (Afshan & Sharif, 2016, Zhou, 2011; Gu et al., 2009;) observed that helping customers to overcome security & privacy risks to develop trust will contribute in adoption of mobile banking. (Schnall et al., 2015) opined that trust came out as prominent influencer in case mHealth technologies.

(Bhatt&Bhatt, 2016) found faster responses from service providers help customers in adopting mobile banking services. The same observations were also done by (Hoehle et al., 2012) and concluded that responsiveness in completing a transaction is one of the key constructs to control choice for any particular technology. (Kesharwani & Singh, 2012, Shu & Strassmann 2005) supported the argument that responsiveness helps to increase the satisfaction level of customers and improves its willingness of technology usage.

(Venkatesh and Davis, 2000; Davis et al., 1992) used extended TAM in their respective studies and found quality of the output as the major contributor towards Perceived Usefulness (PU) in case of Information & Communication Technology (ICT). In similar direction, it was found by many earlier researches that information quality effects the perception towards usefulness of

information (Chopra & Sherry, 2014; Pelletier et al., 2011; Loo et al., 2011). A study was conducted by (Venkatesh & Davis, 2000) with respect to multiple technologies in banking and finance sector and found that customers opt for technology with greater output quality.

Improper terminology used in information systems was found a major problem in adoption of technology (Hong et al., 2002). Terminology used in any system aid much efficient use of resources and provides effective navigation through the same (Hong et al., 2002; Kim, 2006). A research was performed by (Vatsa et al., 2010 and Puri 1997), which argues that mismatch in terminology used by information seeker and terminology used by information provider makes communicate with system difficult and also impedes maximization of the probable system benefits.

Self-efficacy for a system can be defined as one's perception with respect to the capability to utilize the system. (Compeau & Higgins, 1995). Further, various empirical studies have shown correlation of technology self-efficacy and Perceived Ease of Use (PEoU) (Jeong & Yoon, 2013; Sripalawat et al., 2011; Wang et al., 2006; Luarn & Lin, 2005). Self-efficacy was included as an external factor in revised TAM which can impact both PU and PEoU (Kesharwani & Singh, 2012; Kim et al., 2008). In some of the studies it was found that usage of system gets influenced by perceived usefulness and self-efficacy (Alalwan et al., 2016; Hong et al., 2002; Karahanna & Straub, 1999; Igbaria et al., 1997).

(Hu et al., 2019; Tan & Teo 2000) stated that adoption of new technology is influenced by Government support. Many studies in past where TAM was studied with respect to different technologies and geographical regions, it was found that intent to adopt technology was influenced majorly by government support. (Mandri & Chong 2018; Kirana et. al 2018, Marakarkandy & Dasgupta 2016; Haderi 2014; Moon & Bretschneider 1997). In an empirical study on

online banking (Chong et al., 2010) supported the argument that government support plays major role in helping customer technology adoption.

Many previous studies on adoption of new technologies established that technical support plays very vital role in decision making of users in choosing technology (Zheng et al., 2018; Borchers & Bewly 2015; Russell & Bewley 2013; Chang et al., 2007). In terms of Information and Communication Technology applications like Internet Banking, Mobile banking, Mobile Computing Devices, personal computing, many researchers have found that intent to adopt and use the technology is influenced by technical support. (Son et al., 2012; Riquelme & Rios 2010; Chung & Kwon 2009; Shih & Fang 2004; Igbaria et al., 1997).

The literature review clearly shows that there is scarcity of research on factors of mobile banking influencing its adoption in Champawat district of Uttrakhand, India w.r.t. financial inclusion. Therefore it is very important to study and understand the linkages between the constructs identified. To establish relationship between all the identified constructs Total Interpretive Structural Modelling (TISM) has been used to develop a conceptual model.

5.1.1 Data Collection

This objective has considered a sample size of 43 experts. The experts were consulted to draw logical inferences for any indirect relationships identified between factors while processing through the steps of TISM through interviews. The interview questions were based on TISM questionnaire.

According to Malhotra and Dash (2011), the minimum size of 30 expert opinions i.e. $n \geq 30$ accurately represents the population parameters. Therefore, the sample size considered in this study is sufficient to represent the overall system. The experts considered in this study include Reserve Bank of India,

Private and Public Bank officials in Champawat District holding MGNERGA accounts, Business Correspondents, Local Block officials, Gram Panchayat Secretary, NITI Aayog, MGNERGA officials at Champawat, Ministry of Rural Development.

Experts are those professionals that have acquired requisite knowledge, skill and experience. The experts were selected on the basis of judgmental sampling. In the judgmental sampling the experts are only based on their knowledge and experience of the related field.

The collected data was used for the further calculation of TISM model as per the following steps (Prasad et al., 2018; Jena et al., 2016).

Step 1: Identification of the constructs: The identification of constructs for mobile banking was done literature review as discussed above.

Step 2: Identification of links between the constructs: In this step, relationship between constructs will be established by understanding the effect of one constructs on other constructs.

Step 3: Relationship Interpretation: Once relationship has been established, each identified construct will be compared to other constructs one by one. Therefore, there will be 156 pairs of comparison for 13 identified constructs. The existence or relationship will be depicted by "Y" whereas nonexistence will be shown by "N". Further, against each "Y", one interpretive question about the way construct – A effects construct-B will be asked and answered.

Step 4: Development of Interpretive logic-knowledge base: In this step, each construct will be put into comparison with other constructs and existence or non-existence of relationship will be represented with letter "Y" or "N"

respectively and for each "Y" further interpretation is done to understand the relationship.

Step 5: Formation of Reachability Matrix: Reachability matrix, as shown in table 2, will be formed by entering "1" for each existing relationship representing row construct is driving column construct. Final reachability matrix, as shown in table 3, was obtained by testing transitivity in an iterative approach and inserting the same into initial reachability matrix.

		Initial Reachability Matrix												
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
C1	Accessibility	1	1	0	0	1	0	0	0	0	1	0	0	0
C2	Trust	1	1	0	0	0	1	0	0	0	1	0	0	0
C3	Technology Self Efficacy	1	0	1	1	0	1	0	0	0	1	1	0	0
C4	Subjective Norm	0	0	1	1	0	1	0	0	0	1	1	0	0
C5	Technical Support	1	1	0	0	1	0	0	0	0	0	1	0	0
C6	Government Support	0	1	1	1	0	1	0	0	0	0	1	0	0
C7	Response Time	0	0	0	0	0	0	1	0	0	0	0	0	0
C8	Output Quality	0	0	0	0	0	0	0	1	0	0	0	0	0
C9	Terminology Clarity	0	0	0	0	0	0	0	0	1	0	0	0	0
C10	Perceived Ease of Use	0	0	0	0	0	0	0	0	0	1	1	1	0
C11	Perceived Usefulness	0	0	0	0	0	0	0	0	0	1	1	1	0
C12	Behaviour Intention	0	0	0	0	0	0	0	0	0	0	0	1	1
C13	Actual Usage	0	0	0	0	0	0	0	0		0	0	0	1

Table 9 – Initial Reachability Matrix

		Final Reachability Matrix													
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	
C1	Accessibility	1	1	1*	1*	1	1*	0	0	0	1	1*	1*	1*	10
C2	Trust	1	1	1*	1*	1*	1	0	0	0	1	1*	1*	1*	10
C3	Technology Self Efficacy	1	1*	1	1	1*	1	0	0	0	1	1	1*	1*	10
C4	Subjective Norm	1*	1*	1	1	1*	1	0	0	0	1	1	1*	1*	10
C5	Technical Support	1	1	1*	1*	1	1*	0	0	0	1*	1	1*	1*	10
C6	Government Support	1*	1	1	1	1*	1	0	0	0	1*	1	1*	1*	10
C7	Response Time	0	0	0	0	0	0	1	0	0	0	0	0	0	1
C8	Output Quality	0	0	0	0	0	0	0	1	0	0	0	0	0	1
C9	Terminology Clarity	0	0	0	0	0	0	0	0	1	0	0	0	0	1
C10	Perceived Ease of Use	0	0	0	0	0	0	0	0	0	1	1	1	1*	4
C11	Perceived Usefulness	0	0	0	0	0	0	0	0	0	1	1	1	1*	4
C12	Behaviour Intention	0	0	0	0	0	0	0	0	0	0	0	1	1	2
C13	Actual Usage	0	0	0	0	0	0	0	0		0	0	0	1	1
		6	6	6	6	6	6	1	1	1	8	8	9	10	

Table 10 – Final Reachability Matrix

Step 6: Reachability Matrix – Level Partition: Under this step, reachability and antecedent set has been identified from initial reachability matrix, as shown in table 4, table 5, table 6 and table 7, through iterated process of level partitioning. A construct with similar intersection and antecedent set has been assigned a level and excluded from analysis.

I st Label	Reachability Set (RS)	Antecedant set (AS)	Intersection set (IS)	Label
C1	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C2	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C3	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C4	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C5	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C6	1 2 3 4 5 6 10 11 12 13	1 2 3 4 5 6	1 2 3 4 5 6	
C7	7 10	7	7	
C8	8 10	8	8	
C9	9 10	9	9	
C10	10 11 12 13	1 2 3 4 5 6 10 11	10 11	
C11	10 11 12 13	1 2 3 4 5 6 10 11	10 11	
C12	12 13	1 2 3 4 5 6 10 11 12	12	
C13	13	1 2 3 4 5 6 10 11 12 13	13	I

Table 11 – 1st Label transitivity

II nd Label	RS	AS	IS	Label
C1	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C2	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C3	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C4	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C5	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C6	1 2 3 4 5 6 10 11 12	1 2 3 4 5 6	1 2 3 4 5 6	
C7	7 10	7	7	
C8	8 10	8	8	
C9	9 10	9	9	
C10	10 11 12	1 2 3 4 5 6 10 11	10 11	
C11	10 11 12	1 2 3 4 5 6 10 11	10 11	
C12	12	1 2 3 4 5 6 10 11 12	12	II

Table 12 – 2nd label transitivity

III Label	RS	AS	IS	Label
C1	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C2	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C3	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C4	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C5	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C6	1 2 3 4 5 6 10 11	1 2 3 4 5 6	1 2 3 4 5 6	
C7	7 10	7	7	
C8	8 10	8	8	
C9	9 10	9	9	
C10	10 11	1 2 3 4 5 6 10 11	10 11	III
C11	10 11	1 2 3 4 5 6 10 11	10 11	III

Table 13 – 3rd label transitivity

IV th Label	RS									AS									IS									LABEL
C1	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C2	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C3	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C4	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C5	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C6	1	2	3	4	5	6				1	2	3	4	5	6				1	2	3	4	5	6				IV
C7							7									7									7			IV
C8								8									8									8		IV
C9									9									9									9	IV

Table 14 – 4th label transitivity

Table 15 – MICMAC Analysis

Step 7: Construction of digraph: Digraph, as shown in Figure 3, is the pictorial representation of relationships between constructs. It shows construct and direction of relationship through node and directed lines respectively. The direction is obtained as per reachability matrix. Direct relationships were shown with solid lines whereas indirect relationships are shown with dotted lines.

