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Feasibility of m-governance in agriculture: insights from a multimodal study in rural India

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Abstract

Purpose – The paper explores the importance of mobile technology to enable diffusion of agriculture-related knowledge among farmers in India. The purpose of the paper is to evaluate the current socio-economic factors and challenges that impact the feasibility of m-governance project. The authors intend to explore different behavioral aspects of farmers, specifically their information seeking behavior to understand their communication ecosystem.

Design/methodology/approach – The authors have used multiple methods to analyze the significance of m-governance in current social dynamics. To achieve in depth understanding of farmer's attitudes and opinion, the authors have conducted semi-structured interviews with farmers. The authors have also applied experimental observations to evaluate the actual effectiveness of information dissemination and the social dynamics behind the process. The secondary/archival data was also collected from the government offices and non-governmental organizations.

Findings – Findings explore the pattern of mobile usage among the farmers which could lead to interesting implications for the design and implementation of future m-governance projects. The research has also drawn some interesting implication on the feasibility of m-governance project.

Research limitations/implications – Because the findings are co-related with the prevalent socio-cultural dynamics, testing the findings in different context might add value to the proposed theory and its implications.

Originality/value – Considering the need and significance of agriculture-based reforms in rural India, present study offers guidance in devising an efficient communication medium among farmers and government. The authors infer from our field observations that the communication platform is vital for successfully reaching farmers for their overall welfare. The present work is based on findings which are drawn from the ground reality which helps in explicating inferences which are useful for implementation purpose.

Keywords Agriculture reforms, m-governance, Rural India

Paper type Research paper



Introduction

The role of agriculture in economic development has long been recognized. In developing countries such as India, growth in agriculture and agriculture-related sectors contribute significantly to the economic health of the country (Gov, 2013). Share of agriculture is recorded as 17.2 per cent in national gross domestic product in year 2014 (Mospi, 2014). However, agriculture sector possess capability of extending its horizon by improved productivity and quality of produce. Literature also suggests that developing countries such as India are facing a number of challenges in improving their agricultural productivity. Agricultural markets are inefficient and there are much higher transaction costs for information access and utilization (Jensen, 2010). Good governance is one of the major obstacles in meeting the objectives of information symmetry and equitable access to the resources. To improve the agricultural efficiency, government of many countries are devising strategies to enable an efficient governance system which empower the farmers to get appropriate value of their produce, as well as to improve their production efficiency (Sharma *et al.*, 2005). However, the communication gap between the government and the farmers is major hurdle in achieving growth-related goals. In an exhaustive report on current state of agriculture in the past fiscal year, government of India has highlighted the importance of intensive research and technology transfer as one of the prominent area of reform. The ministry of agriculture report (MoA, 2014) quotes:

[...] to enhance productivity, easy and reliable access to inputs such as quality seeds, fertilizers, pesticides, access to suitable technology tailored for specific needs, the presence of support infrastructure and innovative marketing systems is required.

The report asserts the need of an effective communication channel which will ensure a better knowledge transfer to the farmers. Literature also emphasize on transfer of research outputs and knowledge resources to the economically constrained areas (Juma *et al.*, 2001). At present, India is facing a two-way challenge of feeding a growing population and ensuring inclusivity of farmers by improving their income and social status. With only 2.4 per cent of world's geographical area, India has to feed 17 per cent of the world's population (MoA, 2014). Thus, India is focusing on improving output per hectare of land and encouraging use of high yielding crop variety. Because of existing information asymmetry, information such as welfare policies and programs are still unreached to the farmers. Illiteracy in rural regions is also one of the primary hurdles in achieving communication with the farmers. Technological advances related to farming are limited to the research centers and government is facing challenges in enabling their adoption in real world. Similar to other countries where agriculture is one of the major occupations, apart from objectives such as increased production, concerns such as preserving the natural resources, such as soil and water are equally vital. To promote natural resources conservation, much of the effort has been made in devising tools and techniques for sustainable agriculture. However, in addition to the research advances in the sustainable growth, it is essential to communicate the idea of sustainable agriculture so that farmers can be educated to efficiently employ the available natural resources. So finding an efficient and effective communication medium to connect to the farmers is a pertinent problem and such communication mediums will offer multifold advantages.

In the recent studies, one of the technologies driven solution for enabling government-citizen communication is electronic governance (e-governance) (Heeks

et al., 2007; Venkatesh *et al.*, 2014). E-governance refers the usage of information technology (IT) such as the internet and mobile networks to enable the citizens to achieve an efficient access to information regarding government policies, processes and welfare services (Campeau and Higgins, 1995). The phenomenon of using information and communication technology (ICT) and tools to enable governance and establish public communication is observed in both developing and developed countries (Moon *et al.*, 2005). Recent trends involve usage of these ICT tools in agricultural value chain. Web portals are now maintained and managed by different corporate houses to interact with the farmers and producers directly for purchase deals. Indian Tobacco company's (ITC's) much coveted project e-choupal (www.echoupal.com) is an example of the corporate-farmers' communication platform established to offer information and services to the farmers. Apart from lowering information asymmetry, ICT has also been used to achieve better efficiency in produce acquisitions by decreasing intermediary and middle man's cost.

