

Impact of ICT in Rural Development: Perspective of Developing Countries

Jayita Pramanik^{1,*}, Bijan Sarkar², Shyamalendu Kandar³

¹Department of Education, Moyna College, Purba Medinipur, West Bengal, India

²Department of Education, University of Kalyani, West Bengal, India

³Department of Information Technology, Indian Institute of Engineering Science and Technology, Shibpur, Howrah, West Bengal, India

*Corresponding author: pramanikjayita@gmail.com

Abstract Information and communication technology (ICT) can be thought of as an umbrella under which there reside communication system, device and applications. Main importance of ICT is given to its ability to provide greater access to information and communication to the populations and the quality of service provided than the technological backbone required. Rural development includes economic betterment of people as well as greater social transformation to eliminate poverty, ignorance and inequality of opportunities. In developing countries a large number of people are resident of rural area, thus rural development program is a necessary aspect. Use of information and communication technology can contribute a lot in socioeconomic development of rural area. In the current communication we have mainly focused on rural education, agriculture, health care facility, disaster and emergency response and E-governance facility in rural areas of developing countries.

Keywords: ICT, rural development, developing country

Cite This Article: Jayita Pramanik, Bijan Sarkar, and Shyamalendu Kandar, "Impact of ICT in Rural Development: Perspective of Developing Countries." *American Journal of Rural Development*, vol. 5, no. 4 (2017): 117-120. doi: 10.12691/ajrd-5-4-5.

1. Introduction

Information and Communication Technology abbreviated as ICT consist of Information technology, enterprise software, audio-visual system, middleware using which user can access, store, transmit and modify information as required. Exponential growth of internet user, invention of modern communication devices, significant development in cloud and grid computing etc. have helped ICT to flourish as an rapid developed technological field in the last decade [1]. Mass use of information and communication technology with proper guidance helps a nation to create information rich society and helps in supporting livelihoods [2]. According to world bank report about 46.147% of world population are from rural area and for developing countries like India, China, South Africa, Bangladesh, Indonesia the percentage is 67, 44, 35, 66 and 46 respectively. Rural development is a systematic ongoing process of improving the quality of life by socioeconomic well being of the people living in rural areas. In this work we have mainly concentrated on the improvement of education, agricultural process, health care facility, disaster management, tourism (if exist) etc. with the help of Information and communication system and thus contributing towards economical growth and changing quality of life.

An analysis has been made by Shalni Gulati on technology enhanced learning in developing nations [3]. Author focuses on education gaps, success and challenges

of open and distance learning and recommends the need of a uniform policy to incorporate new inventions related to ICT in primary education infrastructure in rural areas. A detailed discussion on ICT enabled rural education on Indian perspective is discussed in [4]. According to the author a 24 × 7 online learning platform, with tele/videoconferencing among multiple groups of geographically dispersed learners may contribute a lot in rural education. Rahaman et. al. [5] have analyzed the impact of ICT on socio-economic condition of rural areas of Bangladesh and highlighted the drastic growth in use of mobile, computer and internet to rural people. A current research [6] proposed a framework of using ICT for the rural development of South Africa. Authors have examined the known implementation failures of using ICT and proposed a model containing goal determination and plan for sustainability. Some literature review of ICT based rural development model for South Africa are available in [7,8]. China has world largest population and a large percentage of that are inhabitants of rural area. The country has adopted ICT as a catalyst for its rural development and boosting the quality of life. A large scale survey on middle and schools in China [9] reveals that use of ICT is diminishing the gap between urban and rural area. Though the report has suggested to build proper ICT infrastructure to bring more number of people to ICT based education. Growth of rural economy of China with availability of ICT is highlighted in [10]

Agriculture is the backbone of the rural economy. Rao [18] proposed a framework for implementing ICT for

agriculture development in India. Role of information technology for agriculture and rural development in Kenya is available in [19]. Role of ICT in farmer decision making according to the supply chain model is discussed in [20]. A plenty of researches [21,22,23,24] pointing the role of ICT in agricultural sector are available in literature. ICT enabled rural financial service of China is discussed in [11]. Almamy et.al. [12] discussed the barriers and success factors of implementing ICT in developing countries. Authors have grouped the barriers into eight possible critical success factors and compared the degrees of severity of those.

To provide service to a big percentage of people maintaining quality of service a strong backbone infrastructure is required. The bottlenecks for setting up the infrastructure are geographical location, changing climatic condition; civil infrastructure factor, per human capita etc. and those are very significant for developing countries especially in rural area. In [13] authors have critically analyzed the factors affecting the ICT expansion in Latin American countries. Opportunities and challenges for ICT implementation in agricultural sector mainly in India are addressed in [14]. Several technical issues related to infrastructure built up for ICT are available in [15,16,17].