Figure 15 - Digraph
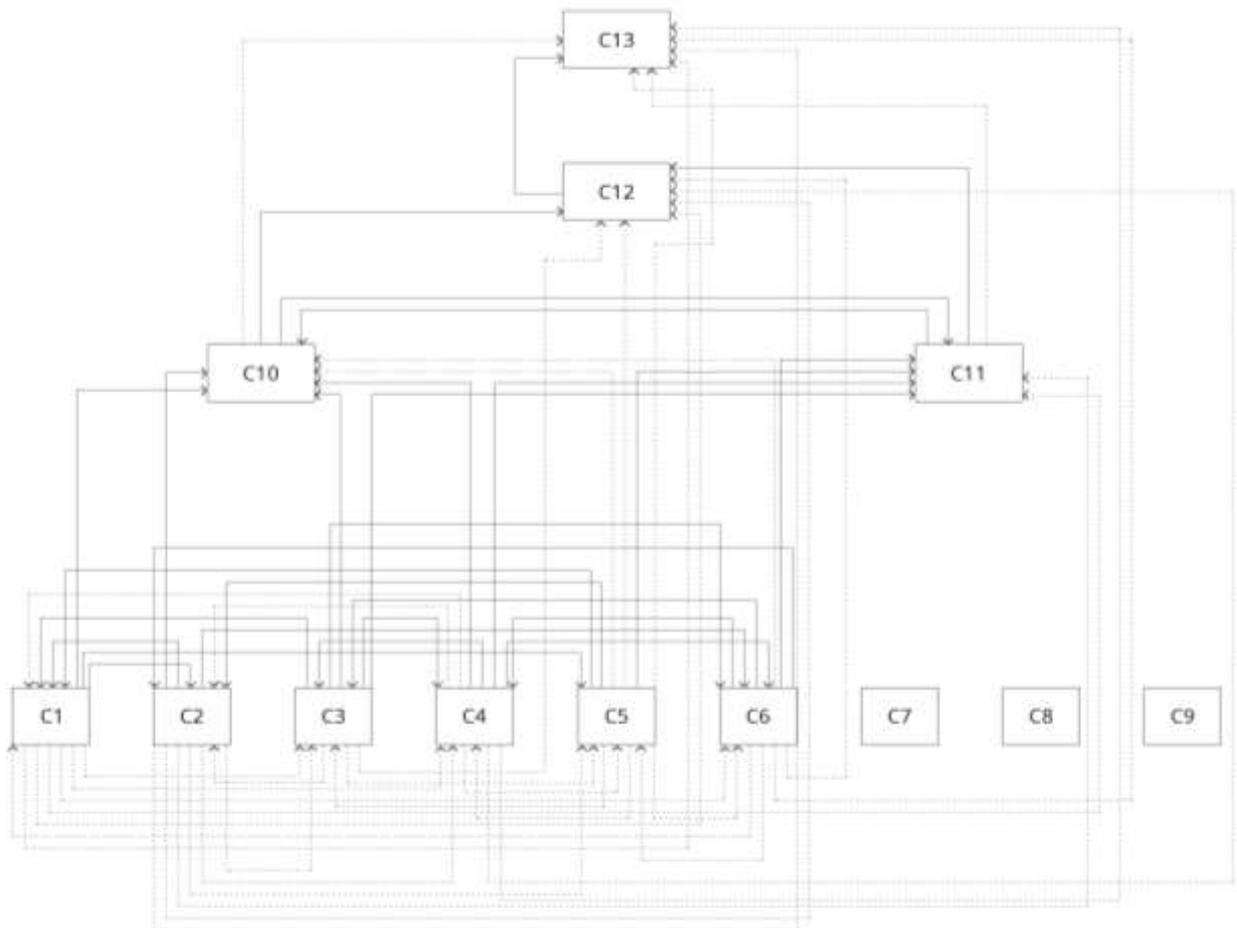
Step 8: Development of interpretive matrix: This binary matrix/MICMAC analysis, as shown in Table 8, will be developed by using digraph, mentioning relationships among various constructs from the interpretation given in interpretative logic-knowledge base. In this matrix 1 indicates the direct and transitive relation between constructs.

Step 9: Total Interpretive Structural Model

In the final step, TISM model will be developed using interpretive matrix and diagrah. This will be final figure, as shown in Figure 4, showing all the relationships along with interpretation of the same. Each interpretation will be illustrated by the side of respective arrow link

Figure 16 - Total Interpretive Structural Model

5.2   Validate the model using Structural Equation Modelling

Due to increased competition in the banking sector, banks were encouraged to adopt new technologies (Alalwan et al., 2017; Koksal, 2016). The new digital distribution platform is mobile banking. As the Internet has developed into a mobile phone, mobile phones are used to carry out banking transactions (Koenig-Lewis et al. 2010). With the advent of mobile banking, banks have become more effective in reducing operating cost and time, while offering customers considerable convenience and enabling them to conduct banking. Based on the variables contained in the literature study by (Mehta et al., 2019) and the outcome of which the model was based on the TAM and TISM, the author intends to broaden the below-shown model and add to the literature on influencers for mobile banking use in hilly area of Champawat district, Uttrakhand.
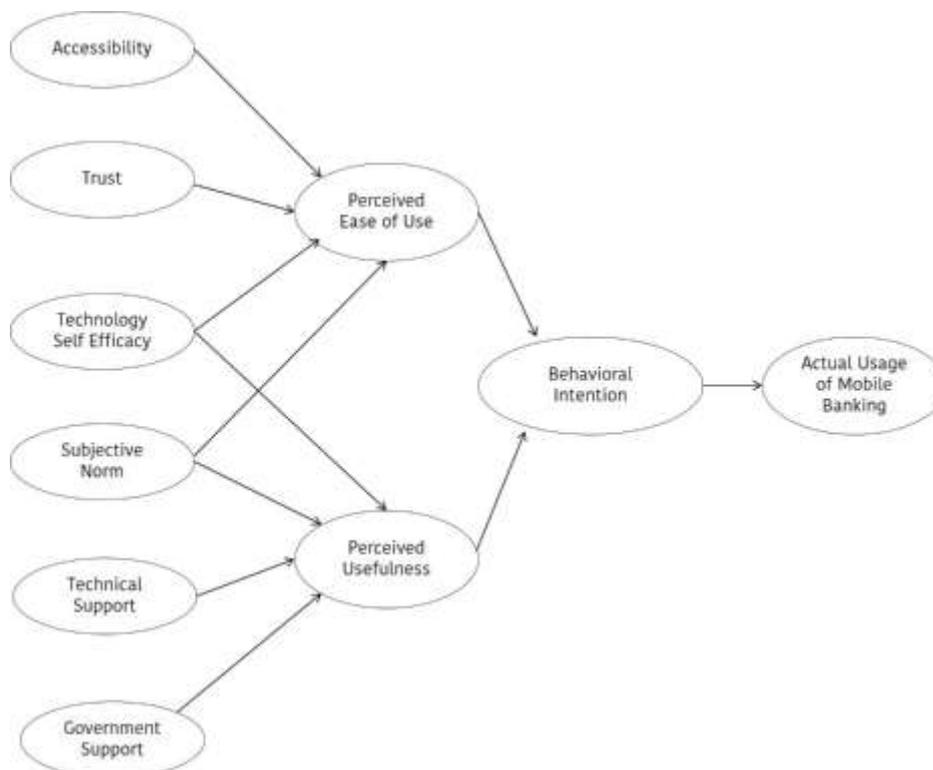
Figure 17 – Conceptual Model

As shown in Figure 1, (Mehta et al. 2019) suggested the conceptual model using TISM by taking extended TAM as a base model. This study will test the same model by using SEM

Formulation of Hypothesis

From the conceptual model, one hypotheses and two sub hypotheses were tested using Structured Equation Modeling

HO – There is no relationship between Behavioural Intension and actual use of mobile banking in hilly rural India

H1 - There is no relationship between Perceived Ease of Use and Behavioural Intention towards the usage of Mobile Banking in hilly rural India

H2 – There is no relationship between Perceived Usefulness and Behavioural Intention towards the usage of Mobile Banking in hilly rural India

5.2.1 Data Mining

The data collected from 425 respondents after applying Yamane's formula, from various villages under the district of Champawat. The degree of response checked after collecting data from the field to figure out the efficiency of the questionnaire design and method of collecting data. Twenty-two entries showed irregularities, and therefore, 403 considered out of 425 entries for data analysis. Out of these 22 entries, 13 entries were from respondents who were not able to show the MNREGA job card and, other respondents from the other nine entries marked all extremes. These twenty-two entries were random across the blocks.

A careful administration for non-response bias is required while dealing with questionnaires and, this carefulness increases when the circulation of questionnaires is in a rural setup. This paper caters the non-bias response for the four demographic variables, namely; age, level of education, monthly income and occupation. The comparison between the two groups of respondents was made using ANOVA. The first group was of 40 respondents who filled genuine

entries and 40 respondents whose missing entries filled manually. Table 16 shows the response bias analysis:

Demographic Entry	Results of ANOVA (First 40 vs. Last 40)	
	F Value	Level of Significance
Age	0.786	0.576
Level of Education	0.846	0.505
Monthly Income	1.134	0.457
Occupation	0.576	0.698

Table 16 – Response Bias Analysis

This analysis indicates that there is no response bias and also the entries that entered instead of missing entries were done carefully. Paper manages missing data and also applies the Malhanobis test. This test reveals a maximum of 0.8% of data was missing for each construct item, and randomness of missing entries was also insignificant, as shown in Table 17:

$\chi 2$	Degrees of Freedom	Sig.
849.338	878	0.75

Table 17 – Chi-square test

The missing data values will be replaced using the two-step procedure of "Regression Imputation" (Allison, 2003; Frane, 1976).

Demographic Summary of Respondent's Characteristics

It is also important to understand the distribution of nominal and categorical data, which, will help to explain the dynamics of respondents. There was an equal distribution of questionnaires across 70 villages out of 662 inhabited villages in 4 blocks of Champawat. A total of 717 villages are under the district. The respondents were using mobile banking under MGNREGA.

The ratio of male to female respondents was 3 to 2, i.e., 65% male and 35% female, which is the same as MGNREGA policy which mentions 1/3rd of the employment should be given to female population. The distribution of the age of the respondents clearly shows that the respondents enrolled for MGNREGA are either between 18-38 years of age (74.4%) or above 58 years of age (15.4%).

The data also shows that the majority of respondents were divided among illiterate or functional literate, while very few were graduates. Table 18 shows the respondent data:

S.No	Education	Total Entries
1.	Illiterate	103
2.	Functional Literate	154
3.	Primary	44
4.	Upper Primary	34
5.	High School	30
6.	Intermediate	29
7.	Graduate	13

Table 18 – Education-wise distribution of respondents

The results show that 75% of the respondents were between 18-38 years of age. Hence, the younger generation uses mobile banking, and also literacy rate doesn't affect the use of mobile banking.

Exploratory Factor Analysis (EFA)

EFA will be used to find relationships between Perceived Ease of Use, Perceived Usefulness, Behaviour Intention, and usage of mobile banking in hilly rural India. This research paper uses principal component analysis (PCA)

and utilises the orthogonal framework with a varimax rotation technique to perform factor analysis.

The EFA results checked and verified using confirmatory factor analysis (CFA) using structural equation modelling (SEM).

The first step is to check the acceptance of sample adequacy in the research, for this Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity was employed. The test clearly showed that factor analysis could be done using sample data. KMO measure of sampling came out to be 0.913. Also, Bartlett's test revealed approx chi-square was 11456.62, Degrees of Freedom was 832 and Sig. (p-value) < 0.001.

Next is to check the communalities for the variables, and if the communality is less than 50%, it leads to the exclusion of the variable from the analysis. The analysis revealed that communalities of all the variables loaded on EFA varied from 0.630 to 0.904 with average communality of 0.808, which makes the model highly acceptable model. The method of extraction was Principal Component Analysis.

EFA, based on the common factor model, was used to understand the relationship between a large set of variables. Table 19 below shows the total number of factors extracted and total variance explained in EFA model.

Items	Initial Eigen Value			Extraction Sums of Square Loading			Rotation Sums of Squared Loadings		
	Cumulative %	% of Variance	Total	Cumulative %	% of Variance	Total	Cumulative %	% of Variance	Total
AU	38.308	38.308	14.2	38.308	38.308	14.2	17.022	17.022	6.3
BI	48.16	9.852	3.65	48.16	9.852	3.65	30.094	13.071	4.84

Items	Initial Eigen Value			Extraction Sums of Square Loading			Rotation Sums of Squared Loadings		
	Cumulative %	% of Variance	Total	Cumulative %	% of Variance	Total	Cumulative %	% of Variance	Total
PU	54.634	6.475	2.4	54.634	6.475	2.4	41.034	10.94	4.05
PEoU	61.02	6.386	2.36	61.02	6.386	2.36	51.416	10.382	3.84
SN	66.185	5.165	1.91	66.185	5.165	1.91	61.773	10.357	3.83
TR	70.466	4.28	1.58	70.466	4.28	1.58	66.595	4.822	1.78
TSE	74.29	3.824	1.42	74.29	3.824	1.42	71.399	4.804	1.78
AC	78.089	3.799	1.41	78.089	3.799	1.41	76.176	4.776	1.77
GS	80.899	2.81	1.04	80.899	2.81	1.04	80.899	4.724	1.75
TS	82.278	1.379	0.51						

Table 19 – EFA Model (Factors Extracted and total variance)

Table 20 shows the data of the rotated component matrix, which corresponds to the loading of measured items on latent factors. Here Principal Component Analysis has been used as an extraction method, Varimax with Kaiser Normalization was used for rotation method with rotation converged in 6 iterations. All nine latest factors contribute to the actual usage of mobile banking. It was observed that 0.30 is the minimum criteria between the constructs and therefore justified the factor loading.

