Framework for Identifying M-government Applications for Agriculture Sector

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Abstract: **M-government is a subset of e-governance and has been defined as the use of mobile and wireless communication technologies within government administration and delivery of related information and services to citizens and businesses. Emerging technology trends and the population structure of India indicate that in the near future there is likely to be a strong demand for multi-channel service delivery especially delivery of services via mobile devices. Despite attempts by the government to offer various mobile-based services to help farmers, several challenges remain. One of the future challenges will be to create effective business models for m-governance in the agriculture sector. Also there is need for specialized m-agriculture services for each particular agribusiness sector (e.g. forestry, horticulture, organic agriculture etc.). Within this context, in this paper we present a framework for identifying m-government applications for agriculture, which would address many of the challenges of the agriculture sector.**

1. INTRODUCTION

Electronic government (e-Government) is rapidly becoming one of government's critical means for providing seamless services to other public agencies, businesses, and citizens. Indian government has set very ambitious goals in this area and is funding various programs for delivering public services electronically.Emerging technology trends and the population structure of India indicate that in the near future there is likely to be a strong demand for multi-channel service delivery especially delivery of services via mobile devices. Moreover, almost universal penetration of mobile devices, including

Internet-ready mobile phones, smart phones, and personal digital assistants (PDAs), is enabling governments to deploy of mobile government or m-government (Sharma& Gupta, 2004). M-Government is defined as the use of mobile and wireless communication technologies within government administration and its delivery of information and services to citizens and businesses (Yoojung, Jongsoo, Seungbong, &Jaemin, 2004). M-Government is a subset of E-Government comprising an alternate channel. It is a fact that governments are increasingly making efforts to provide more access to information and services for citizens, businesses, and civil servants through mobile devices. In recent times government of India has established M-Government services in some

areas. Like E-Government, M-Government operates on four different levels represented by the following interactions (Ntalianiet. Al. 2008):

1. M-Government to government (mG2G), referring to inter-agency relationships and the interaction between governmental agencies.

2. M-Government to business (mG2B), referring to the interaction of government with businesses.

3. M-Government to employee (mG2E), referring to the interaction between government and its employees.

4. M-Government to citizen (mG2C), referring to the interaction between government and citizens.

As ultimate goal of M-government is to bring transparency, accountability and integrity in interaction between citizen and government, mG2C is more developed due to focus and efforts devoted to it by governments. Hence this study will be focusing on mG2C services provided by Indian government.

Within this context, we concentrate our attention on m-government services for agriculture sector. Reason for choosing agriculture sector are as follow:

- Agriculture has been the main occupation a large segment of the Indian population for a long time. Due to lack of awareness and isolationof remote rural areas, this sector has not prospered. Most of the time other stakeholders have able to exploit farmers due to their lack of awareness and access to information.

- Information asymmetry is very high in this sector, therefore deployment and utilization of m-government services is necessity to remove existing inefficiencies.

- Most of the farmers in India are located in rural areas, and do not have access to Web based services and computer devices. Also very low computer literacy rate is found among farmers. But rural areas have good penetration of mobile devices. M-government is therefore an effective

mean ofdelivering information and government services to farmers.

To empower and strengthen the farmers Kissan Call Centres (KCC) were started as an m-government initiative in 2004 to provide farmers with information and help over telephones (mostly 2-G mobiles). The prime minister (at that time) AtalBihari Vajpayee inaugurated this service. KCC comprises of one call centre in every state to provide information, guidance, suggestions and marketing support to farmers. KCC is a platform for providing m-government information services. As government is moving fast to involve and provideservices to farmers using m-government and e-government, there is need to study whether the steps taken properly received and accepted by the citizens. Also it is necessary to study whether the design and development of m-services for the agriculture sector is aligned with all stakeholders' requirements and absorption capability. Hence the purpose of this study will be to:

- Identifying issues with existing m-government services for farmers.

- Using descriptive framework for identifying appropriate and cost effective m-government services for farmers and Agribusiness sector to address those issues. One such descriptive framework was presented by Ntalianiet. Al. 2007.

