Hurdles in rural e-government projects in India: lessons for developing countries

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Abstract: Rural Electronic Government (e-government) projects are aimed at providing government services and information to rural public. The e-government initiatives have not been very successful in developing countries because of several inherent constraints. We study ten typical rural e-government projects in India and analyse the operational, economic and personnel hurdles faced in implementing them along with their progression. Based on the implementation experiences of these projects, a list of recommendations is provided for successful execution of e-government projects. These recommendations will be useful for managing e-government projects in the developing world.

Keywords: e-government; implementation hurdles; India; rural e-government projects; developing countries.

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1 Introduction

Good governance is efficient and effective management of country's resources and affairs in a manner that is open, accountable, equitable and responsive to people's needs. Good governance minimises corruption, the views of minorities are taken into account, the voices of the most vulnerable in society are heard in decision-making, and is responsive to the present and future needs of society. An essential part of good governance is Electronic Government (e-government).

E-government is an important facilitator of good governance. E-government is the use of Information and Communication Technologies (ICTs) to transform government by making it more accessible, effective and accountable. ICTs allow better interaction among the government, its institutions and people. By using ICT, the role of government

changes from direct involvement to a more limited involvement, thereby empowering citizens (Yu and Fang, 2005). E-government utilises ICT to accomplish reform by fostering transparency, eliminating distance and other divides and empowering people to participate in the political processes that affect their lives. Thus, ICTs can improve

- *Democratic governance*: Better representation of citizens within state institutions, enabling transparent elections and participation of the wider society in national democratic discourses.

- *Economic governance*: Cleansing of the general macroeconomic framework of the country, including the banking and financial sectors.

- *Administrative governance*: Bringing citizens closer to the administration, civil registry, land management, population census, tax collection, etc.

E-government enables transactions between concerned groups (citizens and businesses) and the government through multiple channels by using ICT, whose objective is to improve the efficiency, transparency, accountability and effectiveness of a government. As internet penetration grew, many sites began to focus on delivering information and services to citizens and businesses. While there have been significant studies on e-government initiatives in developed nations (Ke and Wee, 2004; Lee et al., 2005; Kolsaker, 2006), in this paper we focus on e-government in a developing nation, India. Though there have been several e-government initiatives undertaken for rural India, there have been several problems in implementing them successfully. In this paper, we review ten of the popular e-government projects developed for rural regions, assess the state of e-government projects through an implementation framework, describe the hurdles faced by these projects and provide recommendations to overcome these hurdles. These recommendations are useful not only for future e-government projects in rural India, but also for e-government initiatives in other developing countries. This paper will be useful for executives in government sector because they can allocate required resources necessary for smoother implementations. The paper is also useful to the executives in private sector (especially those in IT companies) since they can avoid any technological problems that may arise during implementation of the e-government projects.

India is a land of villages and millions of aspirations and hopes reside in its rural segments. It has 36% of the world's poor earning less than $1 a day, with 300 million illiterate and 260 million Below Poverty Line (BPL) (Kumar, 2004). Agriculture is the main occupation for about 70% of Indians. Much of the rural population is isolated in terms of access to information, materials and markets. Teledensity (the number of telephone lines per 100 people) is less than 1.7% in rural, while it is more than 20% in urban areas. Thus, the rural areas are relatively disconnected from the national mainstream.

According to a study by International Data Corporation's (IDC) Information Society Index (ISI), 2004, India ranks 51 out of 53 nations in calculating each nation's ability to access and utilise information capacity and wealth. The survey covers four infrastructure categories, namely internet, computers, telecom and social factors. India's overall position at 51 shows a ranking of 43rd in the internet category, 51 in computers, 53 in telecom and 51 in social factors. These rankings indicate that there is far poorer ability to access and use information and IT than in other countries (Report, 2004).

Digital divide does not emerge out of technology, but is due to inequitable distribution of technology. It is a reflection of lack of basic literacy, poverty, health

and other social issues. ICTs can remove the barriers to information asymmetries that were impeding the working of markets that are critical for economic growth. However, Government of India has committed for developing rural segments, in several ways, including infrastructure and promotion of e-government initiatives.

The rest of the paper is organised as follows. Section 2 has a brief description of selective rural e-government projects implemented in India. Section 3 has a two-dimensional implementation framework for e-government and mapping of the ten e-government projects. Section 4 lists the hurdles faced by each of the rural e-government projects and measures taken by them to alleviate the problems. Section 5 has recommendations to reduce economic, technical and personnel hurdles in rural e-government project implementations. Section 6 has conclusions.