Components	1	2	3	4	5	6	7	8	9
Accessibility	0.123	0.842	0.132	0.127	0.136	0.113	0.136	0.035	0.035
Clear	0.102	0.874	0.072	0.112	0.082	0.09	0.051	0.005	0.025

Components	1	2	3	4	5	6	7	8	9
Comfort in reference manual	0.224	0.153	0.106	0.212	0.78	0.052	0.113	0.082	0.022
Comfort in using first time	0.165	0.213	0.194	0.162	0.767	0.062	0.043	0.092	0.092
Comfort learning from peers	0.165	0.079	0.134	0.167	0.827	0.082	0.016	0.103	0.045
Comfort learning on my own	0.235	0.045	0.112	0.023	0.846	0.113	0.098	0.067	0.043
Consistency	0.242	0.172	0.249	0.806	0.115	0.036	0.098	0.023	0.082
Consistency	0.164	0.136	0.125	0.124	0.183	0.167	0.034	0.864	-0.03
Continuity	0.234	0.195	0.297	0.758	0.149	0.103	0.067	0.087	0.086
Ease and Variety of Access	0.152	0.176	0.124	0.083	0.066	0.547	0.043	0.004	0.904
Easier Transaction	0.241	0.039	0.775	0.245	0.135	0.045	0.049	0.124	0.092
Easy to learn	0.09	0.814	0.173	0.145	0.183	0.074	0.046	0.12	0.095
Flexibility	0.065	0.789	-0.029	0.164	0.083	0.048	-0.066	-0.009	0.034
Fraud Free	0.121	0.035	0.032	0.126	0.136	-0.021	0.914	0.054	0.053
Future Use	0.225	0.226	0.241	0.746	0.219	0.141	0.134	0.045	0.036
Government Facilitation	0.134	0.152	0.114	0.147	0.072	0.887	-0.004	0.152	0.073
Improved Effectiveness	0.242	0.106	0.834	0.136	0.112	0.075	0.04	0.043	0.021
Improved Productivity	0.236	0.102	0.816	0.202	0.172	0.036	0.07	0.025	0.123
Influence of Family	0.765	0.114	0.215	0.114	0.049	-0.006	-0.021	0.197	0.135
Influence of friends	0.843	0.103	0.112	0.101	0.187	0.132	0.033	0.07	0.037
Influence of Media	0.787	0.123	0.189	0.2	0.156	0.032	0.024	0.024	0.035
Often and Diverse Use	0.269	0.224	0.236	0.782	0.235	0.112	0.042	0.041	0.074
Overall Comfort in usage	0.164	0.203	0.157	0.124	0.809	0.032	0.103	0.103	0.034
Overall Rating	0.143	0.834	0.104	0.148	0.162	0.053	0.102	0.136	0.136
Overall rating	0.824	0.111	0.146	0.185	0.112	0.145	0.083	0.012	0.071
Peer Influence	0.782	0.023	0.183	0.175	0.178	0.03	0.068	0.012	0.087
Quick	0.169	0.116	0.11	0.101	0.168	0.115	0.013	0.888	-0.035
Quick Transaction	0.293	0.118	0.786	0.236	0.184	0.074	0.096	0.064	-0.012
Recommendations to Peers	0.236	0.236	0.234	0.813	0.123	0.096	0.078	0.103	0.016
Saves Time	0.248	0.054	0.811	0.206	0.136	0.052	0.063	0.087	0.118
Security of Money	0.076	0.126	0.121	0.08	0.154	0.003	0.872	0.021	0.66
Sharing Experience	0.836	0.084	0.134	0.112	0.165	0.102	0.031	0.042	0.061
Skill Improvement	0.152	0.825	0.083	0.186	0.152	0.14	0.036	0.041	0.054
Societal Influence	0.772	0.134	0.198	0.136	0.121	0.025	0.054	0.126	0.09
Teaching others	0.811	0.078	0.176	0.198	0.135	0.05	0.07	0.035	0.065
Technology Promotion	0.131	0.185	0.142	0.151	0.132	0.873	-0.021	0.13	0.034
Unrestricted Access	0.162	0.146	0.113	0.036	0.067	0.025	0.056	-0.043	0.914

Table 20 – Rotated component matrix

EFA provided nine latent factors, which were the result of the sum of rating scores of all loaded items on each factor. The reliability and cross reliability of each variable and each question respectively were checked to develop a strong framework. Table 21 shows reliability statistics, and Table 8 shows total statistics. Total statistics of each construct revealed that if any item as shown in Table 8 of any of the construct will be deleted, then the Cronbach's Alpha of the corresponding construct can't be increased.

S.No	Construct	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
1.	PU	0.937	0.937	5
2.	PEoU	0.923	0.923	6
3.	SN	0.937	0.937	8
4.	TSE	0.915	0.916	5
5.	AC	0.864	0.864	2
6.	TR	0.871	0.871	2
7.	GS	0.892	0.892	2
8.	TSE	0.888	0.889	2
9.	BI	0.944	0.944	5

Table 21 – Reliability statistics of the nine constructs

The results from Table 21 and Table 22 signifies that variables can derive the latent factors, and also reliability of the variables points out that basic TAM variables Perceived usefulness, Perceived Ease of Use and Behavioural Intention could be used to study mobile banking usage.

Constructs	Items	Cronbach Alpha of item deleted	Squared multiple correlation	Corrected Inter-item correlation	Scale variance if item deleted	Scale Mean if item deleted
PU	Easier Transaction	0.915	0.697	0.842	45.403	18.68

Constructs	Items	Cronbach Alpha of item deleted	Squared multiple correlation	Corrected Inter-item correlation	Scale variance if item deleted	Scale Mean if item deleted
	Improved Effectiveness	0.931	0.736	0.862	24.883	18.82
	Improved Productivity	0.913	0.643	0.821	45.092	18.69
	Saves time	0.922	0.714	0.827	46.115	18.87
	Quick Transaction	0.924	0.725	0.841	44.784	18.85
PEoU	Skill Improvement	0.911	0.765	0.812	66.711	23.8
	Clear	0.915	0.645	0.813	65.545	23.76
	Flexible	0.939	0.465	0.696	69.032	24.13
	Easy to Learn	0.922	0.723	0.823	66.523	23.76
	Accessibility	0.919	0.745	0.865	66.923	23.83
	Overall Rating	0.915	0.721	0.864	65.765	23.86
SN	Teaching others	0.942	0.715	0.864	124.834	32.82
	Influence of friends	0.945	0.724	0.813	125.834	32.7
	Societal Influence	0.956	0.665	0.834	128.556	32.62
	Influence of family	0.923	0.656	0.745	128.122	32.65
	Sharing Experience	0.951	0.716	0.813	125.452	32.76
	Peer Influence	0.955	0.683	0.834	128.603	32.76
	Influence of Media	0.946	0.715	0.832	125.932	32.79
	Overall Rating	0.943	0.734	0.845	126.363	32.75
TSE		0.897	0.628	0.78	39.537	19.16

Constructs	Items	Cronbach Alpha of item deleted	Squared multiple correlation	Corrected Inter-item correlation	Scale variance if item deleted	Scale Mean if item deleted
	Comfort learning on my own					
	Comfort Learning from Peers	0.896	0.623	0.784	38.531	19.18
	Comfort in using first time	0.904	0.573	0.747	39.29	19.05
	Comfort with reference manual	0.894	0.643	0.797	37.926	19.08
	Overall comfort in usage	0.891	0.662	0.81	38.558	19.19
AC	Ease and variety of access	.(a)	0.58	0.761	3.963	4.62
	Unrestricted access	.(a)	0.58	0.761	3.845	4.55
TR	Security of money	.(a)	0.596	0.772	3.68	4.62
	Fraud Free	.(a)	0.596	0.772	3.779	4.69
GS	Technology Promotion	.(a)	0.647	0.805	3.825	4.42
	Government Facilitation	.(a)	0.647	0.805	3.625	4.47
TSE	Network Availability	.(a)	0.64	0.8	3.675	4.7
	Customer Care	.(a)	0.64	0.8	3.307	4.76

Constructs	Items	Cronbach Alpha of item deleted	Squared multiple correlation	Corrected Inter-item correlation	Scale variance if item deleted	Scale Mean if item deleted
BI	Recommendation to Peers	0.927	0.732	0.871	45.373	19.43
	Continuity	0.934	0.732	0.864	44.703	19.63
	Often and Diverge Usage	0.932	0.751	0.862	44.532	19.74
	Future Usage	0.927	0.711	0.824	45.894	19.71
	Consistency	0.932	0.742	0.852	43.799	19.85

Table 22 – Total statistics of constructs

The next aim is to derive the latent factors and relationship between the variables which would be useful for taking care of transitivity. The Bivariate Pearson's correlation significant at 0.01 levels (**2-tailed) has been used to check the linearity of the test in the data. Table 23 shows that government support and technical support shows a negative correlation.

	PU	PEoU	SN	TSE	AC	TR	GS	TS	BI
PU	1	.311(**)	.543(**)						
PEoU		1	.312(**)						
SN			1						
TSE	.421(**)	.383(**)	.481(**)	1					.473(**)
AC	.285(**)	.303(**)	323(**)	.211(**)	1	.189(**)	.162(**)	0.061	.240(**)
TR	.253(**)	.242(**)	.243(**)	.311(**)		1	0.04		.279(**)
GS	.292(**)	.328(**)	.301(**)	.268(**)			1		.384(**)
TS	.318(**)	.281(**)	.332(**)	.373(**)		.175(**)	.375(**)	1	.338(**)
BI	.603(**)	.462(**)	.545(**)						1

Table 23 – Pearson's bivariate correlations between latent constructs

Mahalanobis distance (D2) test and boxplots are used to test multivariate and univariate outliers, respectively. As shown in Table 24, the maximum value of D2 (23.112) is lower than the minimum cut-off limit of 27.653 and shows that there are no outliers in final set of 9 variables from total of 403 entries.

	Std. Dev	Mean	Min.	Max
Predicted Value	38.68	176.99	70.46	304.26
Std. Predicted Value	1	0	-2.754	3.29
Standard Error of Predicted Value	4.713	15.4	6.26	25.058
Adjusted Predicted Value	38.864	176.19	67.55	308.26
Residual	94.441	0	-204.256	223.075
Std. Residual	0.987	0	-2.135	2.332
Stud. Residual	1.002	0.004	-2.154	2.405
Deleted Residual	97.341	0.805	-207.947	237.243
Stud. Deleted Residual	1.004	0.004	-2.166	2.422
Mahal. Distance	5.806	8.975	0.51	23.15
Cook's Distance	0.005	0.003	0	0.037
Centered Leverage	0.016	0.025	0.001	0.066

Table 24 – Residuals statistics

The normality of data was tested using the Shapiro-Wilk test and the Kolmogorov-Smirnov test. Table 25 signifies that the data was normal.

	Shapiro-Wilk			Kolmogorov-Smirnov(a)		
	Sig.	Df	Statistics	Sig.	Df	Statistics
PU	0	403	0.848	0	403	0.219
PEoU	0	403	0.855	0	403	0.212
SN	0	403	0.821	0	403	0.226
TSE	0	403	0.856	0	403	0.202
AC	0	403	0.869	0	403	0.221
TR	0	403	0.858	0	403	0.255
GS	0	403	0.887	0	403	0.199
TS	0	403	0.868	0	403	0.237
BI	0	403	0.821	0	403	0.239

Table 25 – Test of Normality

The Levene's test indicates the homogeneity in all constructs except Perceived Ease of Use. Table 12 shows the test of homogeneity of variance.