- There are some aspects of m-agriculture services which are not covered by framework suggested by Ntalianiet. Al. 2007. This paper aims to propose a revised framework for identifying and developing cost effective m-services.

2. LITERATURE REVIEW OF M-GOVERNMENT APPLICATIONS FOR AGRICULTURE

"We can use new digital channels to deliver better quality services to the citizen – available 24 hours each day, faster, more convenient and more personalized. By doing so, we will also stimulate the market for ecommerce, by encouraging the widespread adoption of technologies and creating new business opportunities". (Blair T, 2000) Above statement signifies the importance of m-government and provides impetus for m-government services. M-Government is an emerging discipline concerning the rise of advanced mobile and wireless communication technologies that would improve the QoS that government services offer to citizens (Arazyan, 2002). As transformation from e-government to m-government is inevitable if Government want to provide personalized, location, context based services and applications (Kushchu&Kuscu,2003). Argument of Kushchu is reinforced by the fact that developing countries has higher penetration for mobile devices.

Rosell, Finger &Misuraca (2006) identifies existing issues with m-government and proposes a new view on m-government. This paper emphasized that mobile e-government

for mobile users can be achieved by adapting government and administrative services so that it is available in a ubiquitous manner with multichannel option(i.e SMS, Alerts). Qianget. Al. (2011) discussed role of mobile applications for agriculture and rural development (m-ARD). Heproposed the services listed below which can be offered to rural population with help of mobile applications:

1. Better access to information
2. Better access to extension services
3. Better market links and distribution networks
4. Better access to finance

Better access to information and extension services will lead to higher income for small-medium farmers. Better market links and distribution will lead to lower transactional and logistical costs. Better access to finance will pave way for new market opportunities. Most widely used m-ARD apps provide valuable information as information asymmetry is prevalent among rural areas.

In developing countries government websites are only feasible source of information for m-ARD app providers. Data on government website may be unreliable, so some m-ARD app providers create their own market research units to provide users with valuable information (e.g. Reuters Market Light) RML has established its market team to collect real time data of commodity prices in local markets.

3. DESCRIPTIVE FRAMEWORK FOR IDENTIFYING M-AGRICULTURE SERVICES

We interviewed some farmers to identify issues related with existing m-agriculture service provided by government KCC (Kisaan Call Center). While interacting with farmers, we have identified some critical issue with existing m-services:

- Accountabilityof information/suggestions given to farmers over the telephone or SMS.

- Sometime prescribed medicines/pesticides are not available at local pesticide or fertilizer dealer.

- These applications provide only public data and interaction facilities; still transaction facility for farmers is missing. It does not link buyer, supplier and producer. This is area where agribusiness sector can be empowered. Most of these services are basic agricultural facilities, there is need to deal with different agriculture sectors differently

- For Suggestions regarding disease Farmers are unable to explain disease properly, if farmer can take a close picture of crop and send it to system, it will help better diagnose and improve reliability of solution.

How to address above issues with the help of simple SMS service is itself a big challenge. Processes need to be designed to ensure accountability of information, facilitating

transactions and transfer of multimedia data with fewer resources. Framework proposed by Ntalianiet. Al. (2007) is helpful for analyzing and addressing issues of existing issue m-agriculture services. This framework requires slight enhancement to cover all aspect of m-government services in Indian context.

We are proposing two extra concepts in this framework namely Resource scenario and Information Accountability and security scenario. Rests of the concepts are taken as it is in original model. Original framework proposed by Ntaliani covers significant and necessary aspect of design mG2B agriculture services like usage scenario, technical scenario and economic evaluation.