ICT is now being used by government also to provide various kinds of information and services over internet and mobile phones (West, 2004). Various successful e-governance implementations are evidence of increasing use of ICT for government services. One of them is agriculture extension programs, which refers to the "delivery of information inputs to farmers" and is a form of education that introduces new knowledge and technology to the farmers. Despite such initiatives, there are various problems that need to be addressed to ensure successful implementation of government services using ICT (Alathur *et al.*, 2014). To offer solution to adoption and implementation related challenges, there is a widespread theoretical and empirical literature attempting to identify the determinants of agricultural technology adoption in different contexts (Tenheunen, 2008; Ntaliani *et al.*, 2008; Aker, 2011). One of the identified hurdles in promoting information services using various technologies is mental un-willingness to accept and use these technologies. The low rates of adoption of agricultural centered Information technologies in developing countries have been well-documented and have become a significant concern (Venkatesh *et al.*, 2013). Apart from psychological inhibitions, low literacy rate and low awareness of ICT also leads to successful implementation. The number of computing devices and the internet literacy is very low in rural India. This is one of the significant causes of smaller level of adoption of e-governance projects. However, the high penetration of mobile devices and increasing mobile telephony subscriptions can be exploited to inform and interact with the rural masses through mobile devices. Thus, in the present study, we are focusing on m-governance projects because we believe that it is one of the largest occupational groups in India; the farmers can be largely benefitted by the successful implementation and adoption of m-governance projects.

To provide farmers with special and targeted services, it is necessary to discover their information needs from their information seeking behaviors and mental states and to understand the inner and external barriers they face to access information. Despite recent studies in the m-governance domain, we believe that a context specific study in India will provide useful insights for not only the practitioners but also the future research. Literature provides ample evidence that developing economies such as India possesses a unique socio-cultural setting which requires a different approach for ICT implementation as compared to developed economies. Thus, findings from the developed countries might not be fully usable in the Indian context (Venkatesh *et al.*,

2010, 2012). This study aims to fulfil two objectives. First, the study attempts to explore the feasibility of m-governance projects in achieving an efficient communication channel between government and rural citizens. The study determines that whether m-governance framework is appropriate to fulfil the stated need for information seeking among Indian farmers through providing an optimum government–citizen communication platform. Second, based on the findings it prescribes a step wise process which can serve as a guideline while designing and implementing m-governance projects.

M-Governance: an overview

M-governance refers to the use of mobile and wireless communication technologies within government administration and its delivery of information and services to citizens and businesses. It is a subset of e-governance comprising an alternative provisioning channel. Mobile phones and portable devices as a communication medium can be used as a very strong tool in implementing governance services and farmers' assistance program (Mengistu *et al.*, 2009). In the present work, our focus is to explore and understand the m-governance phenomenon from the end users' perspectives. In fact, the entire literature on ICT-based governance can be either classified into a supply side theory generation or a demand side theory generation (Lim *et al.*, 2012). Supply side theorist deals with phenomenon related with government side decisions and actions. On the other hand, demand side research work deals with actions and behavior displayed at the users (citizens) end. The present work borrows from the demand side literature and attempts to contribute to the existing literature by exploring behavior and intentions of prospective users of m-governance projects. In the next subsections, we will elaborate on the theoretical background for the present study. The next section explores the feasibility of using mobile phone as a technology medium for ICT-based governance projects.

Exploiting presence of mobile phones for enhanced governance

As per the latest census in India, number of mobile phones subscriber is rising exponentially. The rural penetration of mobile phones is also phenomenal[1] and has reached to about 378 million users (TRAI, 2014). This fact can be exploited to use mobiles as a medium of communication with agricultural workers and farmers (Ntaliani *et al.*, 2008). The network infrastructure can be used to create a platform where information can be disseminated to farmers and that platform can be a connecting medium for researchers, farmers and government. This ecosystem can be sustained to improve both productivity and quality of the agricultural produce. It is also essential that academic and experimental researches are promoted. However, research initiatives can only be termed as successful if government is able to reduce the large gap between the outcomes of agricultural researches and its potential targets.

The rapid growth of mobile phones in developing countries over the past decade has introduced a new search technology that offers several advantages over other alternatives in terms of cost, geographic coverage and ease of use. These advantages can be exploited to fetch various benefits. These benefits can be both economical and sociological. To assess the current status of m-governance implementation we collated all the m-governance projects successfully operating across India (Table I). We found that many state governments achieved moderate to good success while

Table I.
Existing m-
governance projects
implemented by
various states in
India^a

m-Governance initiative	Description	State of operation
Dr SMS	m-Health information system for providing health-related medical advice to the residents	Kerala
e-SMS	Issuing alerts for receipt of government applications and complaints/status tracking	Goa
m-Governance service	Traffic management system managed through mobile alerts and applications	Maharashtra
Greater Hyderabad Municipal Corporation	A mobile phone-based intelligent garbage monitoring system enables sanitary supervisors to report the status of cleaning of garbage bins through their GPS-enabled mobile phones	Andhra Pradesh
MMPL	The service allows residents to pay for electricity bills, property tax, water bill, traffic challan, etc.	Karnataka
Mobile seva	One-stop ecosystem for enabling the delivery of various electronic government services through mobile devices	Central government

Note: ^aSourced from the respective websites of state government

using mobile communication as a medium to reach out to citizens for governance-related issues. There was very broad range of governance areas that were covered in various m-governance projects ranging from a health system to garbage disposal system. In the present study, we are analyzing and evaluating the possibility of deployment of m-governance projects which are useful to farmers. In the next section, we are summarizing the possible avenues of application for devising m-governance projects in agriculture domain.

Indian agriculture sector: challenges and opportunities

Information arbitrage and efficiency. Increasing subscription of mobile phones can ensure wider span of communication. Cost of communication can also be brought down at a considerable level by using mobile phones. It also offers spreading private information to end users – farmers.

The disadvantages of information asymmetry and resulting arbitrage can be minimized for the welfare of the farmers. This arbitrage can be controlled by disseminating relevant information (related to crop, policies, price, minimum support prices[2]) across farmers. The possibility of eliminating intermediaries in the supply chain or “cutting out the middleman” is among the most often cited anecdotal examples of the potential gains to mobile phones for the farmers (Eggleston *et al.*, 2002).