Note: Based in Mean – BIM; Based on Median – BoM; Based on Median and with adjusted df – BoM(df); Based on trimmed mean – BTM

Constructs		Levene's Statistics	Df1	Df2	Sig.
PU	BIM	0.004	1	401	0.951
	BoM	0.045	1	401	0.832
	BoM(df)	0.045	1	400.97	0.832
	BTM	0.031	1	401	0.861
PEoU	BIM	4.737	1	401	0.031
	BoM	1.124	1	401	0.292
	BoM(df)	1.124	1	444.17	0.292
	BTM	2.157	1	401	0.042
SN	BIM	1.033	1	401	0.312
	BoM	0.538	1	401	0.464
	BoM(df)	0.538	1	400.97	0.464
	BTM	1.101	1	401	0.295
TSE	BIM	0	1	401	0.989
	BoM	0.014	1	401	0.907
	BoM(df)	0.014	1	398.84	0.907
	BTM	0	1	401	0.991
AC	BIM	0.084	1	401	0.771
	BoM	0.278	1	401	0.599
	BoM(df)	0.278	1	400.96	0.599
	BTM	0.132	1	401	0.716
TR	BIM	1.063	1	401	0.303
	BoM	0.29	1	401	0.591
	BoM(df)	0.29	1	400.27	0.591
	BTM	0.867	1	401	0.353
GS	BIM	0.043	1	401	0.836
	BoM	0.236	1	401	0.627
	BoM(df)	0.236	1	396.02	0.627
	BTM	0.074	1	401	0.786

Constructs		Levene's Statistics	Df1	Df2	Sig.
TS	BIM	0.194	1	401	0.661
	BoM	0.184	1	401	0.669
	BoM(df)	0.184	1	399.75	0.669
	BTM	0.245	1	401	0.621
BI	BIM	0.742	1	401	0.391
	BoM	0.296	1	401	0.587
	BoM(df)	0.296	1	400.96	0.587
	BTM	0.686	1	401	0.408

Table 26 – Test of homogeneity of variance

The results from the above table clarify that data is ready to apply in Structured Equation Modeling to test the hypothesis and verify the framework.

Structural Equation Modeling (SEM) Analysis

The relationship between constructs was tested using two-step SEM, and a framework was developed. Confirmatory Factor Analysis (CFA) was used to validate the relationship between the measurement items using AMOS, and a structured model was used to study the relationship between the constructs.

Confirmatory factor analysis was conducted, which confirms the validity and reliability of the measurement model. The first step is to check the goodness of fit (GOF). The GOF indices used parsimonious fit indices, incremental fit indices, and absolute fit indices to prove the fitness of constructs in the final framework. Table 27 shows a summary of the results derived from the initial CFA.

Note: χ2 = Chi-square; df = degree of freedom; GFI = Goodness of fit index; RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index; AGFI – Adjusted goodness of fit index

	$\chi2$	Df	Parsimony Fit Indices	Incremental Fit Indices		Absolute Fit Indices		
			AGFI	NFI	CFI	$\chi2$/df	GFI	F
Criteria			≥0.90	≥0.90	≥0.90	1< X2/df<3	≥0.90	<0.05
Obtained	939.311	462	0.899	0.942	0.948	2.272	0.9	0.051

Table 27 – Goodness of fit statistics for the initial CFA

Chi-square statistics indicates that data to the model was not significant and therefore model to be rejected, and it is, therefore, important to switch the analysis to other fit indices like NFI = Normated fit index ; CFI = Comparative fit index; RMSEA = Root mean square error of approximation, GFI = Goodness of fit index; AGFI – Adjusted goodness of fit index. The Chi-square test is mainly dependent on sample size, and it applies to data that doesn't follow the normality.

Results from Table 27 and Table 28 depict that the numbers are not in sync with each other, and therefore the model needs to be refined.

The cut-off value for squared multiple correlations and factor loading is 0.5 and 0.7, respectively (Byrne, 2001). The standard residual value shall lie between -2.58 to 2.58 (Hair et al. 2006). (Hair et al., 2006) opined that limit of modification indices which represents high value of covariance and regression weight also needs to be checked. When the results from data are tested and validated against the output of the CFA applied to the older model. It was observed that factor loading was passed for all the measurement items but "Flexible," "Comfort learning from peers," "Continuity" and "Influence of Media" got high degree of residual variance and therefore they were dropped from the list. Once these items were removed from the list, according to (Hair

et al., 2006; Kline, 2005) CFA was re-run. Table 28 clearly shows the goodness of fit indices, concerning every criterion, improved from the revised model

	χ2	Df	Parsimony Fit Indices	Incremental Fit Indices		Absolute Fit Indices		
			AGFI	NFI	CFI	χ2/df	GFI	F
Criteria			≥0.90	≥0.90	≥0.90	1< X2/df<3	≥0.90	<0.05
Obtained	821.15	546	0.925	0.923	0.987	1.834	0.91	0.015

<p style="text-align:center">Table 28 – Goodness of fit statistics if revised CFA model</p>

Once the goodness of fit indices was done, the discriminant, nomological and convergent validity was done to make sure, new constructs are valid to be used to form a model. Table 29 shows the results of convergent validity, which points out that the revised CFA model clears of the minimum cut off, and it is better than the previous one.

Construct	Item	Average Variance Extracted (AVE)	Critical Ratio (T-value)	Standardized Factor Loading
PU	Easier Transaction	0.772	21.423	0.875
	Improved Effectiveness		22.463	0.869
	Improved Productivity		………..	0.845
	Saves time		22.391	0.813
	Quick Transaction		21.946	0.869
PEoU	Skill Improvement	0.763	25.712	0.863
	Clear		24.839	0.801
	Easy to Learn		23.145	0.823
	Accessibility		21.429	0.893
	Overall Rating		_____	0.914
SN	Teaching others	0.726	19.518	0.821

Construct	Item	Average Variance Extracted (AVE)	Critical Ratio (T-value)	Standardized Factor Loading
	Influence of friends		20.732	0.862
	Societal Influence		_____	0.812
	Influence of family		21.312	0.845
	Sharing Experience		20.874	0.832
	Peer Influence		20.563	0.841
	Overall Rating		20.295	0.892
TSE	Comfort learning on my own	0.665	17.873	0.792
	Comfort with reference manual		19.151	0.854
	Comfort in using first time		18.238	0.813
	Overall Comfort in Usage		_____	0.819
AC	Ease and variety of access	0.751	_____ _	0.894
	Unrestricted access		10.263	0.832
Trust	Security of Money		9.652	0.883
	Fraud Free	0.789	_____	0.873
GS	Technology Promotion	0.878	13.547	0.903
	Government Facilitation		____	0.893
TSE	Network Availability	0.901	13.672	0.911
	Customer Care		_____	0.934
BI	Recommendation to Peers	0.725	24.873	0.873
	Often and Diverge Usage		_____ *	0.893
	Future Usage		23.174	0.899
	Consistency		23.834	0.903

*Regression Weight 1

Table 29 – Convergent validity

Tables 30 and 31 shows strong and significant correlations and discriminant validity for the constructs respectively

	PU	PEoU	SN	TSE	AC	TR	GS	TS	BI
PU	1								0.63
PEoU	0.341	1							0.423
SN	0.583	0.342	1	0.281	0.321	0.241	0.293	0.362	0.557
TSE	0.438	0.431		1					0.51
AC	0.297	0.314		0.213	1			0.062	0.251
TR	0.283	0.298		0.351	0.214	1		0.113	0.287
GS	0.298	0.351		0.294	0.162	0.072	1	0.405	0.4
TS	0.572	0.325		0.392				1	0.367
BI									1

Table 30 – Inter Construct Correlations

	PU	PEoU	SN	TSE	AC	TR	GS	TS	BI
PU	0.723								0.383
PEoU	0.113	0.788							0.226
SN	0.341	0.135	0.736	0.113	0.135	0.074	0.052	0.113	0.314
TSE	0.199	0.183		0.672					0.244
AC	0.083	0.121		0.061	0.789			0.014	0.063
TR	0.063	0.099		0.149	0.082	0.752	0.046		0.072
GS	0.081	0.142		0.104	0.025	0.014	0.825	0.201	0.156
TS	0.346	0.101		0.176				0.901	0.129
BI									0.762

Table 31 – Discriminant Validity

Note: Diagonal values are AVE, and off-diagonal are inter-construct squared correlations

In the end, a Nomological validity test will be done where the correlation between the measurement model constructs will be checked. Table 31 and Table 32 shows the results of nomological validity which depicts that there is some

positive relationship between government support and technical support, but the level of significance is very low similarly trust, and government support shows low level of significance. Apart from these two other values are consistent and supported nomological validity.

P	C.R	S.E	Estimate	Relationship between variables
***	6.459	0.183	1.214	TS<-->TSE
***	3.625	0.156	0.527	AC<-->TSE
0.209	1.325	0.19	0.242	AC<-->TS
***	5.125	0.152	0.883	TR<-->TSE
0.002	3.042	0.145	0.515	TR<-->TS
***	3.127	0.162	0.562	TR<-->AC
***	4.623	0.131	0.762	GS<-->TSE
***	6.568	0.213	1.114	GS<-->TS
0.003	3.124	0.182	0.624	GS<-->AC
0.132	1.423	0.145	0.324	GS<-->TR
***	7.678	0.165	1.423	SN<-->TSE
***	6.125	0.156	1.132	SN<-->TS
***	5.568	0.176	0.924	SN<-->AC
***	4.021	0.141	0.634	SN<-->TR
***	5.234	0.189	0.883	SN<-->GS
***	6.872	0.147	1.104	TSE<-->PEoU
***	5.512	0.115	1.103	TS<-->PEoU
***	5.262	0.193	0.982	AC<-->PEoU
***	5.021	0.179	0.621	TR<-->PEoU
***	5.81	0.193	1.121	GS<-->PEoU
***	6.1	0.152	0.912	SN<-->PEoU
***	6.235	0.174	0.923	PU<-->PEoU
***	7.138	0.152	1.132	TSE<-->PU
***	5.672	0.181	1.103	TS<-->PU
***	4.873	0.172	0.817	AC<-->PU
***	4.662	0.159	0.752	TR<-->PU
***	5.114	0.189	0.867	GS<-->PU
***	8.521	0.166	1.423	SN<-->PU
***	9.024	0.188	1.723	BI<-->PU

P	C.R	S.E	Estimate	Relationship between variables
***	7.79	0.179	1.334	BI<-->PEoU
***	7.613	0.15	1.253	BI<-->TSE
***	6.124	0.171	1.111	BI<-->TS
***	4.146	0.174	0.752	BI<-->AC
***	4.538	0.182	0.762	BI<-->TR
***	6.341	0.192	1.102	BI<-->GS
***	7.345	0.162	1.312	BI<-->SN

Table 32 - AMOS output – Covariance

(Default model)

Estimate	Relationship between variables
0.415	TS<-->TSE
0.236	AC<-->TSE
0.15	AC<-->TS
0.352	TR<-->TSE
0.193	TR<-->TS
0.238	TR<-->AC
0.323	GS<-->TSE
0.434	GS<-->TS
0.203	GS<-->AC
0.123	GS<-->TR
0.545	SN<-->TSE
0.312	SN<-->TS
0.234	SN<-->AC
0.303	SN<-->TR
0.316	SN<-->GS
0.453	TSE<-->PEoU
0.342	TS<-->PEoU
0.343	AC<-->PEoU
0.312	TR<-->PEoU
0.373	GS<-->PEoU
0.364	SN<-->PEoU
0.323	PU<-->PEoU
0.473	TSE<-->PU

Estimate	Relationship between variables
0.364	TS<-->PU
0.317	AC<-->PU
0.304	TR<-->PU
0.329	GS<-->PU
0.621	SN<-->PU
0.62	BI<-->PU
0.504	BI<-->PEoU
0.524	BI<-->TSE
0.403	BI<-->TS
0.273	BI<-->AC
0.302	BI<-->TR
0.423	BI<-->GS
0.534	BI<-->SN

Table 33 -   AMOS Output – Correlations

(Default model)

The constructs derived from the literature were divided into exogenous constructs and endogenous constructs. Exogenous constructs are government support, technology self-efficacy, technical support, subjective norm, trust, and accessibility. Whereas, perceived usefulness, perceived ease of use, and behavioural constructs are classified as endogenous variables.

			Parsimony Fit Indices	Incremental Fit Indices		Absolute Fit Indices		
	$\chi2$	Df	AGFI	NFI	CFI	$\chi2$/df	GFI	F
Criteria			≥0.90	≥0.90	≥0.90	1< X2/df<3	≥0.90	<0.05
Obtained	868.902	534	0.901	0.913	0.959	1.795	0.911	0.048

Note: $\chi2$ = Chi-square; df = degree of freedom; GFI = Goodness of fit index; RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index; AGFI – Adjusted goodness of fit index

Table 34 – Structural model fit measurement assessment

Table 34 clearly shows that parameters of the hypothesized structural model are closed to the goodness of fit.