2 A review of rural e-government projects in India (Project Websites, 2005)

1 *Akashganga* uses ICT to facilitate rural milk producers by integrating all the operations of rural co-operative society right from milk procurement to accounting. First pilot model of Dairy Information System Kiosk (DISK) is currently under implementation at Uttarsanda Dairy Cooperative Society in Gujarat. Each farmer is given a plastic identification card. When farmers arrive at the Raw Milk Receiving Dock (RMRD) counter, his/her identification is updated in the PC. The milk is emptied out in a steel trough kept over a weighbridge and the weight of the milk is displayed as well as entered into the PC. One operator is required for filling of cans and another for measuring fat content and updating the PC. The infrastructure used to carry out these operations includes weighing balance, microprocessor, printer, milk analysers and a display.

2 *E-Choupal*: Agriculture is the backbone of India. Indian farmers have to depend on many intermediaries, right from the process of procuring raw materials to selling their produce. Each intermediary will add his/her profit margin, thereby increasing the cost of product. Some intermediaries even try to block the market information. To protect farmers from such practices, the International Business Division of Indian Tobacco Company (ITC-IBD) came out with an e-government initiative called *e-Choupal* (which means a village meeting place). E-Choupal is useful not only to the agricultural products but also for selling home appliances and consumer goods. Each e-Choupal is equipped with a PC, internet connection, printer and Uninterrupted Power Supplies (UPS). In case the power supply is erratic, a solar panel is provided, and if internet connectivity is not up to the mark, then a Very Small Aperture Terminal (VSAT) connection is provided along with another solar panel to support that.

3 *Drishtee* is a rural model of distribution and promotional network for consumer goods and basic services. Information is provided to the users in the form of services via internet (Government of India, 2003). Drishtee made a presence in Dhar, Seoni and Shahdol districts in Madhya Pradesh, Sirsa district in Haryana and Jalandhar district in Punjab. A village entrepreneur is trained to handle the software that works on MS SQL Server at the back-end and runs on ASP, Java script, VB Script at the front-end. The hardware includes a web server, a district server, kiosks and dial-ups.

The district server regularly gets connected to the web server and performs updates. The database of kiosk gets updated whenever the kiosk gets connected to the district server or the web server. *Soochanalayas* or centres have been established to cater to 25–30 surrounding villages and buildings of *Gram Panchayats*.

4   *Gyandoot* has been established as community-owned, technologically innovative and sustainable information kiosks in a poverty-stricken, tribal-dominated rural area of the state of Madhya Pradesh. The server system runs on Windows NT with Internet Information Services (IIS) server; client PCs run Windows 98. Information kiosks have dial-up connectivity. The server hub is housed in the computer room in the district *panchayat*. Kiosks have been established in the village panchayat buildings. Typically, villages that function as block headquarters or hold weekly markets in tribal areas, or located at major junctions, were chosen for setting up kiosks. The entire network of 31 kiosks cover 311 panchayats (village committees), over 600 villages and a population of around half a million (i.e. about 50% of the entire district).

5   *Rural Access to Services through Internet (RASI)*: Sustainable Access in Rural India (SARI), now renamed as RASI, provides internet and voice connectivity to the villages of Madurai district in Tamil Nadu. The project has 100 internet kiosks in more than 100 villages. Current network technology is based on the CorDECT that was jointly developed by the TeNet group at IIT Madras, Analog Devices Inc. and Midas at Chennai. A CorDECT access centre is located roughly 25 km from the kiosks. Internet facility is provided with the help of Wireless Local Loop (WLL). Each kiosk is connected to the website containing information relating to revenue, registration, rural development, education, health, agriculture and animal husbandry. The major source of income for the operators has been computer education for children.

6   *Jagriti E-Sewa*: The emphasis of Jagriti is deployment of appropriate, affordable, scalable and sustainable technologies available in the developing countries. The system works on LINUX, which is a 'License-Free' operating system. Old computers (e.g. Pentium I) are used in some places. The project uses dial-up telephone lines. The whole system can be adapted to any language in the least time. The kiosks are located in villages where there is a sizeable flow of public on a regular basis. Each kiosk is set up to serve about 25,000–30,000 people and is owned and operated by a 'Kiosk Franchisee' who is typically an educated youth or an ex-serviceman. It is ensured that the kiosk generates adequate revenue streams so as to justify its operations.

