The Role of Information and Communication Technologies in Rural Development in India

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Abstract — Information and Communication Technologies (ICTs) are changing every sphere of our lives. Due to tremendous progress in internet technologies, ICT has a big impact on rural areas and rural lives. Especially in agricultural field there is significant role of ICT in rural areas. It is also expected that the ICT led extension systems are going to act as a key agent for farmers to access information and share knowledge. Hence, renewed enthusiasm to use new ICTs for agricultural advisory services led to mushrooming of e-initiative pilots in India. The innovators are experimenting innovative ICT initiatives solely for agricultural information and knowledge delivery. Unlike other sectors, agriculture is a complex sector where most of the ICT initiatives may not function well. It is time to move forward in integrating ICTs and Information and Communication Management (ICM) in agricultural extension. One of the main reasons for the inequitable distribution of economic gains between the urban and the rural population is the gap in access to information. ICT can help to bridge this gap and hence lead to reduction in the level of poverty. Farmers can get access to knowledge to improve their production and even get better price for their produce using variety of ICT systems. In the present paper the authors made a systematic review of the role which ICT can play in the development of rural areas in India.

Keywords — e-education, e-governance, ICT, rural development, agricultural information

I. INTRODUCTION

Information and Communication Technologies (ICTs) have transformed lives across India. According to the census of 2011, 68.84% of the population of India is rural whereas 31.16% is urban. These figures clearly indicate that India still breathes in villages. But even after more than sixty seven years of independence, illiteracy, poverty and backwardness in all terms still plagues rural India. Information and Communication technologies have become imperative to the progress of rural India. They have become an integral part in the information-flow for catalyzing the development efforts in rural India. ICTs offer several strategies to achieve sustainable rural development. ICTs have been instrumental in empowering the rural India with technologies which help us to reach our goals of sustainable development.

Realizing the importance of ICTs in rural development in India, several government projects have been implemented to achieve universal access to ICTs. These projects mainly focus on bridging the digital divide between the urban and rural areas of India. The urgency to bridge this divide mainly comes from the fact that in India, the rural areas mostly lag behind the urban areas, when it comes to education, health and infrastructure. This leads to inequality of services and opportunities for the rural population which stops them from contributing to the development of the country. This kind of rural isolation can negatively impact growth and in turn affect the sustainable development of the country. ICTs can help to overcome the various constraints in infrastructure. Through the use of ICTs, people in rural areas can connect easily with the local, regional and national economy. They can make use of the banking facilities and also access the various job opportunities which would otherwise be beyond their reach. ICTs can help to create awareness among the rural public regarding new technologies in agriculture which would help them to contribute to the GDP of the country. The various ICTs can help to spread education among the rural masses and help them to connect easily with their urban peers. Thus bridging the digital divide not only helps in bridging the infrastructural gap but also to bring the rural population to the forefront.

The development-landscape has been transformed by the explosion of ICT, especially the mobile phone technology. This technology has improved the life of the rural population by integrating the once isolated people into the economies and politics.

The boom in ICTs has been found to be linked to the economic development of a country. According to a study, based on data from 113 countries over 20 years, 1% increase in the ICT resulted in the increase of 0.03% in the GDP. For mobile networks, the relationship was more prominent with 1% growth in mobile networks leading to an increase of 5% in the per-capita GDP.

ICTs have also been found to negatively impact the level of poverty in a country. Studies have found that more pervasive is the use of ICTs within a population, lower is the poverty rate.
Some of the more traditional forms of ICT such as radio and televisions have had a more prominent impact than the new forms of ICT. Due to their ease of use, easy accessibility and familiarity to the illiterate population, these forms of ICT will remain vital to rural Indian development.

The mobile phone is more important than the other forms of ICT when it comes to rural development in India. This is because of two reasons: firstly, they are easier to access for the rural poor than the other forms of ICTs which tend to be expensive and require infrastructure. If we take some recent statistics into consideration, in 2012, in India, there were 929.37 million mobile phone users as opposed to 31.53 million landlines. Secondly, the use of mobile phones increases the interaction between the users. From being a one-way channel for information, the ICTs have progressed to creating the continent’s largest transaction channel enabling users to buy, communicate, connect, organize and broadcast themselves.

During some emergency situations, the call centers allow people living in remote areas to report their trouble and seek assistance.