It has been seen earlier; four items dropped, and 33 items were used to construct the model again. Similarly, it is again important to undertake the test, and the covariance matrix was build using these coefficient parameter estimates. The cut-off limit for the consideration was a critical ratio higher than 1.96 with confidence level of 95%.

Significance (P)	C.R	S.E	Estimate	Relationships
***	6.425	0.072	0.413	PEoU <-- TSE
***	4.152	0.063	0.213	PEoU <-- AC
0.005	2.834	0.054	0.178	PEoU <-- TR
***	7.314	0.063	0.486	PU <-- SN
0.1	1.662	0.052	0.112	PU <-- PEoU
0.002	3.124	0.058	0.193	PU <--TSE
0.242	1.142	0.054	0.052	PU <--GS
0.146	1.502	0.053	0.082	PU <--TS
***	4.963	0.037	0.302	BI <-- SN
***	7.397	0.042	0.397	BI <--PU
***	6.113	0.041	0.283	BI <-- PEoU

Note: CR – Critical Ratio; SE - Standard Error

Table 35 - Regression estimates of latent constructs

Table 35 clearly shows that 9 out of 12 paths drawn between the variables show a critical ratio higher than 1.96, with a confidence level of 95%. The path significance indicates the perfect relationship between two variables and therefore included in final model.

The hypothesized paths between perceived usefulness and government support; perceived usefulness and technical support indicated that their t-values did not exceed the cut-off point required for statistical significance. Thus, these paths were not statistically significant. Table 36 shows the hypotheses testing by taking standard regression weights (β).

S.No	β	Supported	Relationship (Positive)
1.	0.672	Yes	BI □ AU (Hypothesis)
2.	0.087	No	TS□PU
3.	0.077	No	GS □ PU
4.	0.139	Yes	TR □PEoU
5.	0.373	Yes	TSE □PEoU
6.	0.194	Yes	TSE □PU
7.	0.279	Yes	SN□PEoU
8.	0.453	Yes	SN □PU
9	0.288	Yes	PEoU□BI (Sub Hypothesis)
10	0.397	Yes	PU □BI (Sub Hypothesis)

Table 36 – Hypotheses Testing

Two non-significant paths were removed, based on the above hypotheses testing. The structural model was re-specified and resulted shown in table 37 and 38:

S.No	β	CR	Supported	Relationship (Positive)
1.	0.24	4.128	Yes***	BI □ AU
2.	0.139	2.851	Yes**	TR□PEoU
3.	0.373	6.429	Yes***	TSE □ PEoU
4.	0.214	3.461	Yes***	TSE □PU
5.	0.279	4.911	Yes***	SN □PEoU
6.	0.473	7.846	Yes***	SN □PU
7.	0.285	6.082	Yes***	PEoU□BI
8.	0.399	7.291	Yes***	PU □BI

Table 37 - Regression estimates of revised constructs after dropping insignificant paths

			Parsimony Fit Indices	Incremental Fit Indices		Absolute Fit Indices		
	$\chi2$	Df	AGFI	NFI	CFI	$\chi2/df$	GFI	RMS EA

Criteria			≥0.90	≥0.90	≥0.90	1< X^2/df<3	≥0.90	<0.05
Obtained	578.271	368	0.933	0.935	0.975	1.571	0.942	0.039

Table 38 - Goodness of fit indices revised structural model

The new model was formed based on the above test results, and the same is shown below:
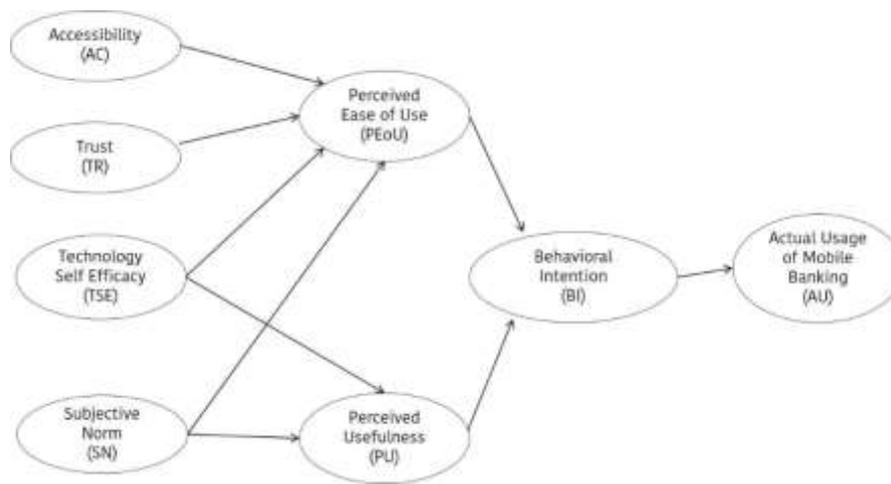
Figure 18 Model of factors influencing mobile banking adoption

5.3 Interpretation of results

The framework developed by testing the hypothesised relationships between the variables indicates that behaviour intention incorporates an important and positive result on the usage of mobile banking for enhancing financial inclusion in Champawat, Uttrakhand under MGNREGA. The framework additionally symbolises that perceived ease of use and perceived usefulness even have a positive impact on behaviour intention.

Trust and Technology-self-efficacy additionally were integral elements in developing the perceptions of the respondents. The framework additionally indicates that accessibility to mobile banking also have a necessary role in

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enhancing perception ease of use. The provision of mobile banking with all and registered in MGNREGA and straightforward access to cash through business correspondent within the village makes a win-win state of affairs for the users.

6 Identification of the most influencing constructs

After the validation of the model and identify constructs which can affect the adoption of mobile banking in hilly rural India, it is important to understand which construct shall be tapped first so that maximum impact on the adoption can be done. Therefore, it is important to understand the severity level of each construct on their overall impact on the system.

6.1 Identify the most influencing construct using Analytic hierarchy process

The severity was analysed by using Analytic Hierarchy Process (AHP) to sequentially arrange the constructs from most impacting to least impacting. The priority weight obtained using expert opinions is calculated by multiplying priority vector of criteria and priority weight of constructs. A final assessment value for each construct is calculated by taking Geometric Mean of all the priority vectors obtained for each expert.

Evaluation using AHP generally involves interview of experts having varied knowledge and experiences in the field. The data was drawn out in the form of expert opinions from the stakeholders. Subject-matter experts or domain experts are those professionals that have acquired requisite knowledge, skills and experience in the field to the extent that his or her opinions might assist in finding facts, solving problems or understanding the logical inferences of the system.

For this research, any professional with in-depth knowledge, skills and practical understanding of mobile banking and its impact on financial inclusion w.r.t MGNREGA was considered. These experts were chosen randomly such that each expert will have equal chance of being selected at the stage of sampling process.

The main advantages of this sampling technique are: error prone, removes biasness, requires less knowledge on population and reduces cost of sampling. The experts selected using random sampling technique further acted as existing study subjects and helped in recruiting future subjects as per their knowledge and acquaintances in the area.

6.2 Data Collection

This objective has considered the same experts which were interviewed during TISM calculations. Out of these 43 experts, 37 experts responded, 6 were found in-consistent and 31 were found consistent and subsequently considered for final calculations. 6 were found in-consistent, hence their opinions were not considered while evaluating the constructs. Finally, weights are obtained using the 31 expert opinions indicating importance of each alternative considered. In this study, data collection process involves following:

The AHP questionnaire was explained to the experts via telephonic conversation & personal visits and opinions were sought. Initially, a preliminary set of constructs were identified in the study were explained to them. Expert opinions were sought for pair-wise comparisons among criteria and constructs to understand relative importance of each criteria and alternative. For comparisons of constructs, experts were asked following question:

"How much influential construct A is as compared to construct B with respect to Criteria C_1?"

Therefore, comparisons among 8 constructs under three criteria were asked in a similar way. For comparisons of criteria, following question was asked

"How much more Criteria C_1 is preferred over C_2?"

If these comparisons are found to be inconsistent, then the comparisons are revisited again to make them more consistent.

6.3   Validation of AHP questionnaire:

It is necessary to validate a newly designed questionnaire for seeking any input from the relevant stakeholders. The advantage with AHP methodology is that it works on its own defined questions therefore, the validation of the AHP questionnaire is not needed. Detailed explanation is given below:

- The AHP questionnaire is not newly designed and it involves one type of question about the relative importance of the criteria or alternatives (Basak, 1998). These questions demand a multi-criteria logic, which falls into mathematical and behavioral science interests and is quite different from statistical theories (Marcarelli et al., 2013).

- The pairwise comparison judgments in the AHP are applied using a fundamental Saaty scale. This scale has been validated for its effectiveness not only in many applications by various studies but also through theoretical justifications (Saaty & Varges, 2001).

6.4   Results

Following are the results we obtained from AHP, which gave us the clarity on which we have work up

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8	Expert 9	Expert 10
Perceived Ease of Use	0.228	0.317	0.247	0.252	0.235	0.303	0.308	0.330	0.344	0.310
Behavioral Intention	0.343	0.247	0.280	0.334	0.339	0.258	0.248	0.250	0.282	0.263
Technology Self Efficacy	0.105	0.116	0.119	0.130	0.115	0.123	0.110	0.116	0.141	0.123
Trust	0.069	0.068	0.068	0.063	0.068	0.084	0.077	0.067	0.089	0.060
Subjective Norm	0.033	0.031	0.032	0.029	0.029	0.033	0.031	0.029	0.044	0.037
Accessibility	0.043	0.041	0.043	0.038	0.037	0.035	0.040	0.042	0.048	0.044
Perceived Usefulness	0.166	0.168	0.167	0.137	0.138	0.120	0.144	0.133	0.116	0.129

	Expert 11	Expert 12	Expert 13	Expert 14	Expert 15	Expert 16	Expert 17	Expert 18	Expert 19	Expert 20
Perceived Ease of Use	0.310	0.315	0.248	0.309	0.320	0.323	0.317	0.340	0.313	0.354
Behavioral Intention	0.259	0.252	0.297	0.252	0.255	0.264	0.276	0.239	0.247	0.206
Technology Self Efficacy	0.105	0.115	0.117	0.114	0.122	0.104	0.115	0.115	0.116	0.144
Trust	0.074	0.066	0.048	0.056	0.067	0.079	0.063	0.063	0.059	0.062
Subjective Norm	0.031	0.027	0.040	0.026	0.041	0.037	0.023	0.028	0.028	0.042
Accessibility	0.041	0.040	0.058	0.051	0.026	0.034	0.037	0.038	0.054	0.031
Perceived Usefulness	0.150	0.134	0.163	0.137	0.131	0.126	0.128	0.136	0.134	0.113

	Expert 21	Expert 22	Expert 23	Expert 24	Expert 25	Expert 26	Expert 27	Expert 28	Expert 29	Expert 30	Expert 31
Perceived Ease of Use	0.338	0.358	0.291	0.317	0.345	0.317	0.323	0.330	0.347	0.316	0.298
Behavioral Intention	0.234	0.262	0.284	0.236	0.234	0.260	0.247	0.250	0.261	0.230	0.252
Technology Self Efficacy	0.136	0.134	0.118	0.144	0.153	0.131	0.115	0.128	0.137	0.141	0.140
Trust	0.072	0.083	0.058	0.050	0.070	0.059	0.070	0.062	0.089	0.070	0.065
Subjective Norm	0.030	0.042	0.029	0.043	0.029	0.037	0.031	0.027	0.047	0.022	0.041
Accessibility	0.039	0.048	0.054	0.059	0.043	0.044	0.039	0.057	0.050	0.049	0.050
Perceived Usefulness	0.124	0.110	0.137	0.129	0.100	0.118	0.167	0.122	0.116	0.075	0.116

Table 39 – AHP results

The actual weight and ranking is shown the figure below.

	GM	Rank
Perceived Ease of Use	0.308	1
Behavioral Intention	0.261	2
Technology Self Efficacy	0.123	4
Trust	0.067	5
Subjective Norm	0.033	7
Accessibility	0.043	6
Perceived Usefulness	0.130	3

Table 40 – Geometric Mean and Ranking

6.5 Interpretation of the Results

- The constructs are ranked according to the decreasing assessment values
- The construct with the highest weight has been considered as the most important construct and ranked as one.
- From the table, it is evident that perceived ease of use is the most important construct which shall require the attention.