3.1 Usage scenario

For the agribusiness sector under study, the usage scenario is described by three attributes:

3.1.1. The generic agricultural mG2B services, which can be categorized as follows:

I. M-government information services, which include:
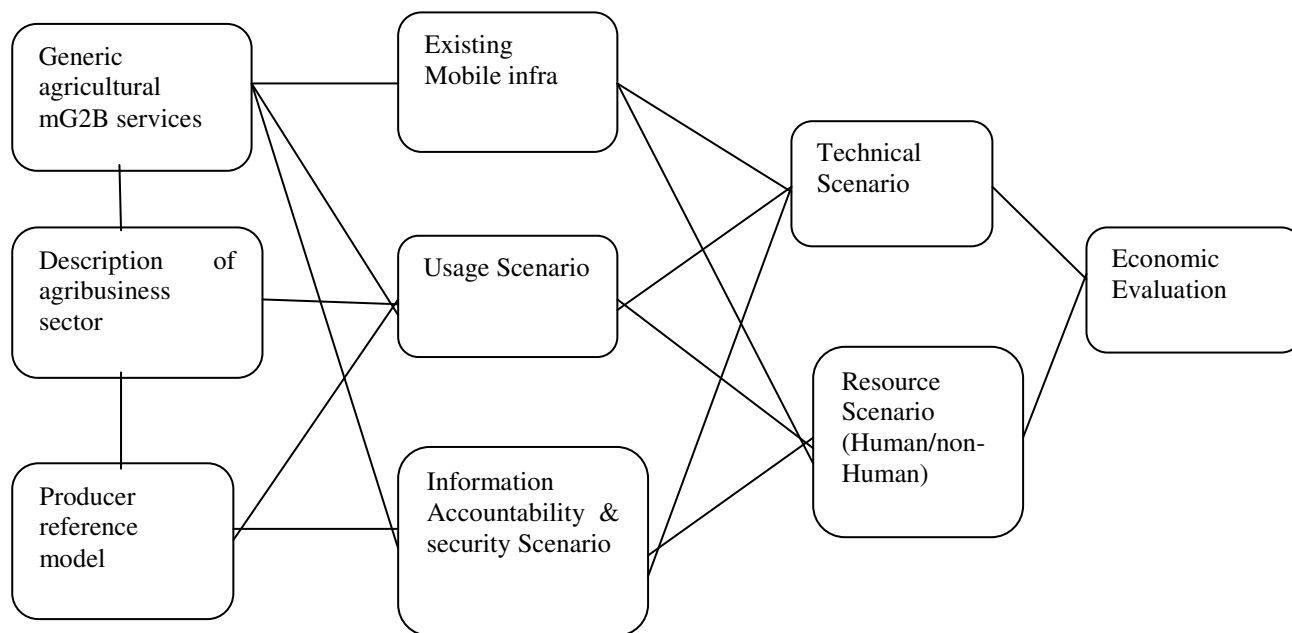
(1) Agricultural news
(2) Agricultural policy
(3) Funding opportunities
(4) Weather forecasts
(5) Alerts
(6) Market forecasts
(7) Expert consulting
(8) Notifications

II. M-government interaction services, which include:

(1) Petitions (e.g. license renewal).

(2) Tele-diagnosis (e.g. plant, crop and animal diseases).

(3) Calculations (e.g. for subsidy or indemnification). (4) Financial transactions (e.g. loan payments).

(5) Employment market (e.g. job offer and demand in particular area).

(6) Search engine (e.g. for databases, locating agencies in the surrounding area).

(7) Polls.

(8) Forums.

(9) Messages to public agencies (e.g. agricultural accident reports, incidents, queries, complaints, comments, interventions, opinion stating).

3.1.2. The description of the structure of the agribusiness sector includes the identification of the involved parties—producers, agribusinesses, agricultural agencies and agricultural experts, as well as the particular characteristics of the sector, such as its priorities and needs.

3.1.3. The producer-reference model, which is a collection of information about the usage of mG2B services derived from producers' questionnaires. In specific, such a questionnaire is divided in three sections. The first section concerns personal information, the second the status of the provision of existing agricultural services and the third refers to potential agricultural mG2B services provided via mobile devices based on the aforementioned generic agricultural mG2B services.

Framework for introducing Agricultural mG2B service

3.2 Technical scenario

In this section Ntaliani provide an overview and description of mobile and wireless technologies and of the technical scenario. There is today a great variety of mobile and wireless technologies, which can be used for the deployment of M-government.