7   *N-Logue*: N-Logue Communications Pvt. Ltd. provides telecom and internet services in small towns and rural areas of India. For operational purposes N-Logue divides the country into service areas corresponding approximately to a *taluk*. Eighty-five percent of taluk headquarters in India have optical fibre today, which acts as the backbone for telecom and internet connectivity. N-Logue ties up with a number of content providers such as state government, rural development ministry, agricultural ministry and fertiliser/pesticide manufacturers. N-Logue employs WLL technology as the basis for its village-level communications. The CorDECT technology used operates on the same principles as regular wireless technology, providing internet access at 35–70 kbps to 1 gbps. The subscriber set can transmit both voice and data

signals simultaneously to an access centre, which must be located within a 25 km distance.

8   *LokMitra* project was developed by the National Informatics Centre (NIC) in Himachal Pradesh, in order to provide easy access at remote areas and to redress complaints. The LokMitra Intranet in Hamirpur district consists of two Pentium III-based servers, with four Pentium III-based client systems. The servers and the clients are connected on a LAN. The hub is placed in the Deputy Commissioner's office. The client systems are used by the officials from concerned departments for answering the complaints and queries received and for updating with information. The LokMitra software interface is web-enabled, user-friendly and has two modules: one for the citizen information centres and the other for the control room.

9   *Tata Kisan Kendra (TKK)*: Tata Chemicals Ltd. came out with TKK to help farmers in states of Uttar Pradesh, Haryana and Punjab. The TKK tracks key parameters relevant to farmers, such as soil, ground water and weather on a real-time basis with the help of Geographic Information Systems (GIS). The GIS software provides spatial information regarding roads, rivers or buildings; it works by imposing layers of data in digitised maps with information about administrative, socio-economic and physical set-up. Satellite image processing can help detect unproductive farming practices, track the progress of insect attacks across states, get crop estimates or update maps. Currently there are 11 main kiosks and around 300 franchisees TKKs and is looking to set up 40 more kiosks and 800 franchisees to serve 48,000 villages.

10 *Bellandur Project* is a gram panchayat e-government solution. Working closely with the panchayat members and village residents, the software was designed to suit the needs of panchayat administration. Bellandur Rational Unified Process (RUP), a set of software engineering tools, enables a phased and iterative approach to e-government. At present, the panchayat office has three computers, one for each of the bill collectors. All the district offices, taluk offices and gram panchayats are connected. The committee meetings are aired on the cable television.

3   Progression of rural e-government projects

We use a two-dimensional e-government implementation framework (Gorla, 2007) based on Watson and Mondy's e-government (Watson and Mundy, 2001) design phases and Infodev's e-government (Infodev, 2002) implementation phases. Then we map each of the ten e-government projects to assess the progression of rural e-government projects (Table 1). The following provides description of the design and implementation dimensions.

The design dimension includes three phases:

1   *Initiation*: This phase emphasises on informing citizens by providing them with a single point of access to government information through web portals by individual agencies. Services provided by the individual agencies are confined to people residing in the areas where the kiosks are set up as these kiosks are not connected.

2   *Infusion*: It is characterised by adopting the principles of e-government (citizen centric, accessibility, accountability and transparency) and installing online payment applications. Information kiosks are all connected and thus offer similar services to citizens.

3   *Customisation*: Citizens have electronically maintained personal profiles of their financial transactions with government. Emphasis is on maximising the value of e-government to citizens, for which the delivery process of services is re-engineered and customer relationship management techniques are implemented. Also facilitates the users to buy/sell online.

The implementation dimension includes three phases:

1   *Publish*: This phase involves publishing the government information online. These sites offer a wide range of services with local language support. The emphasis of these sites is on diffusing information.

2   *Interact*: In this phase, communication flows from citizens to government and vice versa. These sites provide feedback forms, email facilities or conduct public meetings where people can share their ideas.

3   *Transact*: This phase offers online e-commerce services apart from other services. This phase is quite useful for businessmen, farmers, unemployed, students, etc., to conduct their transactions.

The ten e-government implementations were mapped into the nine cells of the framework (Table 1). There are two rural e-government projects under 'Publish' phase. The project 'Akashganga' is categorised into (Infusion, Publish) cell since it only integrates various equipments using different technologies and only provides information to the public. It stores transaction details in accounting and displays them to the public in the form of reports. The project 'Tata Kisan Kendra' is categorised as (Infusion, Publish) since it provides a wide range of services to farmers using GIS and satellite technologies, in addition to offering them training and workshops.