The increasing mobile usage can be exploited to decrease information asymmetry between farmers and the government/public sector ventures (such as R&D setups, government regulated mandis, etc). It reduces the search cost considerably. We observed that in the current scenario, information is obtained by personal visits, peer-to-peer conversations and sometimes by radio and newspaper. There are a few reasons why information could lead to farmers receiving a higher price for their output. First, by lowering search costs, phones may reduce the market power of traders. Another additional net gain to highlight is reduced price variability due to efficient information dissemination.

Socio-cultural and contextual challenges. Research suggests that socio cultural and economical setting of developing economies creates impediments in the implementation of technology-based governance programs (Kumar and Best, 2006; Venkatesh *et al.*, 2014). Despite significant benefits, m-governance project faces obstacle such as scalability and sustainability. The agriculture extension programs and m-governance programs are difficult to scale because of geographical distribution of target farmers. India is a resource diverse country and because of different geographical conditions, crops and farming techniques are different in different regions. Diversity is also very evident in the case of prevalent culture and usage of vernacular language. The information required has to be customized for small scale groups of farmers that will add up to the cost of these programs, particularly in a condition where interaction with the target farmers requires use of vernacular languages. Deep-rooted traditions and rich experience in one production activity make the learning and dissemination of new technology difficult, especially when the farmers possess low levels of education and rely strongly on skills passed down from generation to generation (Winkler *et al.*, 2011).

Implementation of m-governance projects also need to oversee policy implications regarding public information. Privacy policies regarding what kind of information can be shared through public platforms should be assessed (Bélanger and Hiller, 2006). The adoption and acceptance of technology also depends on different elements of prevailing socio cultural fiber. Present study attempts to understand the socio-cultural and behavioral dynamics which might affect various dimensions of m-governance implementation.

Research objective

The present study aims to explore multi-dimensional phenomenon of inducting m-governance projects for agriculture growth in India. The literature review conducted for the present study has provided us with sufficient reasoning that m-governance projects can lead to improved growth in agriculture sector. In order to achieve this objective, present work attempts to:

- understand the utility of m-governance in current socio-economic conditions prevailing in rural India;
- identify factors that plays a role in determining possible success of m-governance projects in rural India; and
- understand the social dynamics involved in adopting and implementing m-governance projects.

For the objective, we have selected individuals with agriculture as a profession to understand multiple dimensions of farming practices in rural India. We will focus on extracting challenges faced by the farmers which can be addressed using m-governance projects. Based on our findings we will provide recommendations for conceptualizing and designing m-governance projects relevant to rural India.

Method

Our research design is based on multi method approach to ensure data validation and improve robustness of findings. Literature suggests that using multiple methods and data sources fosters theory building and offers integrative perspectives which will not be possible for any one approach in isolation (Ågerfalk, 2013; Walsh, 2015). We believe

that to explore the phenomenon under study, we needed a more personalized approach, where we can engage and involve our respondents in our interactions. Thus, personal interviews and experimental observation was used as data collection methods which allowed us to understand their perspective without burdening them to provide the data. Experimental observation allowed us to gain in depth insights about their attitudes and dispositions which might not be discernible through formal conversations. We also collected archival data about existing policies and their effectiveness from the government offices and the Gram Pradhans (heads of the village). Figure 1 illustrates the multiple methods employed for the present study.

Method 1: interviews of farmers

Semi-structured interviews were used to collect responses from the respondents. Questions were framed around various key areas like how they make crop-related decisions, what all are the sources from where they acquire information and resolve their queries and what are their trustworthy sources of information. Few open-ended questions were also asked to understand various issues they consider relevant and explore their perceptions and beliefs. Data are analyzed using constant comparison method (Glaser and Strauss, 1967; Pratt et al., 2006; Ladge et al., 2012). We have built data categories by coding similar expressions and opinions in groups and keep adding details till no new category is emerging from the data. The data collection and analysis are concluded at the point of theoretical saturation when further data were not adding new dimension to our data categories. Based on the observations and data categories, we have phrased our propositions. These propositions can be seen as central findings of our study, and they provide an abstracted view of the proposed theory. Our propositions thus intend to highlight the phenomenon under study by identifying the core constructs and their underlying relationship.

Sample description

We will start by describing the location and context of the present research. It will help in understanding the processes and behavioral dynamics observed and explained in our findings. We conducted our research in three villages in the western part of Uttar