6.6 Findings

1 The study confirms that planning to enhance the mobile banking adoption is essential to conduct the current assessment, providing a clear visualization of the future, and taking concrete action. Improper planning has a direct impact on economy as whole.

2 Appropriate allocation of accountability and clear focused policy intervention are necessary to increase mobile banking adoption

3 It was clear that if we work on enhancing the perception of ease of using mobile banking, then we can definitely improve the mobile banking adoption in hilly rural India.

7 To develop strategies to enhance mobile banking adoption in hilly rural India

This study has sequentially applied the Thinking Process in the adoption of mobile banking in Champawat district. This is the first study in the literature that will highlight the important constructs, working on which will help to enhance the mobile banking adoption in hilly rural India.

7.1 Thinking Process

Thinking Process (TP) uses only 1, 4 and 5 out of the 5 focusing steps of Theory of Constraints to eliminate the policy level constraints (Motwani et al., 1996). TOC has benefitted both manufacturing as well as service industry.

Benefits achievable through adopting this approach are reduction in lead-time, cycle-time, lowering inventory and improving productivity and quality. Hence, TOC-based management philosophy focuses on change at three levels (3Ms): the mind-set of the organization, the measures that drive the organization and the methods employed within the organization. The mobile banking adoption literature does not normally include TOC, but as the theory uses a system thinking approach that largely deals with problem solving and decision making, the theory seemed highly appropriate for this study.

This technique is logical "Thinking Process", which can be used in standalone situations or in a coherent problem-solving and change management. The main purpose is to translate intuitions that can be discussed rationally, questioned without offense and modified to fully reflect the understanding of the situation.

It caters to the three questions of any system a) what to change, b) what to change to and c) how to change.

This process will first allow us to assess the current situation of mobile banking in Champawat district with the help of graphical representation or cause-effect diagram and linkages among various issues that lead to a particular factor within the system. The next step will be to work on the root causes that lead to any impediment, with the help of identification of proposed actions require to eliminate that impediment. It also assists in identifying some of undesirable effects that may arise by taking a particular action. This will prompt system the trade-offs of taking that particular action. Furthermore, it will also bring focus on the obstacles while implementing the actions to enhance the adoption. In short, a complete knowledge tree in the graphical form is prepared that indicate impediments and constructs of the system with proposed strategies. Additionally, it will assist in articulating thoughts or explicit/implicit knowledge of experts into more structured form.

7.2 Data Collection

The data was collected by conducting group discussion with various experts working in the related field. These experts were selected using judgmental sampling technique. The criterion for the selection was the vast experience of the experts involved. The minimum size of 30 expert opinion i.e. $n \geq 30$ accurately represents the population parameters (Malhotra and Dash, 2011).

In this objective, 43 experts were approached for the data collection and 31 willingly participated to assist in developing various logic trees for the Thinking Process. Based on the information provided by the experts, the current state was mapped, followed by identification of the undesired effect of the current processes. After this, a work plan was created, proposing key strategies to achieve the desired goals.

Focused group discussion is used as it is a qualitative approach to gain an in-depth understanding of social issues. The data was collected through semi structured focused group protocol consisted of open ended questions to elicit information about participant's perception about the various constructs.

FGD was conducted in 5 different groups of 5-6 members in each group. Each group was given one tree to work upon. The researcher worked as moderator while conducting reach discussion for 45-60 minutes' duration over "zoom" web tool and telephone. The responses were captured and tree were formed according to inputs.

7.3 Current Reality Tree

The construction of the CRT begins with the identification of the list of impediments to adoption of mobile banking in Champawat District. It was developed using cause and effect logic for understanding the core issues related to adoption of mobile banking in hilly rural India. The figure below can be read from downwards to upwards using IF-THEN statements. Experts during the discussion found that low income within the region is a main problem in the adoption. Even expert feel that literacy rate doesn't affect adoption of mobile banking.
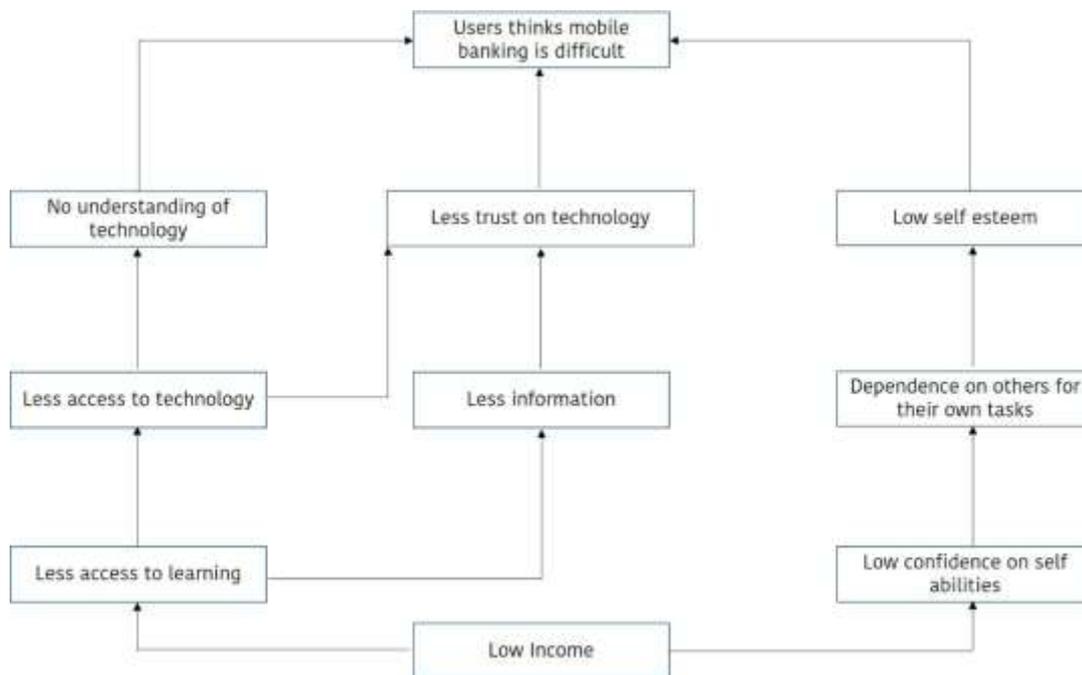
Figure 19 – Current Reality Tree

7.4 Evaporating cloud

The Conflict Resolution Diagram (CRD), also known as Evaporating Cloud (EC). As the name tells, the Conflict Resolution Diagram is used to surface and resolve conflicts, e.g. dilemmas.

The CRD is based on two assumptions:

1. Conflicts (opposition about objectives or opposite points of view, for instance) tend to be settled by compromise. Yet compromising requires making concessions that lead to a solution which isn't satisfactory for neither side, hence a win-lose nor lose-lose situation.
2. Conflicts are often the result of false assumptions, beliefs or myths which constrain needlessly the organization. As two opposite things cannot be true at the same time, one is necessarily false. If the falseness

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can be debunked, the conflict disappears (evaporates) and a no-compromise, win-win solution is found.
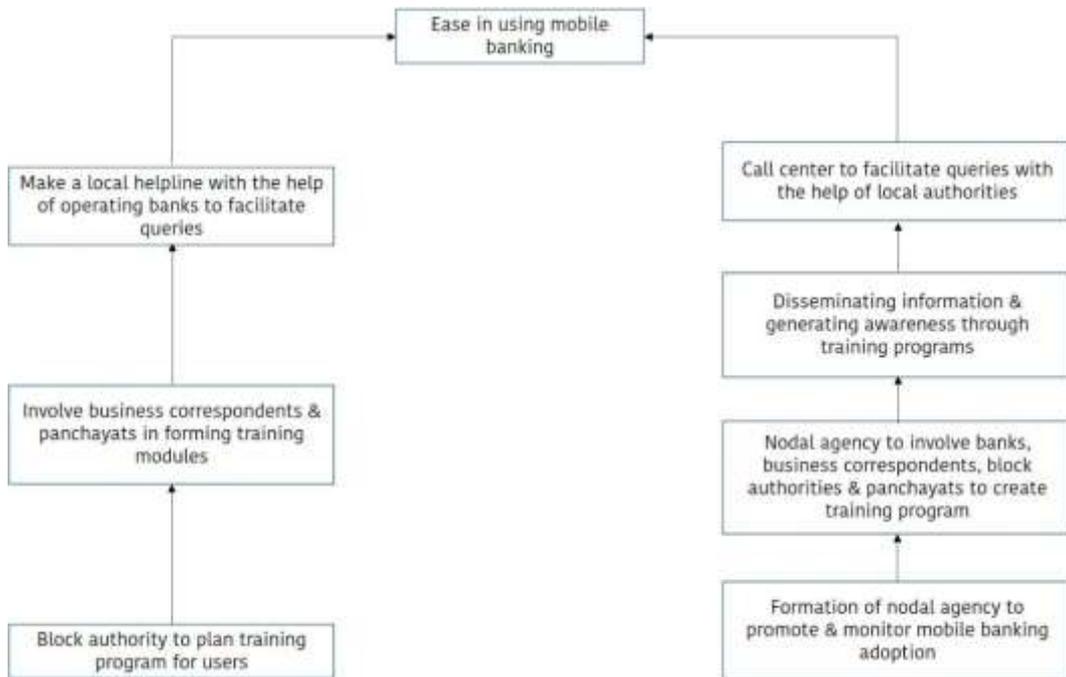
Figure 20 – Evaporating Cloud

7.5 Future Reality Tree

A Future Reality Tree (FRT), as the name suggests is a visualization of a desired, improved future state. It answers the question "What to change?" Or "change to what?" The Future Reality Tree is one of the Thinking Processes or Thinking Process tools. A FRT usually follows an analysis with a Current Reality Tree (CRT) and an Evaporating Cloud (EC) on mobile banking adoption in Champawat District.

Thus the FRT turns the Undesirable Effects (UDEs) of low awareness, less information, problems with accessibility and trust identified during the CRT into Desirable Effects (DEs) by combining the real causes of UDEs with

injections, which are entities (actions or conditions) that do not yet exist, but which are necessary to correct the current state, turning it into desirable future condition or target.

Injections are a cure to Undesirable Effects when combined to the cause of UDEs. Injections are always entry points (they do not have a cause) and are distinguished from others entities by their square corners. A FRT is recognizable by the basic structure of a cause AND an injection linking to a Desirable Effect. In the figure below shows the injections are at appropriate place to trigger the desired affect which will facilitate the enhance the ease in using mobile banking among users in Champawat district.
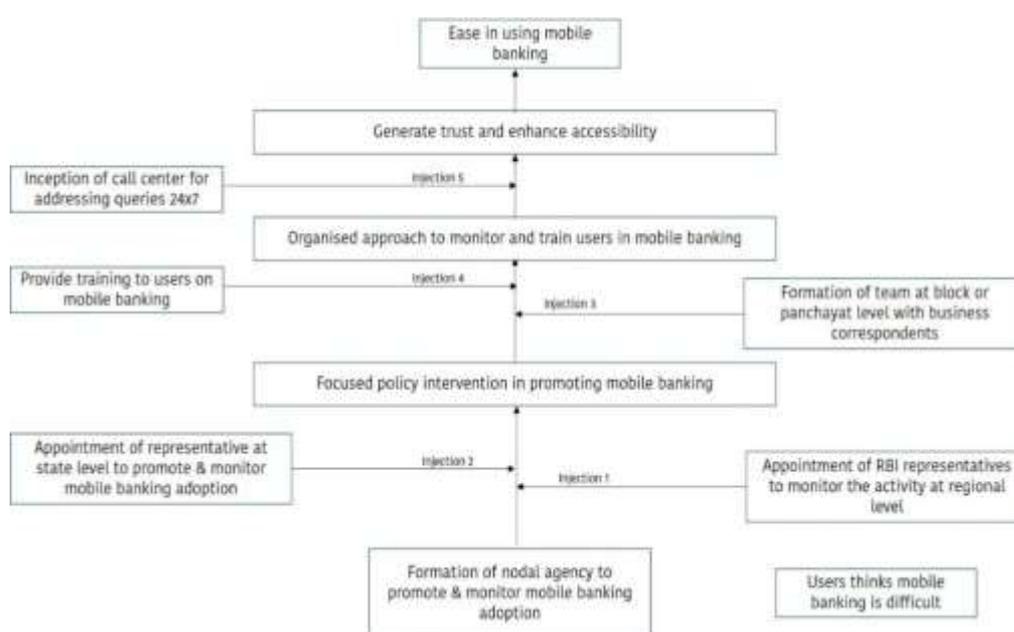
Figure 21 – Future Reality Tree

A Future Reality Tree depicts the could-be future, but does not give all the answers about how to get there, how to close the gap between the Current Reality and the Future Reality. Therefore, two more tools or processes are provided: the Prerequisite Tree (PRT) and Transition Tree (TT).