ICTs permit the rapid dissemination of information among the farmers and traders regarding the fluctuations in commodity prices, and differences in the demand and supply of commodities.

The teachers use the student feedback systems to structure their classes and modify their teaching styles to suit the needs of the students.

II. ROLE OF ICT IN AGRICULTURE

Information and communication have always been vital to people who have grown crops, raised livestock and caught fish. They have sought information from each other regarding the most effective planting strategy on steep slopes, buying of improved seeds or feeds, the highest price being paid in the market and the one paying it and so on. The answers to such questions are hard to come by for the farmers. They may have planted some crop for centuries but due to the changing weather patterns and soil conditions, epidemics of pests come and go. Updated information can help the farmers to not only cope with but also benefit from these changes. Although the Green Revolution led to increased productivity of food crops, there is still the need of a new revolution which will bring new prices for consumers, contribute to “smart” agriculture and incentivize the farmers to increase their productivity. The search has been long on the effective solutions to address the long-term and short-term challenges in agriculture and to answer the vast number of questions which are faced by the farmers. ICTs have emerged as the potential solution to meet the aforementioned challenges.

Due to their accessibility, affordability and adaptability, they have found their use even with the rural population. New small devices (such as multifunctional mobile phones and nanotechnology for food safety), infrastructure (such as mobile telecommunication networks and cloud computing facilities) and especially applications (such as those that transfer money and track an item moving through a global supply chain) have proliferated. Many of the questions asked by farmers can now be answered easily and efficiently and with greater accuracy.

The number and type of ICTs which can develop the life of the farmers has been on the rise. Of all, the most noticeable and mentionable is the mobile phone which serves as a platform for exchanging information through the ‘short messaging service’ (or popularly known as SMS).
Reuters Market Light, for example, services over 2,00,000 rural subscribers in 10 different states in India for a cost of US $1.50 per month. The farmers receive four to five messages per day on prices, commodities, and advisory services from a database with information on 150 crops and more than 1000 markets. In recourse-constrained areas, satellites or remote sensors can be used to gather temperature data, internet can be used to store large amounts of data, and mobile phones can be used to disseminate temperature information to farmers cheaply. All these prevent crop loses and mitigate effects from natural adversities. Soil data can be collected and disseminated by a variety of ICTs. Some more sophisticated and specialized applications such as software used for supply chain or financial management are also becoming popular among the rural people. These are only some of the examples of the ways ICTs can be used to improve the agriculture in India. Hundreds of agriculture-specific are now emerging and are showing great promise for smallholders.

Some of the web portals which are available currently for agriculture related help are as follows:

- **aAQUA** (www.aaqua.org)
- **KISSAN Kerela** (www.kissankerela.net)
- **DACNET** (www.dacnet.nic.in)
- **E-Krishi** (www.e-krishi.org)
- **Agropedia** (www.agropedia.iitk.ac.in)

### III. ROLE OF ICT IN E-GOVERNENCE

With the ICTs pervading every sphere of life, they have become omnipresent. Political, Cultural, Socio-economic, Developmental and Behavioral decisions today, rests on the ability to access, gather, analyze and utilize information and knowledge. ICT is the conduit that transmits information and knowledge to individual to widen their choices for economic and social empowerment. Government of India is having an ambitious objective of transforming the citizen-government interaction at all levels to the electronic mode (E-Governance) by 2020.

It is a proven fact that majority of the Indians live in villages or rural areas. Hence, to ensure a sustainable growth and development of these rural people, the Government of India has introduced the National E-governance Plan (NeGp) which seeks to lay the foundation with various projects, starting from the grass-root level, and providing impetus for long term e-governance within the country. In this light, the importance of ICTs has been shown in various rural e-governance applications implemented in the recent years. Indeed, some of the schemes introduced in rural India have improved the government services immensely.
India lives in villages, and for the development of India, it is important that the rural development be consistent and continuous. In many of the remote villages, several government services are not available and the locals have to rush to nearby districts to get their work done. E-governance applications can provide online services which can reduce the cost of, not only the citizens but also of the government. Rural e-governance applications can sensitize the people regarding the possible benefits and services of the government. The success of e-governance in rural India is reflected by the fact that the rural citizens are now using the online services. Projects like E-grampanchayat has made communication easy as now, government officials can be aware about exact situation of villages coming into their work territory very easily.