In this current communication we have mainly pointed some fields like education, agriculture, health, economic, disaster management etc. which are keenly related to rural development. Organization of rest of the paper is as follows. Section 2 focuses on the infrastructure for ICT, section 3 puts light on the use of ICT in rural education. Role of ICT in rural healthcare is discussed in section 4. Section 5 contains ICT in agriculture. Use of ICT in disaster management in rural areas are enlighten in section 6. Finally conclusion is drawn in section 7

2. Infrastructure for ICT

To provide quality service using ICT a strong infrastructure backbone is required. Infrastructure backbone includes workstation, high speed network, Projection/Display technology, interactive devices, video conferencing equipments, printer etc. For mobile workstation devices like laptop, tablets, notebooks are essential. In hill area or island where setting up wire network is costly, there wireless network infrastructure is the best choice. The workstations must have a focused coverage and publicly access. It aims to provide free service or service at low cost. Those must be set up in some convenient locations, accessible in walking distance. Selection of proper application software and graphical user interface (GUI) are important for smooth operation using ICT. Now a days Cloud computing are becoming popular to provide support to a large number of users without buying individual software copy. The services provided by cloud computing may be thought as 'whenever and whatever needed'. It reduces the implementation and maintenance cost. Software as a service, Platform as a service and infrastructure as a service are various cloud computing models as per the user requirement. Technical support is also a part of the infrastructure to keep the backbone in proper health. Knowledgeable technicians in the field of IT community

must be staffed to provide the technical support. They can be grouped into problem solver and problem preventer. Technical Support acts as a liaison with vendors on technical matters.

3. ICT in Education

Education is the backbone of the nation. In many developing countries bringing a large percentage of students to education system is a great challenge. The reasons may be the geographical location, socio-economic condition etc. As example the north east states of India many villages are scattered in impassable hill regions, West-indies and Filipinos are mainly scattered islands. Poor transport facility discourages the rural students to come to school regularly. Scarcity of efficient teacher in the rural schools and a large student teacher ratio to the student side is also a reason for dropout of a large percentage of students in the midway of their education. Thus a great mismatch of education quality is observed when comparison is made with rural and urban students. Adoption of ICT in education can minimize the gap. Role of a teacher is shifted from leader to facilitator in ICT based education system. Adoption of ICT in teaching system enable and support the move from traditional 'teacher-centric' teaching styles to more 'learner-centric' methods. A diverse group of students can learn simultaneously even in the absence of teacher. An online repository must be maintained for accessing the study materials 24x7. There must be facility for teleconferencing, video conferencing with experts and for this a certain pre defined time span must be broadcasted to the target learners. A pre assigned interactive session may provide the opportunity to the geographically diverse learners to interact with each other. Internet and World Wide Web open the door of the wealth of learning materials in variety of subjects- thus can be thought as an any time anywhere library. Achieving higher education from rural areas is a great challenge. Most of the male has to contribute to their family income in their pre-youth and the girls are got married. ICT based distance learning facility can help a lot in providing higher education to the rural students. Not only in primary or higher education, anytime anywhere feature of ICT helps to provide adult education in the rural area. Online vocation training in engineering fields like civil, electrical, computer, mechanical etc. prepares experts in rural areas who can easily handle the rural needs in people's daily life activities.

4. ICT in Healthcare

The medical facility is the mostly neglected section in connection to the rural people. In the perspective of developing countries there is no health center, even not a degree holder doctor available in each village. In many rural hospital there is no full time doctor. Even the doctors do not want to stay in rural areas due to lack of facility, opportunity, poor communication facility etc. For this reason the rural people depend on the quackish even on ojha for health issues. This gives an alarming figure of child death and mother death in rural areas. ICT has a

great role to play in health section in rural areas. Adoption of telemedicine in some rural areas of India has given an encouraging result for its accessibility, affordability and availability. With this ICT based facility a small E health kiosk with a trained person can provide medical facility to a large number of people. When a patient is brought to the health kiosk, he enters the health details and problems of the patient to a central server. The server communicates with some doctor in district or urban hospital. The person at the kiosk communicates with the doctor to the other side and performs check up and gives medicines according to the instructions of the doctor. By video conferencing doctor sited at some urban health center can face to face talk with the patient. Facility of pathological center is inadequate in rural areas. Even in some health centers the pathological instruments are kept unused. Recruitment of some trained persons (Not pathologist or radiologist) can operate the instruments and the captured images or results from some patients are sent to some radiologist/pathologist for analysis using ICT facility. For any major problem a patient can take appointment of any doctor or clinical center located in urban area using ICT. The health centers can also help the serious patients to get appointment of a doctor of any district or major government hospitals with the help of ICT.