Table 1   E-government implementation framework

		Implementation dimension		
		Publish	*Interact*	*Transact*
Design dimension	Initiation			
	Infusion	• Akashganga • Tata Kisan Kendra	E-Choupal	
	Customisation		• Gyandoot • Jagriti E-Sewa • N-Logue • Bellandur	• Drishtee • RASI • Lokmitra

There are five e-government projects under 'Interact' phase. The project 'e-Choupal' is categorised into (Infusion, Interact) cell since it provides farmers with valuable suggestions and opinions and clarifies questions, in addition to giving them information

on government schemes. The project 'Gyandoot' is categorised as (Customisation, Interact) since it uses local languages (Hindi) for interaction with citizens and provides education, in addition to recording grievances of citizens and addressing them. The project 'Jagriti E-Sewa' is in the phases (Customisation, Interact) since it provides latest information to rural public in local languages and allows partially e-commerce transactions (called d-commerce, *d* stands for *desi* meaning local). The project 'N-Logue' can be categorised as (Customisation, Interact) since the project provides information on market, climate and soil to the farmers, in addition to facilitating public grievance redressal by which citizens can interact with government officials. The 'Bellandur' project is categorised as (Customisation, Interact) since it maintains financial records of citizens and their birth and death certificates, in addition to allowing interaction among the village members.

There are three e-government projects under 'Transact' phase. The project 'Drishtee' is categorised as (Customisation, Transact) since the project allows online buying and selling of agricultural products and services, in addition to issuing ration cards by maintaining a citizen database and their economic status. The project 'RASI' is categorised under (Customisation, Transact) phases since it facilitates online buying and selling of commodities, provides information on marketing conditions and facilitates online interactive training to citizens. The project 'LokMitra' is categorised as (Customisation, Transact) because the project provides user interface in local language, allows buying/selling, allows updating of the address and other citizen information and allows the public to share their ideas through online interaction.

4 Hurdles in rural e-government projects

The hurdles (operational, economic and personnel) faced by the typical rural e-government projects in India are listed in Table 2. The most common hurdles in implementing e-government projects are the poor connectivity in rural areas due to lack of telecom network, frequent power failures, insufficient funds to equip the kiosks with the latest infrastructure and difficulty of illiterate people to cope with the new technology. We collected data regarding the solutions adopted by them to overcome the hurdles, based on our contacting and interviewing the various e-government agencies and also through literature search on these projects. The following are the measures taken by some of the projects to overcome hurdles:

Akashganga: A key challenge for Shree Kamadhenu Electronics Pvt. Ltd. (SKEPL) was the need to sell the Akashganga Milk Collection System (AMCS) to village farmers who are often reluctant to adopt new products and services until the benefit is proven to them. Akashganga has succeeded in overcoming this challenge with customer education and the free trial option. The company has made considerable efforts to gain the trust of farmers by delivering simple solutions and quality support.

E-Choupal: ITC-IBD noticed that it was difficult to impart skills to the first-time users in remote areas and thus, appointed a person called *Sanchalak* who is identified from each village and equipped him with an internet kiosk. ITC trained the sanchalak to guide farmers and work as an intermediary between ITC and farmers. ITC also provided e-choupals in local languages.

Drishtee: Drishtee removed the barrier of providing limited services due to poor infrastructure successfully by installing its Wi-Fi system at Sirsa district (Haryana) as an experimental launch with the help of social funds. Drishtee also removed the hurdle for poor farmers by partnering with certain microfinance institutions and finance them so that they can set up their own kiosks.

Gyandoot: In order to provide continuous access without any disconnections, Gyandoot adopted the WLL technology. It also provided solar panels in kiosks to overcome power failures.

RASI: In order to remove the hurdle of non-standardised processes, RASI defined a standard process and implemented it in all the districts. A simple audit was conducted to know the differences in the processes. RASI connected all its systems in LAN and provided access to the land records.

N-Logue: The TeNet group faced the problems of delayed testing and costly technology, and the group removed them by installing the technology in many countries outside India to gain acceptance in India. To accelerate the deployment in rural areas, the TeNet group has started providing telephone services deploying its technologies.

LokMitra: Since connectivity in the remote areas would continue to be a problem, NIC has switched over to internet. With the switchover to internet, LokMitra scheme is not confined to Hamirpur and people from all over the state get their grievances redressed.