E-governance services through ICT refer to transactional services that involve local, state or national government. ICTs acts in speeding up the flow of information and knowledge between government and citizens and transforming the way in which governments and citizens interact. We need a successful ICT application in E-Governance which provides a one stop solution for the rural population. In the recent past, various rural E-Governance applications have brought to the forefront, the importance of ICTs in the realm of rural development. Several e-governance applications have tried to improve the reach, enhance the base, minimize the processing costs, increase transparency and minimize the cycle times. To facilitate the easy access of the state and district administration services to the rural people, many states have implemented the State Wide Area Networks (SWAN).

According to the Center for Electronic Governance at the Indian Institute of Management, Ahmedabad (CEG-IIMA), significant efforts are required to design, develop and internalize the ICT solutions through well-managed re-engineering of back-end processes and capacity building efforts to ensure sustainability.

The government is increasingly using various forms of ICT to extend the reach of its services to such locations which are convenient to the people. The aim of such rural ICT applications is to bring to the village door steps, services of central agencies such as district administration, co-operative union and state and central government departments. Such applications offer improved connectivity and processing solutions to the rural people. A large number of rural e-governance applications aim to offer easy access to citizen services and improve processing of government-to-citizen transactions.
APSWAN, a State-wide network for voice, data and video communication, is the basic information highway for improving government-citizen and government-industry interface. In subsequent phases, APSWAN would be extended to all 'mandal’ headquarters, other towns and eventually to all villages. APSWAN makes use of the 2MB dedicated communication network established by AP Telecom from the State Headquarters to all the Districts and the other two important centers viz. Vijayawada and Tirupati.

A satellite network, which is being set up by Revenue Department would connect 177 Bhoomi Data Centres located at various taluk entres. BSNL will set up a wide area network (WAN) for the Karnataka government at an estimated cost of Rs 170-crore. The WAN called Karnataka State Wide Area Network (KSWAN) will provide 2 mbps connectivity from Bangalore to all district headquarters of the state (27 locations) and 64 kbps connectivity to taluk headquarters.

TNSWAN Network will be linking all the Government departments to provide Voice, Data and Video connectivity for improving delivery of services to the citizens and for improving the response-time and transparency. Connectivity will be established for the 29 District HQ to Chennai and also to Taluks and Blocks using the free 2Mbps bandwidth available from Private Communication Providers (PCPs). Each PCP has to provide free Bandwidth of 2Mbps for connecting the State HQ to the District HQ, dynamic bandwidth allocation at State HQ among various Government users and also Intra District bandwidth requirements.