7.6   Pre-requisite Tree

The Prerequisite Tree (PRT) is one of the Logical Thinking Process tools, in Thinking Processes. The Prerequisite Tree is used to surface and overcome obstacles to achieving the change towards the organization's Goal by setting Intermediate Objectives (IOs). These IOs are sequential steps to implementing the change or steps helping to overcome or neutralize the obstacles.

The Prerequisite Tree is a necessity logic-based tree, like the Goal Tree and its building starts from the Goal or objective downwards. The objective may be the result of an injection identified in a prior Future Reality Tree (FRT). The implementation sequence starts from the bottom up to the top as each layer is dependent on the layer underneath.

The underlying IOs are the tasks required for attaining the objective. If Obstacles surface, additional IOs are required to bypass or neutralize them.

The obstacles like unfamiliarity with mobile banking services, issues with less use and information about mobile banking services were highlighted by the figure below. The first issue which needs to be catered is conventional mind set without breaking it, it would be difficult to move ahead on journey of enhancing the mobile banking adoption.
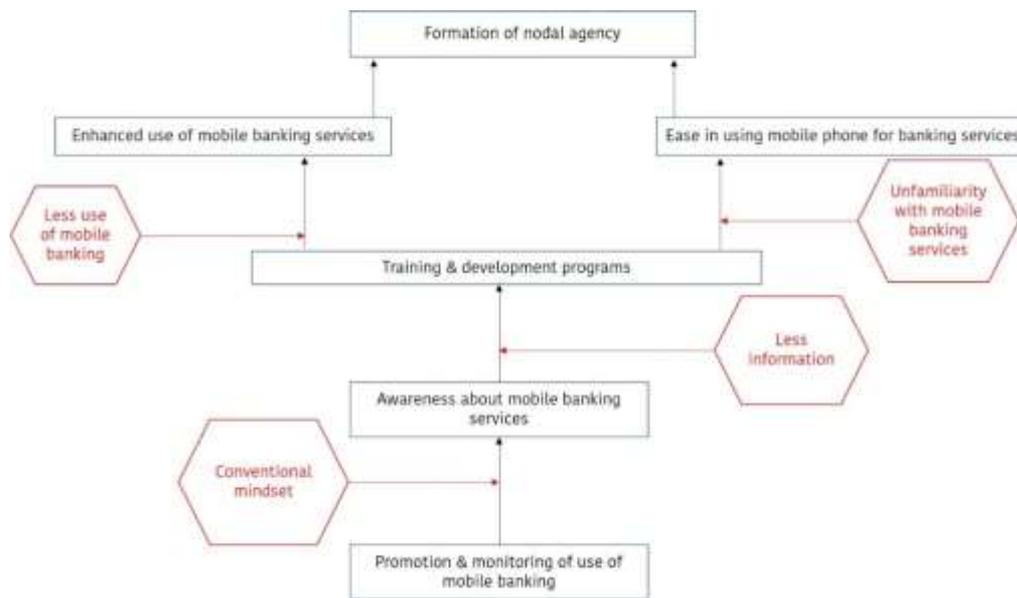
Figure 22 – Pre requisite tree

7.7 Transition Tree

The Transition Tree is the fifth and last tool of the Thinking Processes. Transition Tree is a step-by-step sequential depiction of how to implement the change.

Basically, the Transition Tree combines an entity of current reality, a statement of need and an action (injection) to create a new reality (expected effect). This basic structure is repeated from the lowest or farthest condition to change up to the closest to the objective on top of the Transition Tree. For communication purpose, a justification of the rationale is added to the expected effect to justify the next new need and level of change.

The following figure shows that how perception can be changed from mobile banking is difficult to use to mobile banking is ease to use.
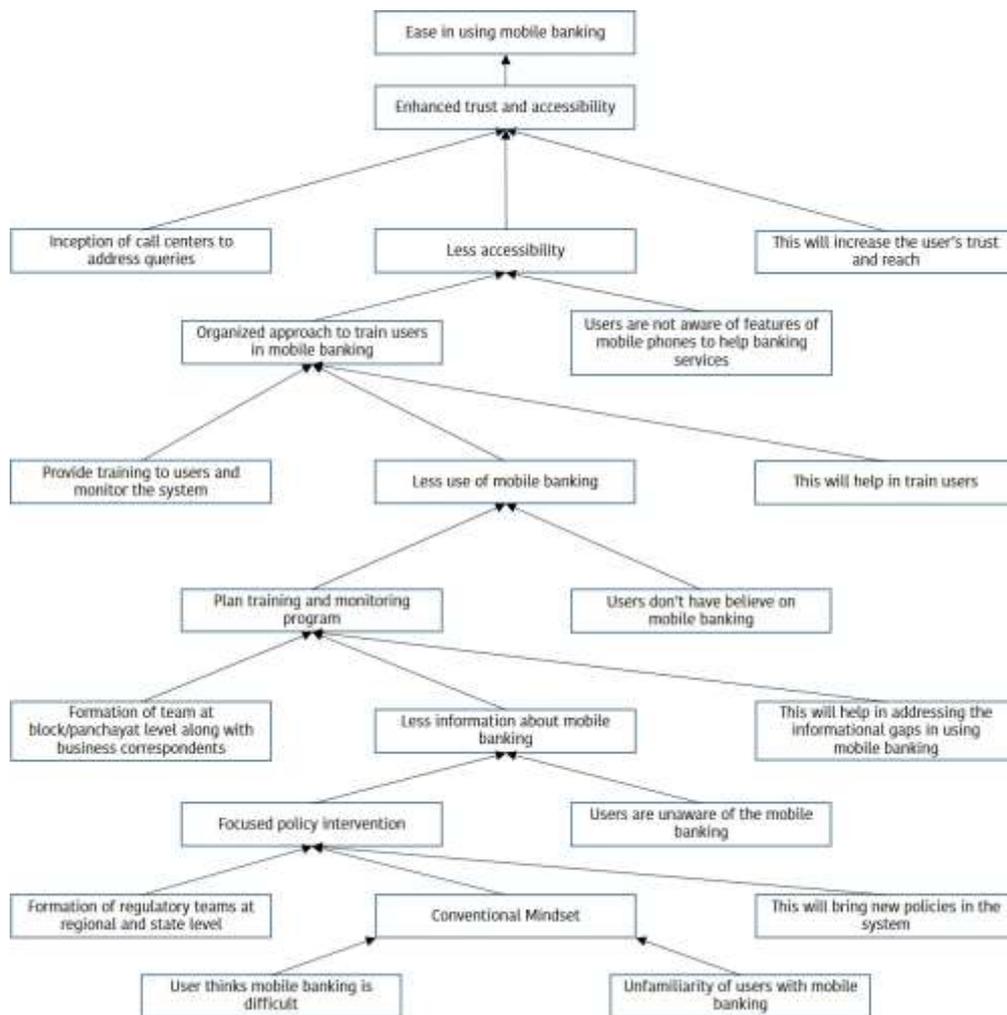
Figure 23 – Transition Tree

7.8 Interpretation of the results

- Eight undesirable effects (UDEs) were identified while developing CRT. These UDEs are responsible for low adoption of mobile banking. The UDEs were linked to each other by considering the cause-effects relationships among them using If-Then Analysis

- Conventional mindset of the stakeholders are the core impediment. The current situation that leads to inadequate adoption of mobile banking, the requirement to enhance the adoption became more obvious.

- Two ways to achieve the objective of ease of using mobile banking, were identified in the Evaporation cloud that were conflicting in nature. Therefore, only the most optimum way of appointing nodal agency was selected by the experts

- In the FRT, one of the undesirable effects i.e. focused policy intervention was treated using various injections. These injections are the broad actions required to mitigate the undesirable effect from the system.

- Six obstacles that can come into elimination process were identified and intermediate objectives to deal with these obstacles. These include conventional mindset, less information sharing, less use of mobile banking, and less users of mobile banking.

7.9 Findings

Following key strategies were identified using Thinking Process:

- Focused policy intervention by bringing in a nodal agency by RBI at regional level.

- A change management process must be initiated to deal the reluctance of the policy makers to alter the conventional planning process.

- Improve the skills of local business correspondents and block/panchayat officials to make them able to give training to the users.

- Providing training to users on mobile banking services servers both social and economic benefits to them.

- Enhancing the adoption of mobile banking will also help banks to engage users and provide them better services and bring them into the purview of financial inclusive customer base.

8   Conclusion

This chapter presents concluding remarks for the undertaken research. The chapter also highlights limitations of the study and paves the path for future scope of research. The chapter also covers theoretical and managerial implications of the research findings which would be useful in defining the contribution towards theory and field.

The research findings presented in a framework can be classified under two heads. Firstly, contribution towards existing body of knowledge and secondly towards practical aspects of the field. The contributions are standalone for both the sections and therefore, it is important to understand the implications in detail.

8.1   Theoretical Contribution

The study started with understanding the existing scenario of mobile banking in rural India and then specifically in MGNREGA. The results contributed towards testing the relationship between behavioral intention and usage of mobile banking for enhancing the financial inclusion. The research results drew variables from TAM and added fresh dimensions in the existing body of literature by including variables like government support, technical support and accessibility. The existing framework of TAM was also enhanced by studying the effect of demographic variables on the relationships along with the effect of stakeholders.

The study also added that "Less awareness" was a key variable which was found to be one of the prime barriers from field discussions. It is therefore proposed that "Awareness" which was a confounding variable in most of the early researches should be included in the modified version. This confirms that TAM although has been constantly been revised by various researches needs a bird eye view analysis in terms of explanatory variables. The integration of these extraneous variables has also proved that there is a need to checking the transitivity among the variables. It can be interpreted that external factors and trust are both theoretically significant in the framework and appealing as well. The results also add a fresh perspective to the concept of extended TAM.

The study is one of the few studies which integrate adoption of mobile banking in a public policy program to generate higher financial inclusion. The innovated topic also helps the existing literature towards interdisciplinary research. The study is one amongst the few studies which integrates the three dimensions of technology, finance and economics.

The research framework also splits the core constructs into sub parts and extends the relationship of Perceived Ease of Use and Perceived Usefulness with Behavioral Intention to actual usage of mobile banking.

AHP and Thinking Process of ToC gave a fresh perspective to the studies done for mobile banking diffusion and brought the policy intervention into the diffusion of technology.

8.2 Managerial Implications

The study aimed at analyzing the relationship between the key constructs of TAM and extends the relationship with intervening and confounding variables.

The results will not only benefit the existing literature but also impact the stakeholders involved in the process. The study, being interdisciplinary in nature leads to implications for stakeholders as well. The slow yet definite drift mobile banking under MGNREGA has been seen and covered in the study from the user's viewpoint.

The results indicate that stakeholders have not been contributing much in changing the decisions of the end user. An increase in interest of the users and the results indicate that MGNREGA officials need to be more pro-active in helping this change and diffusion of mobile banking.

The results also promote that the banks should provide services to citizens under MGNREGA in making the mobile banking much more user friendly. This will be further beneficial for banks and financial intermediaries as they are indirectly benefiting as diffusion of technology leads to solving their problem of financial inclusion.

The results also point out the role of perceived ease of use and perceived usefulness towards changing the behavior of users which is a matter of concern for service provider. The perception of the users seems to be the primary constructs which needs to be focused by strategy development by them. It is also important for the designers and developers of the mobile banking applications and services to understand the results and therefore design the applications which would be useful for enhancing the adoption of mobile banking at a much faster pace.

The results would also benefit the banks and post offices as they need to improve and restructure the business correspondents in order to increase the accessibility of mobile banking.

8.2.1 Limitations of Study

Although the findings of the study present degree and attributes of relationships between the key constructs, it also has a flip side of it which needs to be understood as well. The data collected was cross sectional in nature which could be changed to longitudinal in nature to understand the pattern of behavior of individuals towards changes with time.