One of the most important mobile services of GSM and UMTS is the Short Message Service (SMS) that enables the exchange of text messages between mobile phones, handheld devices, and fixed-line phones. An evolution of SMS is Multimedia Messaging Service (MMS), supporting multimedia messages. SMS can be used for various types of communication (Jensen &Thysen, 2003) including:

1. **Information**: The text message contains all the relevant information and the user needs.
2. **Notice**: It concerns notifications for available information. As text message may contain only limited information, notifications may give direction to further information needed by user.
3. **Alert**:Notifications exclusively for crisis situations or emergency, aiming at receiver's immediate activation.
4. **Dialog**: A sequence of related messages consisted of requests and response between the user and the provider

3.3 Economic Evaluation

The economic evaluation can be split into two closely interrelated parts: the techno-economic and the socio-economic. The techno-economic evaluation is primarily based on cost–benefit analysis. It evaluates five factors: (1) strategic issues, (2) service planning, (3) service demand, (4) operation and management, and (5) tariffs and financing planning.

Above three criteria have been broadly described by Ntalianiet. Al.,2007. In addition to original framework two new components has been added:

3.4. Information accountability & security Scenario

In case of tele-diagnosis, pesticide prescription, accountability should be identified and ensured. Process should be in place to tackle with wrong crop and animal diagnosis and compensate farmer for losses occurred due to inefficiency or ignorance of others. For ex: farmer calls to KCC for crop disease advice, after receiving prescription from KCC farmer contacts local pesticide dealer/shop for medicine. If even after application prescribed pesticide, crop disease is uncured or suggested pesticide has bad impact on crop, then inefficiency in the whole transaction found and farmer should be compensated if there is ignorance or cheating from other stakeholders like KCC, Pesticide dealers.

Accountability and security requirements and processes would be identified from producer reference model and existing mG2B agriculture services. Accountability and security requirements and processes would be implemented with help of technical scenario and resource scenario.

For example for ensuring accountability in KCC service below scenario can be identified:

•   Farmer make a call to KCC and register his request for diagnosis

•   His request is opened and diagnosis is sent to farmer by message

•   Diagnosis is also sent to his nearest dealer which is registered with KCC.

•   Farmer collects the pesticides and invoice from pesticide shop

•   Feedback is collected from farmer about use and effect of prescription if effects are not positive, grievance is initiated on the behalf of farmer.

•   Thus this process will ensure reliable prescription and genuine product to farmer and it will also increase trust of farmer in m-government services.

3.5 Resource Scenario Tanaka et. Al. (2005) classified assets associated information system into three categories:
1. Information assets (Data about farmers, Business entities)
2. Human assets (Technological skill and managerial skills)
3. Physical assets (Hardware, IT infrastructure).

As discussed in previous sections also one of the major issues with agricultural services is facelessness problem. Sometime agriculture expert/Officer is required to make field visit for better prescription or grievance resolution. As in case of KCC, to ensure accountability you need to have pesticide dealers registered with you which will ensure availability and originality of prescribed medicines (Information resource). In case of RML (Reuters Market Light), to get updated commodity prices across all the local agriculture markets, RML has deployed market reporter at each market (Human Resource). Service provider also need to have hardware, office etc (Physical source). So there is need to identify human and non-human resource necessary for delivering that service to target population.

Resource scenario will also help in identifying organization structure which you need to deliver services cost effectively. It will help us to identify which resources are needed at what time so that usage scenario and accountability scenario is implemented with the help of existing mobile infrastructure.

4. CONCLUSION

M-agriculture services have been able to deliver information and services to the target community with ubiquitous availability. However, existing m-agriculture services lacks in personalization and accountability. Also, all these applications provide only basic agriculture related information services. They fail to connect producers, suppliers and buyers on an integrated platform. Such an integrated platform would make the agriculture supply chain much more efficient. Along with information, the M-agriculture platform should also enable farmers to transact and participate actively in a 'virtual' market. Within agriculture, there are many related agribusiness sectors. There is need for specialized m-agriculture services for each particular agribusiness sector (e.g. forestry, horticulture, organic agriculture etc.). Our proposed framework can work, as a guide or compliance framework for developing mobile applications for agriculture sector to cover most aspects of the agriculture sector and help addressing critical issues.

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