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<tr>
<th>Number</th>
<th>State</th>
<th>Application</th>
<th>Status of SWAN</th>
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<tr>
<td>1</td>
<td>Andhra Pradesh</td>
<td>Rural Development Department connectivity over APSWAN</td>
<td>APSWAN Connectivity to Police Department across AP</td>
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<td></td>
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<td>RajIV Project</td>
<td>APSWAN, a State-wide network for voice, data and video communication, is the basic information highway for improving government-citizen and government-industry interface. In subsequent phases, APSWAN would be extended to all 'mandal’ headquarters, other towns and eventually to all villages. APSWAN makes use of the 2MB dedicated communication network established by AP Telecom from the State Headquarters to all the Districts and the other two important centers viz. Vijayawada and Tirupati.</td>
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<td>2</td>
<td>Karnataka</td>
<td>Bhoomi MonitoringCell: would responsible for managing the centralized Bhoomi database which would be shortly hosted in the State Data Centre. Kiosks managed by an operator to assist the citizens in rural areas for accessing the services of the government. Rural Digital Services (RDS) to offer value Added services, including video conference, to citizens across the state by charging minimal costs.</td>
<td>A satellite network, which is being set up by Revenue Department would connect 177 Bhoomi Data Centres located at various taluk entres. BSNL will set up a wide area network (WAN) for the Karnataka government at an estimated cost of Rs 170-crore. The WAN called Karnataka State Wide Area Network (KSWAN) will provide 2 mbps connectivity from Bangalore to all district headquarters of the state (27 locations) and 64 kbps connectivity to taluk headquarters.</td>
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<td>3</td>
<td>Tamil Nadu</td>
<td>The pilot project called Sustainable Access in Rural India (SARI) Project was initially implemented in Melur taluk in Madurai during 2003-04. Its aim was to help villagers harness the power of the Internet for social development, wealth creation and job generation and to establish rural connectivity at a low cost. SARI was later extended to 10 more districts and renamed RASI. Touch screen Internet kiosks had been installed through public-private partnerships in all taluks of the State.</td>
<td>TNSWAN Network will be linking all the Government departments to provide Voice, Data and Video connectivity for improving delivery of services to the citizens and for improving the response-time and transparency. Connectivity will be established for the 29 District HQ to Chennai and also to Taluks and Blocks using the free 2Mbps bandwidth available from Private Communication Providers (PCPs). Each PCP has to provide free Bandwidth of 2Mbps for connecting the State HQ to the District HQ, dynamic bandwidth allocation at State HQ among various Government users and also Intra District bandwidth requirements.</td>
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<td>4</td>
<td>Kerala</td>
<td>The <strong>Akshaya project</strong>, first started in the rural Malappuram district of Kerala, India, and now spread all around the state, was the first district-wide e-literacy project in India and one of the largest known Internet Protocol (IP) based wireless networks in the world. In November 2002, the state government of Kerala put into place a project, piloted in Malappuram, with the goal for one person in every family to be computer literate in that district. Malappuram is now what is said to be India’s First E-literate District. The mission continues to make Kerala the First E-literate state in India. The project offers a lot of services in 2008: E-Pay (electronic payment of utility bills like electricity, land phone, drinking water, university fees etc.); E-Krishi (for farmers to provide online agriculture trading and information portal, A to Z Solution) E-Vidya (advanced IT learning for e-literate and others); E-Ticketing (online train, flight, bus ticket reservations); PMRY online registration; online passport registration; a village kiosk for transparent collectorate program, online communication providers for expatriate Indians; an online medical transcription course, with extension programs for all the above-mentioned services. Networking and computerising the 1214 local self-governing bodies to expedite transactions like issue of certificates, licenses, tax collection etc. Setting up internet kiosks, accessible to the public in every Panchayat ward. The government is setting up broadband Internet facility to connect all the Akshaya centers. The Kerala State mission is thinking of providing the Akshaya e-centres the facility of collecting the government revenue as part of the existing FRIENDSs project.</td>
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<td>5</td>
<td>Maharashtra</td>
<td>With a view to take the benefits of Information Technology to the common man, and as a part of its e-Governance initiative, the Government of Maharashtra had embarked on a unique project that seeks to redefine public service – SETU – which in Marathi language means a Bridge, a bridge between the people and the Government! SETU is focused on the common man and it is citizen centric. Several Wide Area Networks are being created for specific tasks. No Mention on any StateWide Area Network.</td>
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The objective is to provide to the citizens of the State more and more services and information of the departments and agencies of the State and Central Governments in an efficient, reliable, transparent and integrated manner on a sustained basis.

SETU centres are citizen facilitation centres setup by publish administration at district and tehsil level, to offer computerized services such as certificates and licenses. SETU centres started operating in Maharashtra in 2001.