5. ICT in Agriculture

Rural economy is mostly depends on agriculture. Agriculture provides a square meal for filling the stomachs of the growing population of a country, and this has made it critical for global stability and development. Even with a noticeable growth in industrialization, agriculture still accounts a major part in GDP of developing countries. But till in many rural areas the farmers are cultivating same crops years after years, while in the mean time the weather, soil condition of the land are changed, the pest have acquired immunity against the known pesticides -resulting a declined production graph. ICT can transform the common agriculture process to a smart one. With the help of ICT based service a farmer can directly seek advice in his own language from some agricultural expert. He can apply online for soil test and get suggestion from experts regarding the type of crop which will give best production to that type of land. In developed countries ground sensors set up in agricultural field are used for crop protection. The sensors provides information to the farmer regarding the necessity of irrigation, deficit of mineral (To select appropriate amount of fertilizer), increase of pest etc. Adoption of this technology can provide a better production in developing nations. Use of satellites and remote sensors provides accurate weather forecast even a month ago. This gives farmer a long time for crop selection for a season. He can seek for improved seed, best market price for his production, government's credit program etc. from internet. Bulk purchasing policy of some multinational companies directly from the farmer has eliminated the role of middleman as well as providing beneficiary to the cultivators. Different state governments in India have adopted the facility of bringing fresh vegetables directly to urban kitchen from farmers' field. ICT has given wings to these initiatives.

6. ICT in Disaster Management

Natural calamities or Disaster is unpredictable and can occur at any place irrespective of the developed, developing or underdeveloped country. Severe natural disaster leads to massive destruction of properties and even loss of human lives- effect of which remains as a scar for a long time. It is experienced that a large scale natural calamity impacts more severely to the developing or least developed countries than the developed one. Devastation of 2004 Tsunami at Indian coastal regions or 2015 Nepal earthquake are some of the examples which tremble the world. It is observed that rural areas are mostly affected than urban areas in natural disaster mainly due to poor transportation and communication facility. In relation to natural disaster for some cases like cyclone, flood, tsunami, volcanic eruption etc. an early warning system can be setup using remote sensing technology. An earlier forecast helps people for preparedness and to take safe shelter. This may save a lot of lives and properties from destruction. As examples tsunami warning facility in Japan, Indonesia; cyclone warning facility of Cuba, Mexico, USA have brought life loss figure to single digit even zero. Proper use of ICT tools help to build knowledge warehouses and data warehousing techniques. Those can facilitate planning and policy decisions for preparedness in right time, quick response and recovery at all levels. Communication system is largely affected by natural disaster which makes the situation worse. GIS based system is governed by satellite and can easily identify the location of any person having the system(May be mobile phone) and stuck in the disaster. GIS with GPS have been found useful in 2013 sudden flood in Uttarakhand, 2014 flood in Kashmir and even in 2015 Nepal earthquake. Ham radio is an ICT component for emergency communication in disaster affected areas. Remote sensing technique and satellite data may be useful for measuring the ground water situation, which provides a early warning of draught situation. Plan and strategies for relief work for the inhabitants and farmers like well-digging, setting up submersible pump, choosing crop which can grow in less irrigation etc. can be started. Setting up of earthquake sensor can provide a warning for volcanic eruption.

7. Conclusion

The impact of ICT in the rural development of the developing nations are discussed in this paper. The authors have mainly focused on the role of ICT in education, agriculture, healthcare and disaster management of rural area. ICT is an examined key for development of the geographically scattered rural people in developed nation and it is getting its popularity in the developing nations. The primary cost for establishment and set up of ICT infrastructure may be a barrier for developing nation but its enormous usefulness for the rural people can not be denied. Though education, agriculture, healthcare etc. are common to all rural regions, but there are several other sections like tourism, banking and finance etc. in which ICT also has a great role to play.