Table 2   Hurdles in e-government projects

Project	Operational hurdles	Economic hurdles	Personnel hurdles
Akashganga (Parghi, 2001)	• The dusty environment in the villages created difficulties to operate computer systems • Lack of adequate power supply halts the system operation		• People not able to accept the project until the total benefits are understood
E-Choupal	• Outdated infrastructure to the 'sanchalak'	• Inadequate finance for acquiring up-to-date infrastructure	• Difficulty in imparting the technical knowledge to first time users in remote places
Drishtee	• Little rural data were readily available for planning purposes • Limited services provided due to poor infrastructure		• Poor farmers missed the opportunity of working as kiosk operators
Gyandoot	• Operations were interrupted due to telecom network disconnections and power failures	• Increase in cost of operation, as diversified services are included in the system	• Lack of highly skilled personnel to offer its diversified services

Table 2   Hurdles in e-government projects (continued)

Project	Operational hurdles	Economic hurdles	Personnel hurdles
RASI	• Non-standardised processes across the districts resulted in integration difficulties	• Lack of availability of funds resulted in the use of outdated infrastructure.	
	• The land owners are unable to obtain up-to-date information as the records at ARO and taluk offices were not linked	• There was lack of financial support for local service providers and kiosk operators	
	• The internet connection was not available in all the offices		
Jagriti E-Sewa	• Frequent disconnections as the system uses dial up connection where the lines during the day are busy		
N-Logue	• Difficulty in adopting the new CorDECT technology as it has to meet the standards specified by the telecom operator		
Lokmitra	• Frequent disconnections due to the unstable telecom network		
TKK	• Limited functionality (i.e. agriculture only)		
Bellandur project		• There was no financial support of government or private institutions	

5   Some recommendations

Following are some recommendations based on the case studies of typical rural e-government projects implemented in India. These solutions are categorised into operational, economic and personnel.

5.1   Operational

- *Connectivity problems*: Dial-up connectivity in rural areas is subject to interruptions because of telecommunications network failures. WLL technology enables continuous access. Wireless Cellular Technologies (WCT), advanced in USA

and European Union (Blechar et al., 2006; Seeman et al., 2007), may offer additional solutions to connectivity problems in rural areas.

- *Power failures*: Operational hurdle due to power failures is quite common in rural regions. Solar panels and UPS are useful for providing power backup in case of power failures.

- *Rural sector data*: Since there is little information available on rural sector, it makes it difficult to propose appropriate services in the system. Research studies in rural markets should be carried out in order to create the needed information.

- *Non-standard processes*: Standardising processes and conducting audits will reduce problems associated with non-standard processes and help integrate information systems across geographical locations or subsystems.

- *Infrastructure*: It should be improved by providing air-conditioned rooms for housing kiosks in villages, thereby reducing operational problems associated with dusty environment. Adding modern hardware and software will help provide user-friendly systems to the rural public.

- *Local languages*: Since most rural population is English illiterate, user interfaces designed for local languages make adoption easier.

5.2   Economic

- *Lack of funding*: The most common economic hurdle that many projects face is lack of adequate funds to acquire infrastructure needed to implement a system. Government should help citizens in extending interest-free loans and instalment loans, encouraging public–private partnership.

- *Assistance to the poor*: The poor cannot set up their own kiosks due to financial reasons. To overcome this, the project-implementing companies should partner with financial institutions to facilitate support. The project implementers should help the poor in finding resources to set up kiosks, such as initial deposit and periodic payment.

- *Development of kiosks*: If many services are added initially, cost of operation will tend to be high; this will discourage the citizens in using the kiosks due to system complexity and cost. It is necessary for the developers to build the website in stages and add services on the need basis. For example, first let the project be implemented for publish phase, followed by interact and transact phases (Table 1).

5.3   Personnel

- *Technology adoption*: The rural people, at times, may not accept the project until they are convinced of benefits (e.g. Akashganga). The implementation teams need to give training to the villagers in order to motivate them. Appointing local personnel as kiosk operators will help interact with the users easily.

- *Conducive environment*: Qualified trainers sometimes are unwilling to visit remote villages because of inadequate facilities. In order to attract the trainers to villages,

clusters of villages may be formed and modern facilities may be provided for each cluster, thus providing facilities cheaper.

• *Unskilled villagers*: Operation of complex kiosks requires skilled personnel, which is scarce in villages. Young villagers who have aptitude for this job should be provided with strong training in computers.

6   Conclusion

In the e-government projects described above (Table 1), most projects were designed adequately until the last phase (customisation) of design, while only a few reached the last phase of implementation (i.e. transact phase). This suggests that future projects should be designed and implemented with incremental approach in order to realise full benefits. Furthermore, there is little evidence of involvement of citizens in government decision-making (Marchionini et al., 2003). Future e-governance applications may consider e-voting and email campaigns, so that citizens can express opinions on public policies on food, transportation and environment. Employment of new technologies will enable governments to provide the above services more meaningfully. However, governments should carefully devise their regulatory procedures so that competition is encouraged and innovation is stimulated (Choudrie and Papazafeiropoulou, 2006).

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