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<th>District</th>
<th>Initiative/governmental body/programme</th>
<th>Details</th>
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<tr>
<td>Gujrat</td>
<td>Gyan Ganga Project with nLogue Communications Pvt. Ltd: 5 Talukas commissioned, 3 Talukas final stages, 70 kiosks connected and operational. Services started: Computer education, photography, email, video-mail, video conference. E-governance, Health, Veterinary – to start soon</td>
<td>All districts HQ are linked with the Secretariat with 2 MBPS leased circuits and all Talukas (TC) linked with the District HQ (DC) with 64 KBPS leased circuits taken from Bharat Sanchar Nigam Limited (BSNL). There are at least 20 other offices at each district HQ, in the process of integration with the district wide area node (DC) through bare copper from BSNL. Each DC has 10 telephone (receive only) lines from PSTN terminating on to dialup services. In all there are 250 dialup ports available through the state enabling units/offices/individuals to hook on to GSWAN just by making a local call, from anywhere within the state.</td>
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<td>Madhya Pradesh</td>
<td>Setting up of information kiosks for providing email, internet and other value added services. The existing public grievance redressal system is being upgraded, to facilitate access to citizens through kiosks. Mandi Board has prepared a scheme to computerize its activities and for integration of Mandi network through Internet/Virtual Private Network.</td>
<td>Reliance Industries Ltd. has entered into a Joint Venture (JV) with Madhya Pradesh State Industries Development Corporation (MPSIDC). Reliance will set-up 500 information kiosks by March 31 2001, and 7,300 more in the following year. 80% of these kiosks would be set-up in rural areas for which Reliance will lay an optical fibre cable network of 4500 km in the State.</td>
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<td>West Bengal</td>
<td>Government-to-citizen portal: Anybody can download non-saleable government</td>
<td>The West Bengal State Wide Area Network (WBSWAN), which serves as the backbone for</td>
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forms and avail many more facilities through the Internet. 82 information kiosks have been created to provide services at a nominal fee. Three major hospitals have been connected to rural hospitals to provide the benefits of their quality healthcare facilities to the rural populace. The systems operate on conventional telephone lines/ISDN—mostly on store and forward technology with live video and data session support. Almost 1,500 people have been treated so far. A GIS databank is being developed to reach the smallest of municipal areas.

9 Himachal Pradesh

The State Government has recently taken up the implementation of LOKMITRA project on a pilot basis in Hamirpur District. The project envisages the setting-up of a District-wide INTRANET with Servers at the District headquarters, connecting 25 Citizen Information Booths located in the rural areas throughout the District.

The State Government, as a part of its comprehensive Information Technology Plan and for E-Governance, is creating a State Wide Area Network (HPSWAN), which will also be connected to the Internet. This State wide computer network will link all the district headquarters with the State headquarters.

10 Pondicherry

Information Village Research Project: The project was implemented by the M.S. Swaminathan Research Foundation, for Pondicherry fishermen. Computers were placed in the village center and connected to the Internet, through which regular weather reports of the Indian astronomical office could be accessed. The weather report is broadcast by loudspeakers and through VHF radios which enabled fishermen to determine low and high tide before sailing off to the sea to fish.

Technology for the Internet access was based on a hybrid of 2-way VHF radio and the wired public telephone network, providing integrated voice and data communication capability. The data transmission was restricted to a maximum speed of 14.4 KBPS on the wireless, where Email (SMTP) or fax protocols were used. Through a PBX (office intercom-style), every village center could be connected to this hybrid network. To overcome power outages, a hybrid system of solar photovoltaic panels and grid power, interfaced by a commercially available digital circuit, was used as source of power.
IV. CONCLUSION AND FUTURE SCOPE

Information and Communication technologies are transforming all human activities. ICT is a powerful and productive system which can accelerate economic and social development in rural areas. To empower the rural communities with a sustainable approach, ICTs have been one of the most effective instruments. The following table provides a better insight into this fact:

**Strengthening rural governance**: With the introduction of ICTs in rural India, there has been a big change in rural governance. It has improved transparency, accountability and administrative efficiency of rural institutions. This has led to not only a better participation of the rural people in the decision making process but also to an improvement in the efficiency and responsiveness of the rural service delivery. It has facilitated a speedy, transparent, accountable, efficient and effective interaction between the rural citizens. As a consequence, it has not only promoted a better administration but has also saved time and transaction costs of government operations.

**Encouraging social transformations**: For any kind of developmental process, access to information is of utmost importance. With the growth in ICT, the flow of information and knowledge beyond the border of economic and social status has received an impetus. In this context, ICTs are now widely recognized as a critical tool to tackle development issues in any developing country which ultimately leads to social transformation.

**Ensuring a better quality of life**: The application of ICTs can help to alleviate the living standards of people in remote and rural areas by providing important commercial, social and educational benefits. ICTs can strengthen the livelihood opportunities for rural people by expanding the use of government services.

ICT can ensure a better quality of life for the rural poor with an improved access to markets, health and education. This in turn will push rural India towards economic development, job-creation and poverty-alleviation.

**Strengthening the information-base of rural communities**: The queries generated by the local needs of the rural people can be satisfied using the ICTs. Moreover, support to local governance can also be provided. ICTs can help to enlighten the rural people regarding their rights, entitlements and the availability of various government schemes.

REFERENCES