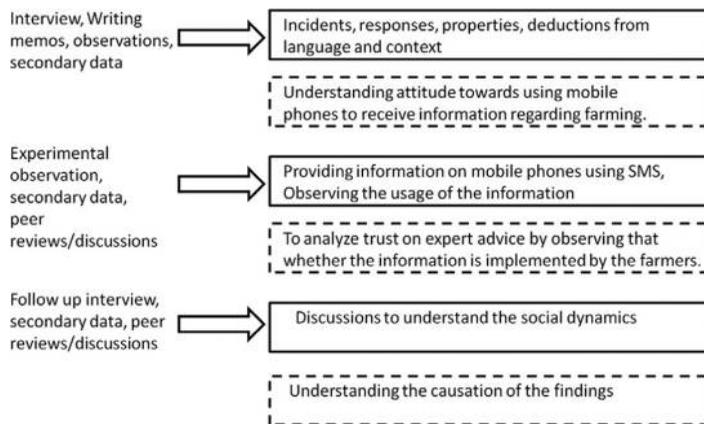


Figure 1.
Illustration of research methods used

Pradesh in India. We selected these villages as they represent average socio economic statistics of a typical village in western Uttar Pradesh. These villages were multi-caste villages with approximate sum of 1,800 inhabitants (census obtained from Gram Pradhans[3]). Source of income for most of the inhabitants was farming. The primary crops were wheat, potato, pulses and vegetable farming. Caste system was observed to be prevailing in all the three villages and majority of land owners belong to higher castes. The scheduled caste inhabitants own a very small fraction of total land and they earn their livelihood by working for landowners in their farms. A small section of these inhabitants travelled to the nearest city for their daily wages. We observed that not many were cash rich, and most of the household were maintaining a very low-end lifestyle, which means meeting their basic needs only. Electricity cuts are very frequent so usage of electrical appliances was scarce. The appliances that were seen in most household were television sets, radio and CD players and mobile phones. We found at least one mobile handset in many household and more than one in few cases. During data collection, we discovered that the first mobile set came in the village in the year of 2000. Since then, the mobile users have increased significantly. One of the respondents while narrating the earlier days of mobile adoption told us that in initial days, mobile network was a great problem and sometimes people use to climb on their house roofs to talk on phone. However, to attract huge population base of rural Indian, telecom companies have worked proactively to improve network infrastructure in rural locations. In the present time, mobile network has improved significantly, mobile SIM cards and recharges are available in their nearest locations which has added to the convenience of using mobile phone services.

Interview protocol

One of the two authors has conducted each interview. Each interview lasted for 45-60 min. The interview questions were designed in semi-structured manner. There were multiple meetings with the respondents thus there were many follow up interviews. We decided to keep the interview duration for 45-60 min because we observed that long interviews were making the respondent tired and their responses were influenced by their mental fatigue. The language for conducting of interview was vernacular Hindi as the respondents were well versed in the usage. The interviews were transcribed within 24 h of interview conduction. The interviews were then translated into English for the data analysis and presentation purpose. The translation was verified by two independent individuals who were well versed with both the languages.

Our interviews aimed to explore basic themes through three sets of questions capturing the multi-dimensional aspect of the phenomenon. The first set of questions aimed at understanding the farming process. To understand their views and thoughts about the government support, we also asked opinion-oriented questions such as what do you think about the support extended by government to help you in your farming and what kind of support you expect from the government?

The second and third sets of questions were centered to:

- obtain knowledge on their understanding of existing policies and benefits;
- understand the process of information gathering for farming process; and
- understanding the pattern of usage of mobile devices.

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All these responses helped us to observe and understand their feelings, expectations, views and grievances.

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We took prior appointment to confirm our meetings with the respondents. We also conveyed them that the responses are for the sole purpose of our study and will not be shared elsewhere. We also ensure the anonymity of the respondents. They were told that if they wish they can stop answering any question or stop the interview process. However, we experienced good level of co-operation and hospitality while we visited their households. After interviewing 45 farmers, we were able to achieve theoretical saturation. Total numbers of interviews conducted was 67 because there were multiple meetings with the respondents. All the respondents of the present study were male within the age brackets of 24-56.

Method 2: experimental observation

We have also used experimental observation method to understand the social dynamics of information sharing and adoption. This cycle starts with the creation of useful and relevant information which is followed by information dissemination through various communication mediums and in the last stage information is utilized and adopted by the bearer. In the present study, we are focusing on information dissemination and its adoption by the farmers. It is essential to understand that what factors lead to or influence the information adoption because the benefits from acquiring any information can only be realized by its utilization in the relevant context. To understand this process, we conducted a small experiment with a subset group of respondents. Major objectives of experimental observation were to triangulate the findings from the interview data and also to understand different aspects of the phenomenon. To observe the daily reality, experimental observation is believed to be an appropriate lens. The experiment design was longitudinal, where observations were made in two time waves. The total time period for the observation recording was eight months. At the start point, we choose a group of farmers and disseminate crop-related information which was sourced from experts and government authorized centers. The stimulus was given over a week where information pamphlets were distributed which carried information regarding seed selection, choice of pesticide and their usage instructions. Information such as how to find how much fertilizer and pesticide is required for soil based on some simple tests and observation was provided. We also conducted both one on one and group interaction sessions for their feedback and queries. The first wave of observation was organized at the time of farm preparation and seed selection as we observed that most procedural decisions regarding the crop are taken at that time. The responses were recorded against each name and their displayed behavior was noted. The second wave of observation occurred at the time of harvesting. In this wave, we gathered information regarding their overall practices and their opinion about the harvest. Through this design, we were able to capture the responses of all categories of farmers, ones who followed the suggested practices and the farmers who decided based on their own experiences. We also collected responses from a control group which was formed in another village to control permeability of disseminated information among experimental groups and control group. We observed the extent to which the shared information was utilized in their farming practices. The objective of the experimental observation was to observe the sources of information on which our farmers rely to

make crop-related decisions. We will discuss the findings of the experimental observation in next section.

Findings

Archival data

We have also collected and analyzed archival data related to our study. The main sources of archival data were public information provided through state and central government websites, organizations such as Gramin bank[4] and Kisan call centers. To gain understanding of operative e-governance and mobile governance projects of the state (Uttar Pradesh), we visited websites and portals created by ministry of agriculture at both state and central level. We observed some intriguing findings. The official website of department of agriculture, Uttar Pradesh government offers some information of different schemes available to farmers. However, all those link are connected to empty web pages which do not provide any information. Some useful links such as “kis maah mai kya kare” (Month wise to-do list for farmers) and “Pest and crop disease control” are linked to empty web pages and does not fetch any useful information (Appendix). We recommend that considering the need of improvement in the state of Indian farmers is imperative to work rigorously to include them into the main stream. It is essential that farmers are made aware of various welfare schemes so that their social and financial status can be improved.