References

- [1] Khalil, Mohsen, and Charles Kenny. "The next decade of ICT development: Access, applications, and the forces of convergence." *Information Technologies and International Development* 4.3 (2008): pp-1-6.
- [2] Kumar, Abhay, and Krishna M. Singh. "Role of ICTs in rural development with reference to changing climatic conditions." *ICT FOR AGRICULTURAL DEVELOPMENT UNDER CHANGING CLIMATE*, Krishna M. Singh, MS Meena, eds., Narenda Publishing House (2012).
- [3] Gulati, Shalni. "Technology-enhanced learning in developing nations: A review." *The International Review of Research in Open and Distributed Learning* 9.1 (2008).
- [4] Roy, Niraj Kumar. "ICT-Enabled Rural Education in India." *International journal of information and education technology* 2.5 (2012): pp 525-528.
- [5] Rahman, Atiqur, et al. "ICT impact on socio-economic conditions of rural Bangladesh." *Journal of World Economic Research* 2.1 (2013): pp 1-8.
- [6] Mamba, Malungelo Siphiosami Njinga, and Naomi Isabirye. "A framework to guide development through ICTs in rural areas in South Africa." *Information Technology for Development* 21.1 (2015): pp 135-150.
- [7] Krauss, Kristin, and Marita Turpin. "The emancipation of the researcher as part of Information and Communication Technology for Development work in deep rural South Africa." *The Electronic Journal of Information Systems in Developing Countries* 59 (2013). pp 1-21.
- [8] Johnston, Kevin Allan, et al. "ICTs for the Broader Development of South Africa: An Analysis of the Literature." *The Electronic Journal of Information Systems in Developing Countries* 70 (2015).
- [9] Lu, Chun, Chin-Chung Tsai, and Di Wu. "The Role of ICT Infrastructure in Its Application to Classrooms: A Large Scale Survey for Middle and Primary Schools in China." *Educational Technology and Society* 18.2 (2015): pp 249-261.
- [10] Oreglia, Elisa. "ICT and development in Rural China." *Information Technologies and International Development* 10.3 (2014): pp-19.
- [11] Zhu, Ying, et al. "Key Characteristics of Rural ICT Service Innovation: A Case Analysis of ICT-Enabled Rural Financial Services in China." *Transforming Rural Communities in China and Beyond*. Springer International Publishing, 2015. pp 143-166.
- [12] Touray, Almamy, Airi Salminen, and Anja Mursu. "ICT barriers and critical success factors in developing countries." *The Electronic Journal of Information Systems in Developing Countries* 56 (2013).
- [13] Ngwenyama, Ojelanki, and Olga Morawczynski. "Factors affecting ICT expansion in emerging economies: An analysis of ICT infrastructure expansion in five Latin American countries." *Information technology for development* 15.4 (2009): 237-258.
- [14] Meena, M. S., Krishna M. Singh, and R. K. P. Singh. "ICT-Enabled Extension in Agriculture Sector: Opportunities and Challenges in Climate Change Situation." *ICTs FOR AGRICULTURAL DEVELOPMENT UNDER CHANGING CLIMATE*, KM Singh, MS Meena, eds., Narenda Publishing House (2012).
- [15] Firdhous, Mohamed, Osman Ghazali, and Suhaidi Hassan. "Cloud computing for rural ICT development: Opportunities and challenges." *Computing, Electrical and Electronics Engineering (ICCEEE)*, 2013 International Conference on. IEEE, 2013.
- [16] Masud, Md Anwar Hossain, and Xiaodi Huang. "An e-learning system architecture based on cloud computing." *system* 10.11 (2012).
- [17] Bo, Yifan, and Haiyan Wang. "The application of cloud computing and the internet of things in agriculture and forestry." *Service Sciences (IJCSS)*, 2011 International Joint Conference on. IEEE, 2011.
- [18] Rao, N. H. "A framework for implementing information and communication technologies in agricultural development in India." *Technological Forecasting and Social Change* 74.4 (2007). pp 491-518.
- [19] Muriithi, Anthony Gikandi, Bett Eric, and Ogalleh Sarah. "Information technology for agriculture and rural development in Africa: Experiences from Kenya." (2012).
- [20] Ali, Jabir, and Sushil Kumar. "Information and communication technologies (ICTs) and farmers decision-making across the agricultural supply chain." *International Journal of Information Management* 31.2 (2011) pp 149-159.
- [21] Glendenning, Claire J., and Pier Paolo Ficarelli. "The relevance of content in ICT initiatives in Indian agriculture." *International Food Policy Research Institute Discussion Paper* 1180 (2012): 1-40.
- [22] Mittal, Surabhi. "Modern ICT for agricultural development and risk management in smallholder agriculture in India." *CIMMYT*, 2012.
- [23] Camargo, Anyela, et al. "Intelligent systems for the assessment of crop disorders." *Computers and electronics in agriculture* 85 (2012): 1-7.
- [24] Mittal, Surabhi, and Mamta Mehar. "Socio-economic factors affecting adoption of modern information and communication technology by farmers in India: analysis using multivariate probit model." *The Journal of Agricultural Education and Extension* 22.2 (2016): 199-212.