The data was also collected in a Champawat district of Uttrakhand and therefore, the results cannot be generalized for other districts of the same state or other states. The data although was collected using questionnaire and focus group discussion, needs to be backed up by understanding the ethnography of the individuals.

The study also deals with one technology used and the diffusion of the same. The results may differ for diffusion of other technologies in MGNREGA. Therefore, generalizing the findings in this case would be challenge.

8.2.2 Future Scope of Research

The research gives a fresh dimension in understanding the relationship of constructs of mobile banking adoption. The research also adds a step more in the ladder and finds out relationship between behavior intention and usage of mobile banking for financial inclusion. This research paves a path for continuing such researches for other technologies as well which are being used in public policy programs or for enhancing financial inclusion in the country.

The study also forms a foundation for conducting research in understanding the role of stakeholders in enhancing the diffusion of mobile banking in rural areas which most of the frameworks do not talk about. The robustness of the model can be enhanced by using cultural enablers in the model. A similar framework

can be developed for other districts in a state and the results can be then generalized for a state and therefore for a country.

The study could also be used for studying the rate of diffusion of similar technologies which can lead to development of a theory or extension of a theory. Thus, it would be important to integrate similar studies to develop theory for studying the behavior patterns of users of technology.

Similar studies can be conducted in different districts which would help in making a comparative analysis in the results and therefore identifying common construct and successfully elevate them. The results can also be used for longitudinal study which would be useful for extended version of study is developing a different theory in future.

8.3   Conclusion

The study brought out the requirement of focused policy intervention in adoption of mobile banking in Champawat district, by bringing a nodal agency by RBI at regional level. A change management process must be initiated to deal the reluctance of the policy makers to alter the conventional planning process. In addition to this, it is very imperative that improvement in the skills of local business correspondents and block/panchayat officials to make them able to give training to the users.

Research on factors influencing user acceptance of mobile banking was stimulated by the advancement in information and communication technology (ICT), which was considered as one of the most fundamental forces for change in the financial services sector.

This includes the availability of mobile phones and similar technologies for public policy programs. Together with innovation in technology, ICT has transformed the ways in which personal financial services are designed and

delivered in public policy programs. Mobile banking allowed consumers to conduct a wide range of uses at any time of the day, anywhere, much faster, and in a cost-saving manner compared to traditional banking services offered at the bricks-and-mortar branches of banks.

It was important to understand why customers accept or reject new information systems and identify those factors that influence acceptance mobile banking. This research study intended to address this research issue by developing and testing a structural model.

The proposed framework in this study was based on the model of technology acceptance and relevant constructs. The model was tested by collecting data from the field using structured questionnaire and focused group discussions. The current study investigated the effect of user beliefs (i.e. PU and PEOU) and external variables (i.e. technological self-efficacy, trust, accessibility, subjective norm) on behavioral intention towards acceptance of mobile banking by extending the TAM, which provides a conceptual framework to explain individual's acceptance of an information system based on user perceptions.

TAM model postulates that individual's beliefs of ease of use and usefulness are primary determinants of acceptance of new information system technologies.

The present research proposed a conceptual causal model that incorporated trust as additional direct determinant of intention to use mobile banking, along with, the antecedents of user beliefs (i.e. PU and PEOU) to supply a better explanation and understanding of the factors influencing user acceptance of mobile banking for financial inclusion in rural areas.

The results of this research study provide empirical support for the extended model of the TAM. In this study, the beliefs about ease of use and usefulness

were observed to have significant impact on behavioral intentions towards acceptance of mobile banking under MGNREGA, revealing more than half of the total variance in the acceptance intention.

However, initially, beliefs about usefulness had a stronger effect on the intended use than the perceived ease of use beliefs. But while applying the AHP it came out that if perceived ease of use will be improved than usefulness would be enhanced simultaneously. The study was intended to draw strategies to enhance the adoption of mobile banking so that all the stakeholders (users, banks, business correspondents, post offices) can be benefitted.

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Annexure 1 – Questionnaire in Hindi

	दृढ़तापूर्वक सहमत	सहमत	थोड़ा सहमत हूँ	दुविधा	थोड़ा असहमत हूँ	असहमत	दृढ़तापूर्वक असहमत
Perceived Usefulness							
मोबाइल बैंकिंग लेनदेन को आसान बनाता है							
मोबाइल बैंकिंग बहुत प्रभावी होगी क्योंकि इसका उपयोग कहीं भी किया जा सकता है							
मोबाइल बैंकिंग मेरी उत्पादकता को बढ़ाता है क्योंकि यह बैंक में मेरे यात्रा खर्चों को बचाता है							
मोबाइल बैंकिंग उपयोगी होगी क्योंकि इससे मेरा समय बचेगा							
मोबाइल बैंकिंग तेज लेनदेन में मदद करता है							
Perceived Ease of Use							
मोबाइल बैंकिंग का उपयोग करना सीखना मेरे लिए आसान होगा							
मोबाइल बैंकिंग अधिक सुविधाओं तक पहुंच प्रदान करेगी							
मोबाइल बैंकिंग का उपयोग मेरे कौशल को बढ़ाता है							
मोबाइल बैंकिंग मुझे बैंकिंग सेवाओं का उपयोग करने में लचीलापन प्रदान करती है							

मोबाइल बैंकिंग मुझे अपने लेनदेन में स्पष्टता प्रदान करती है							
कुल मिलाकर मुझे मोबाइल बैंकिंग के जरिए लेनदेन करने में आसानी होती है							
Subjective Norm							
मैं दूसरों को मोबाइल बैंकिंग सिखाने में सहज महसूस करता हूं							
मेरे दोस्त सोचते हैं कि मुझे मोबाइल बैंकिंग का इस्तेमाल करना चाहिए							
मेरे पड़ोसी पसंद करेंगे कि मुझे मोबाइल बैंकिंग का इस्तेमाल करना चाहिए							
मेरा परिवार सोचता है कि मुझे मोबाइल बैंकिंग का इस्तेमाल करना चाहिए							
मैं दूसरों के साथ मोबाइल बैंकिंग के अनुभव को साझा करने में सहज महसूस करता हूं							
मेरे सहयोगियों को लगता है कि मुझे मोबाइल बैंकिंग का उपयोग करना चाहिए							
मोबाइल बैंकिंग का उपयोग करने के लिए मुझे मीडिया पर भरोसा है							

कुल मिलाकर, मैं मोबाइल बैंकिंग का उपयोग करने के लिए समाज के बाद सहज महसूस करता हूं						
Technology Self Efficacy						
मैं अपने दम पर मोबाइल बैंकिंग के उपयोग को सीखने में सहज महसूस करता हूं						
मैं अपने साथियों से मोबाइल बैंकिंग के लिए सीखने में सहज महसूस करता हूं						
मैंने पहली बार मोबाइल बैंकिंग का उपयोग करने में सहज महसूस किया						
मैं संदर्भ पुस्तिका का उपयोग करके मोबाइल बैंकिंग का उपयोग करने में सहज महसूस करता हूं						
कुल मिलाकर, मैं मोबाइल बैंकिंग का उपयोग करते हुए लेनदेन करते हुए सहज महसूस करता हूं						
Accessibility						
मेरे पास मोबाइल बैंकिंग की सुविधाओं के लिए अप्रतिबंधित पहुंच है						
मेरे पास मोबाइल बैंकिंग का उपयोग करके सुलभ और विविध प्रकार की सुविधाएँ उपलब्ध हैं						

Trust						
मेरे पैसे को मोबाइल बैंकिंग का उपयोग करके सुरक्षित रूप से स्थानांतरित किया जाता है						
मैंने मोबाइल बैंकिंग का उपयोग करते समय कभी किसी धोखाधड़ी का सामना नहीं किया						
Government Support						
सरकार वित्तीय लेनदेन के लिए मोबाइल बैंकिंग के उपयोग को बढ़ावा देती है						
सरकार मोबाइल बैंकिंग सक्षम करने के लिए सुविधाएं स्थापित करने में सक्रिय है						
Technical Support						
मोबाइल बैंकिंग पर वित्तीय लेनदेन करने के लिए उपयुक्त नेटवर्क उपलब्ध है						
प्रश्नों को हल करने के लिए प्रभावी ग्राहक सेवा उपलब्ध है						
Behavioral Intention						
मैं अपने साथियों को मोबाइल बैंकिंग की सलाह देता हूं						
मैं मोबाइल बैंकिंग का उपयोग जारी रखूंगा						
मैं मोबाइल बैंकिंग का उपयोग अक्सर						

और विभिन्न उपयोगों के लिए करता हूं						
मैं भविष्य में भी मोबाइल बैंकिंग का उपयोग करने में सहज हूं						
मैं लगातार मोबाइल बैंकिंग का उपयोग करता हूं						
Actual Usage of Mobile Banking						
मैं वित्तीय लेनदेन करने के लिए मोबाइल बैंकिंग का उपयोग करने के लिए प्रेरित महसूस करता हूं						
मैं अन्य तकनीकों पर वित्तीय लेनदेन करने के लिए मोबाइल बैंकिंग का उपयोग करना पसंद करता हूं						
मैं वित्तीय लेनदेन करने के लिए मोबाइल बैंकिंग का उपयोग करने में कुशल हूं						
मैं अपने मनरेगा वेतन की जांच के लिए मोबाइल बैंकिंग का उपयोग करता हूं						
मैं अपने प्रियजनों को पैसे भेजने के लिए मोबाइल बैंकिंग का उपयोग करता हूं						
मैं तीसरे पक्ष के लेनदेन करने के लिए मोबाइल बैंकिंग का उपयोग करता हूं						
मैं भविष्य में वित्तीय लेनदेन						

करने के लिए मोबाइल बैंकिंग के उपयोग की आवृत्ति बढ़ाऊंगा						

Annexure 2 – Questionnaire in English

	Strongly Agree	Agree	More or less agree	Undecided	More or less disagree	Disagree	Strongly Disagree
Perceived Usefulness							
Mobile banking eases the transactions							
Mobile banking would be very effective as it can be used anywhere							
Mobile banking enhances my productivity as it saves my travelling expenses to the bank							
Mobile banking would be useful as it would save my time							
Mobile banking helps in quick transactions							
Perceived Ease of Use							
Learning to use mobile banking would be easy for me							
Mobile banking will provide access to more facilities							
Using mobile banking enhances my skillset							
Mobile banking provides me							

flexibility in using banking services						
Mobile banking provides me clarity in my transactions						
Overall I feel ease in doing transactions through mobile banking						
Subjective Norm						
I feel comfortable in teaching mobile banking to others						
My friends think that I should use mobile banking						
My neighbors would prefer that I should use mobile banking						
My family think that I should use mobile banking						
I feel comfortable in sharing experience of mobile banking with others						
My colleagues think I should use mobile banking						
I trust media to use mobile banking						
Overall, I feel comfortable following society to use mobile banking						
Technology Self Efficacy						
I feel comfortable learning mobile banking usage on my own						

I feel comfortable learning usage of mobile banking from my peers						
I felt comfortable in using mobile banking for the first time						
I feel comfortable in using mobile banking using reference manual						
Overall, I feel comfortable while performing transactions using mobile banking						
Accessibility						
I have an unrestricted access to the features of mobile banking						
I have an easy and variety of features accessible using mobile banking						
Trust						
My money is securely transferred using a mobile banking						
I have never encountered any fraud while using mobile banking						
Government Support						
The government promotes the use of mobile banking for the financial transactions						

The government is active in setting up the facilities to enable mobile banking						
Technical Support						
Suitable network is available to perform financial transactions over mobile banking						
Effective customer care is available to resolve queries						
Behavioral Intention						
I recommend mobile banking to my peers						
I will continue using mobile banking						
I use mobile banking quite often and for various usage						
I am comfortable using mobile banking even in future						
I consistently use mobile banking						
Actual Usage of Mobile Banking						
I feel motivated using mobile banking for performing financial transactions						
I prefer using mobile banking to perform financial transactions over other technologies						

I am proficient in using mobile banking for performing financial transactions						
I use mobile banking to check my MGNREGA salary						
I use mobile banking to send money to my loved ones						
I use mobile banking to perform third party transactions						
I would increase the frequency of usage of mobile banking for performing financial transactions in future						

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