Interviews of farmers

Information seeking behavior. In our data collection process, we focused on understanding their views and opinions about the current methods of farming, their perceived needs and existing expectations. We observed that most of the respondents were engaged in traditional[5] ways of farming. On asking that whether they want to use the advanced machines and techniques, we received diverse responses. One set of the farmers were vaguely aware of the available options, and they did not show enough venture to reach out to the available resources and information:

We are doing the best possible. We buy good seeds and we work hard. If we will go for better methods it will cost us so eventually we will not be getting any better. I don't know what improvements can be given [...] in our village even in villages around there is facility or support. We can't run kilometres for our queries. We cannot learn it on our own and there is no assistance provided at our door step. We do not have so much spare money also.

The narrative asserts that farmers have a very poor access to government run facilities and benefit programs. Their productivity suffers because of their traditional methods of farming and a high degree of self-reliance. Dissemination of knowledge regarding better methods and low-cost solution can lead to improved productivity and informed farmers. These responses also indicated that there exist a need of a robust platform which can enable information and assistance to be shared with them with convenience. The mobile-governance platform can create a better medium for this kind of communication.

Another set acknowledged the better options available but shared the difficulties in machine up gradation and improving their methods. The reasons for the non-implementation were observed to be inertia, lack of resources and fund and sense of uncertainty.

P1. The farmers acknowledged the need of knowing more about research and technological advances in the farming and crop cultivation

We found that the problems and queries regarding farming are mostly solved within the boundaries of the village, often within the parameter of few houses. The farmers who were able to produce well became the reference point and most of their peer follows them. They consulted their peers while deciding on what crop to cultivate, where to buy seeds and fertilizers, when and how to use fertilizers, when to sell and where to sell; all these questions were discussed among farmers. We observed a very interesting group dynamics working in these villages:

[...]they (referring to the neighbour) cultivate around 60 acres of land for the potato crop alone, last year they got very good price as they used superior quality seed, one which produces bigger size potatoes, ones which are used in chips and wafer making [...] you get good price if you pick good seed. This time I am also using the same seed in my farms [...]. I am hoping for a better produce this year [...].

We found that there are some opinion leaders who were followed by other farmers regarding crop-related decisions. There are some specific characteristics of these opinion leaders:

- opinion leaders mostly are relatively educated;
- they played an important role in village politics;
- they usually belong to affluent family, that often meant they farm a bigger piece of land; and
- they visited the nearest city more frequently so many times they are source of information.

When we discussed the opportunities for getting expert advice and counselling available through government agencies, most of the farmers shared their ignorance and dismissed the idea of visiting the authorized offices and centers:

[...]all these counselling centres and all for good for papers and records [...]. In real world we work on the basis of our own experiences and learning, we work in the field we learn from our mistakes and even our colleagues' mistakes [...] that's the way we decide what is good or bad for us.

These narratives also indicate the need of trust establishment on government initiatives. These shared views indicate that their own experiences and their peers' advice are trusted and valued by the farmers.

P2. The farmers prefer approaching their peers to resolve queries and obtain advices.

The farmers are concerned with collecting information about many aspects of farming. Most significant and sought after information and suggestions are related to the type of seeds, quantity of fertilizers, kind of pesticides and appropriate time to watering and fertilizing. The most relied upon source of information was their self experiences accumulated over years. However, there were some examples where they have to resort to external sources of information. For instance, a new disease of the crop would be addressed by consulting with their peer farmers or their trusted vendor/seller of

pesticides and medicines. As one of the respondent shared in most cases, they possess the required skill to grow a reasonable produce:

We are doing farming since our childhood, we have lots of experience. We have seen so many circumstances, years when rain down pour was not well or years when prices fell to rock bottom. This is our ancestral skill set and it passes down to new generations. We ask our vendor if we have any confusion, he is providing us with seeds and fertilizers since more than a decade [...] these people also accumulate knowledge. They buy all their stock in bulk [...] they know what will sell [...].

P3. Farmers exhibited trust on vendors for acquiring information on usage of agriculture related products (such as seeds, pesticide and fertilizers)

We collated the currently running and relevant list of schemes and programs running by both state and national government. We have shortlisted the schemes and programs which were found to be relevant to the respondents and the geographic location of the research (western UP). We went to the respondents with some cue cards which mentions and describe briefly the current policies and schemes running in the area by both state and central government. The results indicated lower level of awareness among the respondents. In the [Table II](#) we have collated the percentage of respondents who acknowledged the awareness about a particular policy.

Another interesting dimension was lower level of pro-activeness among farmers to collect relevant information about the benefits available to them. The farmers do not initiate the contact process with agriculture research centers, despite expressing interest in knowing the current advances. This finding raises concern about the effectiveness and reach of numerous schemes and benefits running for these farmers.

P4. Awareness regarding the current benefits and policies run by the government is very low among majority of the respondents

Pattern of mobile devices usage

We analyzed mobile device usage through three important dimensions. First, we noted the presence of mobile devices to understand the level of penetration. Second, we observed common usage pattern among mobile device users such as the features of

Various schemes run by national and state-level government	Awareness of these schemes recorded for the respondents (in %)	
Subsidy on high quality and hybrid seeds	2	
Quality control of fertilizers and seeds	14	
Pest control and vegetation protection	32	
Commercial crop development programs for jute, cotton and maize	7	
Crop insurance	4	
Kisan credit card	89	
Soil and water conservation	16	
Kisan call centers	34	
National agriculture insurance scheme	12	
National project for development of organic farming	2	
Development of bio fertilizers	23	

Table II.
Distribution of respondents on the basis of their awareness of prevailing government welfare schemes and programs

mobile device accessed. Lastly, the purpose of usage of mobile devices was explored to understand the objectives behind using mobile devices.

While examining the penetration level of mobile devices, we found that mobiles are rapidly becoming part of every household. Our respondents shared with us that in recent times mobile devices are replacing the landline connections. There were many cases where more than one mobile device was found in one household. Multiple users used one mobile device and sometimes a single mobile device is shared across households.

We also evaluated the extent of usage of mobile devices and its different features. For instance, address book accessing. We found that many respondents were not able to use “contacts” feature of mobile device and they maintained a physical phone book or a small notebook to keep record of their phone contact details. Whenever they wanted to reach someone, they will refer their notebooks for the contact detail and then dial the destination number through their mobile device. This was an intriguing observation because it demonstrates the ease of use factor of mobile devices adoption. It also indicates technology related inhibition among the farmers which lead to selective adoption of mobile technology. However, we found young respondents to be more adoptive of new and complex features of mobile devices as compared to older respondents which conform to the earlier findings of mobile devices adoption (Hong and Tam, 2006):

I am using a mobile phone since last two years [...] it is very convenient to keep a mobile device to communicate [...]. I have explored much of the functions of the device, I use it only to make and receive calls [...] you know but my son who is just 15 years old is better than me in handling this device [...] sometimes he changes some settings and I keep wondering how to undo that [...].

We also found that voice based services were preferred among our respondents. Development of interactive voice system based on their information need can be a strong platform to disseminate information and resolve their queries. A formal assistance can be provided to the farmers to supply vital information such as high yielding crops variety or connect them to better paying buyers and processing companies:

P5. Among farmers, mobile device usage is limited to selected features primarily voice based services.

Experimental observation

The source of information plays an important role in determining the credibility of the information. Few responses offered some new revelation such as farmers’ disbelief on weather forecasting. While discussing the availability of weather forecast and its utility in planning the crop irrigation, farmers responded that they do not believe that weather forecast can be made. One of the respondent mockingly, expressed that “Mausam Vibhaag agar bolega ki barish hogi to phir to barish ho hi nai sakti” which means that if weather forecasting department is declaring that there will be rains then rain will certainly not happen. These findings suggest that to reach to these farmers with information, it is very essential to develop a feeling of trust on government initiatives and departments. The socio-political climate affects how these information-based services are adopted by the farmers (Teo *et al.*, 2008). We observed general mistrust on

government initiatives, which translates into a number of doubts raised by the respondents regarding authenticity of information.

We conducted a small social experiment. We wanted to study the efficacy of providing expert advice to farmers regarding their crop. At the time of the start of the experiment, we found that potato crop will be harvested in the present crop cycle. We decided to collect expert information on potato harvesting from the official sources and agriculture experts. We collected information about prerequisite of potato farming such as variety of seeds, fertilizers, possibility of insects and weeds and required pesticides. After the interviews and various informal conversations, we observed that they are aware of usage of fertilizers and pesticides. We wanted to provide some important information that they were not aware of but which is believed to benefit the potato crop. We found that usage of micro nutrients is not well practiced. So before the seed dispersion process, we collected some information on micro nutrient required for a better potato crop from the Kisan call center and department of agriculture. We found that correct amount of phosphorus is essential for a good crop. It is advised that in north western soil, 80-100 kg of phosphorus per hectare will ensure a better produce. We went to the farmers with this information and shared with them some standard brochures obtained from the officials. The information was shared well before the process. We followed up after seed dispersion was over and found that farmers used the amount that was suggested by their vendor. It establishes the possibility that the farmers trusted their peers and acquaintances more than the government and expert sources. This finding put forward a more intricate challenge to the government and authorities in winning the trust of the farmers:

P6. The information provided by the peer farmers/vendors is more trusted than the expert advice sources.

Discussion

Findings of our study highlight the need of strong communication between farmers and government. Indian agriculture practices can be enhanced and improved to address sustained challenges such as low productivity per hectare and poverty among farmers. We propose that an effective and relevant m-governance solution can be designed and implemented to curb information asymmetry among farmers and government. We noticed very low awareness of government policies and welfare scheme among farmers which can be a significant factor in low efficacy of these initiatives.

Another important contribution of present study is that it prescribes some functional measures which can ensure better success rate of m-governance projects in rural India. The current study also identifies major barriers in implementing m-governance projects in rural India. The study re-establish the proposition that mobile devices can be a strong communication medium in rural India where penetration of computer and internet is very scarce. Considering other hurdles of implementing e-governance projects such as low literacy and high cost, m-governance can be utilized as a possible alternate.

Role of establishing trust among farmers

Respondents of our study exhibited lack of trust on information outside their social arena. They have shown great amount of trust on their peers and acquaintances. Most of their technical information is sourced either from other farmers or their vendors. It is evident from our experimental observation that they do not accept information coming

out of their known sources. Unfortunately, government and its departments are treated as unfamiliar sources of information. There are other studies which also have highlighted the existing large gap between what and how these services are offered and delivered (Amrithesh *et al.*, 2013). We prescribe that to establish a fruitful communication with farmers it is essential to win their trust. We recommend that government should make attempt to work more closely with farmers. Officials should be advised to make more and more visits to the villages and interact with the farmers to gain their trust. Trust establishment will not only enable better communication channel but also ensure success of government initiatives such as m-governance projects. Literature has suggested that trust establishment is a challenge (Parent *et al.*, 2005) while implementing m-governance project. Improving both of quality of information and efficiency of communication channels will work positively in gaining their trust (Alenezi *et al.*, 2015; Lee *et al.*, 2014).

Barriers in implementing m-governance projects

Literature has categorized barriers in implementing m-governance projects into two categories – technological inhibitions and socio-political climate (Teo *et al.*, 2008). We will discuss both hurdles as per our research context.

Technological inhibitions

According to recent statistics, technology literacy in India, especially in rural India is alarmingly low. According to NSSO (2012/2013) data, illiteracy and lower levels of education is a prominent problem among Indian farmers which is persistent in previous years. Illiteracy also plays a role in increasing technology inhibitions among farmers and they become apprehensive about its usage. Through our study we were able to observe technology usage inhibitions lead primarily because of their lack of ability to read and comprehend. Many of the respondents were unable to use features of their mobile devices such as messaging services, changing the settings of the device or even accessing history of calls made and received. Grimsley and Meehan (2007) emphasized the role of technology driven inhibition in the acceptance and adoption of electronic government projects. According to a recent KPMG report, only 10 per cent of rural families have personal computers (PCs) at their home where 36 per cent of these household can afford a PC. Poor literacy, infrastructure challenges and knowledge limited to vernacular languages poses technology inhibition among rural inhabitants in India.

The m-governance project design issues are equally important (Schellong, 2010). As per our findings, mobile usage is limited only to the major functions of the device such as voice, messaging and internet in a very few cases. Thus, it is imperative to design these projects in such a manner that the features are easily accessible and flexible in usage. In the case of deployment of mobile governance project, it should be considered that the use of mobile technology is not the motive itself but only an enabler for the motive. In this scenario, it is inevitable that the users will expect highly flexible computing technology (Wiredu, 2007). Summing up, an efficient, flexible and easy to use interface of m-governance projects will reduce technology inhibitions and will enable large scale adoptions.

Socio-political climate

As discussed in the present work, the social structure prevalent among farmers is focused on peer-to-peer communications. We observed lack of trust on government initiatives and our findings indicated clear lack of willingness among the farmers to explore available benefit schemes and policies of the government. Thus, the communication network between government and citizens is needed to be reinforced to achieve multi fold objectives. As per our analysis, we found that difficulty of access and unavailability of personalized contact also acts as inhibitions for acceptance. Coursey and Norris (2008) in their study asserted that citizen's low acceptance of e-government projects are inhibited by the socio-political climate. They also stated that the socio-political climate is affected by but not limited to public administration and comprise other influencers such as social fabric and perceptions regarding general governance. Lack of trust, perceived corruption and lack of reliance on political capabilities lead to ineffective communication among government and citizens. As Rajalekshmi (2007) quoted:

[...] although the technology in itself might have the potential for integrating services, the institutional factors like trust associated with the service determine whether the services are actually used or not.

These factors affect rural population and Indian farmers with more severity because of lack of effective education and access to relevant information. The prevalent challenges among Indian farmers should be resolved with the mutual collaboration of public and private (Ray, 2012; Rose *et al.*, 2015). Exhibited transparency in the design and implementation processes of the m-governance system can also address the issue of trust among famers (Welch *et al.*, 2004). This paper strongly advice to seek benefit of multiple communication platforms (for instance using different m-governance projects) to achieve better reach to the farmers. The welfare and subsidies should reach to them effectively and mobile network can be utilized to reduce information asymmetry, which is cited as a significant hurdle in government-farmers network. The next section explains a step-by-step process of m-governance projects implementation. The process can be modified and adapted according to local farmers need but the framework presents a useful implementation model.

Step-wise process for successful implementation of m-governance projects

Figure 2 explains a step-wise framework of m-governance projects implementation and adoption. In the current framework, we are not dealing with the design and development of m-governance project. The focus of the paper is to explain the factors which might lead to improved acceptance and minimize the inhibitions among farmers.

- *Stage 1: Achieve constructive bondage with the farmers:* The findings suggest that culminating trust among farmers is the fundamental stone of the communication platform. To achieve better trust, it is essential to follow a participatory approach. We suggest establishing personal contact centers so that the issue of ease of access can be resolved. Conducting workshops, seminars and discussions among the farmers will orient them toward the possible m-governance project and will improve the acceptability. These discussions and seminars can also be used as a platform to collect opinions and feedbacks from the farmers.

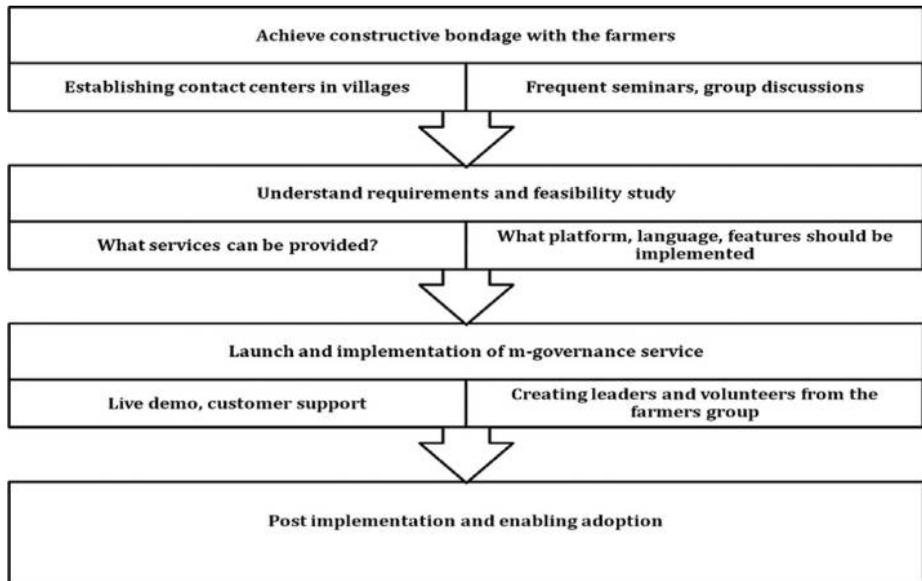


Figure 2.
Prescriptive process
for successful
implementation of
m-governance
services in rural
India

- *Stage 2: Understand requirements and feasibility study:* The Stage 1 will help in establishing an efficient communication channel with the farmers, which will allow a two-way interactive communication medium between government and the farmers. This channel can then be exploited to acquire relevant information regarding the project for instance what features they will expect from the system, how these applications should work, etc. This information can be utilized in refining the system design and enhance the functionality of the system.
- *Stage 3: Launch and implementation of m-governance service:* After finalizing the project, the service can be launched and demonstrations should be organized at various sites where maximum participation from the farmers can be ensured. Apart from these events, it is essential that consumer support and query resolution is conducted as a continuous service. As per our *P6*, volunteers and leaders from the farmers group will provide more effective and trusted communication medium and will ensure that the services are utilized in the real world.
- *Stage 4: Post implementation and enabling adoption:* After successful placement of service by launching the project and establishment of customer support units post adoption processes can be used. Feedback should be collected from the users and their queries should be resolved in a timely manner. Customer support and complaint resolution camps should be organized periodically to ensure service continuance. It might also enhance the farmers' loyalty to the m-governance services.

Implications for theory and practice: theoretical implications

The present work contributes to the streams of literature on ICT-enabled governance. First, our findings contribute to the literature of citizen participation, specifically,

acceptance and adoption (Teo *et al.*, 2011; Venkatesh *et al.*, 2013). Second, we identify contribution to the trust research in ICT-based governance (Bélanger and Carter, 2008; Reddick, 2005). At the end, the findings also hold implications for social psychology and network theorist by observing and explaining behavior and actions of a complex group form. Our sample consists of individuals involved in same occupation and our findings gives useful insights issues such as communication network, effect of peer communication and effect of perceived socio-political climate.

Practical implications

Our findings highlight some significant areas of study to develop and implement a successful m-governance project. We propose that establishing an efficient communication medium between government and the farmers is the quintessential element of any implementation cycle. In the following subsections, we are discussing that how improving awareness and harnessing the peer network can build a favorable environment to conceive and develop successful ICT-based governance projects.

Improve awareness among the farmers

One of the significant barriers to improve farmer's condition is a high very degree of information asymmetry between farmers and government. We found that awareness regarding current benefits and policies is very low among farmers. As a result, a very small fraction of the farmers' section is entitled to these benefits. A major change in communication policy is required at the government level. As Figure 2 suggests, organization of seminars and workshops can help improving the bridge between government initiatives and the farmers. It is required that attempts are made to reach out to farmers and present optimum solution to the challenges they face. These policies can help them to overcome problems such as productivity, quality of the produce and obtaining best price of their produce. Ensuring that the farmers improve their productivity and receive a fair price of their produce will certainly help in fighting vices such as poverty and poor living conditions.

Leveraging peer group influence

To establish a productive communication with farmers, our study finds peer level influence as a significant factor. Policies should be framed to ensure better participation from the farmers by including them in the policy-making and implementation process. One of the methods as suggested in previous studies can be exploiting network dynamics (Bailur *et al.*, 2012; Marin *et al.*, 2011). Groups of farmers can be setup to create a dynamic network which is actively engaged and involved with devising and implementing strategies for farmers' welfare. It can also involve selection and training of farmers to become opinion leader and consultant for their peer farmers. These networks can work in the direction of improving the overall productivity and profits for the farmers to ensure their aggregate welfare. Inclusion of their peers in government initiatives will help in leveraging the mutual trust and will lead to increased trust on government initiatives. These findings can be extended to m-governance projects as well.

Limitation and future research

This paper adopts the exploratory approach to address a pertinent research problem in the context of Indian farmers. We have explored and analyzed different phenomenon to seek solution to our research problems and the insights from the study are encouraging. We have

already discussed that how these findings can be used to create a better platform to connect to Indian farmers. However, further studies can investigate that whether the prescriptions given in the study can be implemented with success. Also further studies can quantitatively validate the findings by operationalizing the presented propositions. Further, the present study is conducted in a subpart of western Uttar Pradesh; studies can be conducted in other parts of India as well to examine whether the social network and structure vary from the presented findings and what difference these factors can create in implementing m-governance projects in those regions. Findings can be tested in different regions where different culture and group dynamics are prevalent. These cultural settings can influence how farmers process the information provided to them. Factors such as trust on government can vary state wise and it is possible that studies in different state will produce difference in trust levels and adaptability of the farmers. Literature also suggests that national culture and subcultures influence the fundamental characteristics of its citizens such as development of trust (Aladwani, 2013; Doney *et al.*, 1998). Because our findings are co-related with the prevalent socio-cultural dynamics, testing the findings in different context might add value to the proposed theory and its implications.

Further studies can confirm these relationships in different cultural and contextual settings. Addressing the generalizability concern because the study is qualitative in nature, statistical validation is not derived. However, the findings can be used as a guiding theorizing framework in studies exploring adoption of m-governance projects among farmers.

Notes

1. Recent reports (2014) from Telephone regulatory authority of Indian and Cellular Operators' Association of India (COAI).
2. Minimum support prices or MSP are declared by the government to ensure that farmers receive a reasonable price for their produce.
3. Head of the village, is an elected personnel who is responsible for administrative and governance related work in the village.
4. Rural banks, setup by government of India in order to facilitate banking needs of farmers including credit schemes such as Kisan Credit cards.
5. This statement is based on our observations of the farming processes. We have deduced it based on the following parameters. Extent of usage of machine/automated devices which we found was limited to traditional equipments such as tractors, harrows, hand operated tools etc. Advanced equipments such as harvesting machines, windrowers and planters were not found at any farm. Modern techniques such as soil testing, advanced bio fertilizers and fortified seeds were found to be absent.

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Figure A1.
Empty web page
under the tab of
“crop diseases and
prevention”

Source: Sourced from the official website of department of agriculture, Uttar Pradesh government (Agriculture, 2013)

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