ICT Based Applications to Support Rural Development in India – A Review

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ABSTRACT

A brief review was done based on the literatures available and the findings from these research studies are used to evaluate its effectiveness on rural livelihood upliftment, poverty alleviation and implications for education and further research. Rural development in India is one of the most important factors for the growth of the Indian economy. Even after seventy years post-independence, India has not been able to come under "developed nation", instead the nation is still developing. Public administration, governed by bureaucratic structures that dominated the twentieth century has failed to respond to the changing requirements of the present times. ICT plays a prominent role in strengthening societal development and helps to speed up the developmental process and can also bridge gaps between the educationally and technologically backward and forward sections of society. Various e-governance projects have attempted to improve the reach, enhance the base, minimize the processing costs, increase transparency and reduce the cycle times. For example, the introduction of computer and e-chaupal, radio farm forum, community radio, and ministry of rural development mobile apps such as shramik bandhu, janmanrega, meri sadak app, etc., are some of the initiatives by the government that have up to some extent been able to bring the rural population in contact with technologies. There are great opportunities for ICT application that help in democratic and sustainable development of rural India. This review mainly focuses on various ICT-based applications and their role in the Rural Development of India.

KEYWORDS: Information, communication, development, poverty, empowerment, marginalized, e-chaupal, janmanrega

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1. INTRODUCTION

According to the United Nations, rural development is defined as a procedure of change that unites the efforts of the people with those of government authorities to improve the economic, social and cultural conditions of communities (Roldan et al., 2023) and to enable them to contribute fully to national development (Robinson, 2024). It is a process of bringing change among the rural communities to transform them from conventional lifestyle to contemporary way of living (Brown and Schafft, 2011). It implies the financial growth, improved social status and justice, and improvement in their standard of living by providing adequate and quality social services as well as minimum basic amenities (Chethan and Mayya, 2015). The recent action plan of rural development focuses mainly on economic upliftment for poverty mitigation, improving employment opportunities, providing basic amenities and accommodation facilities through innovative programmes of remuneration and self-employment (Fatima, 2020; Kapur, 2019; Shehu, 2018).

The rural population (% of total population) in India was reported at 64.61 % in 2021, according to the World Bank collection of development indicators who are mostly dependent on the stressed agrarian economy. After independence, rural India was characterized by severe poverty, illiteracy, lack of health facilities, lack of job opportunities, etc., and above all backwardness. The current approach to rural development focuses primarily on poverty alleviation, better livelihood, arrangement of essential convenience, and infrastructural facilities. Rural areas are often seen as poorly informed and the provision of information has often been a key component for rural development (Van et al., 2017). In India, the Ministry of Rural Development is the supreme body responsible for making policies, regulations and acts related to rural sector advancement (Gangopadhyay et al, 2008). Development of socially and economically backward class is an important agenda of the Government (Kumar and Singh, 2012). Literature states that Information and Communication Technologies (ICT) plays a prominent role in strengthening societal development and it also helps to speed up the developmental process and can also bridge gaps between the educationally and technologically backward and forward sections of society (Bandyopadhyay, 2021). ICT is being used by the government and non-government organization for developing the rural and urban areas. It is one of the fast developing technological fields in the global society. Anonymous (1956) reported that the five-year plans of the union government mainly aims at rural development which is a coordinated plan of growth, and poverty alleviation. These have been of prime consideration in all the five year plans (Gupta, 2024). We know that the concepts, methods and applications involved in ICT are constantly evolving in our daily lives. The application of ICT is a paradigm shift from the traditional approaches that the government has been using past so many decades (Rodney, 2020). With the use of ICT, the government renders services and information to the public using electronic means like TV, radio, mobile, etc. (Rangayasami and Kannan, 2022). These apps have inherent provisions for sharing of information to its citizens in reference to its implementation. For any schemes to be executed citizen awareness is must and it serves as a key for efficient, effective and transparent execution (Wright, 2019). The awareness of ICT can escalate the interest of people belonging to rural areas which indirectly impacts the rural economy and aids in rural development which is a major issue for developing countries like India (Shaktawat and Swaymprava, 2024). The challenges that exist in using ICTs in rural development, such as illiteracy, language barrier, acceptance of new technologies, high costs of ICT infrastructure, low incomes, lack of policies to enhance ICT development in rural areas, and lack of necessary skills to use the technologies, unethical use of ICTs needs to be resolved. The assessment of information and service needs of rural people should also take gender differences into account (Peng, 2024). Paradigm shift from an employment-oriented to a sustainable and productive life support ensures greater public involvement (Kovács and Lopes, 2010). In this literature review we will overlook into the Information and Communication Technology (ICT) and its role in the development of rural India.

2. ICT BASED APPLICATIONS

2.1. Radio farm forum

Radio Farm Forum was an initial effort in the application of radio for rural development. The first trial was undertakenby All India Radio (AIR) in five districts of Maharashtra from February to April 1956 (Mukherjee, 2011). Rural listener groups were organized to listen to radio broadcasts followed by discussion of what they listened and understood. The cumulative impact assessment showed positive outcome of this forum. Radio listening led to an increase in knowledge across illiterates and literates, agriculturists and non-agriculturists, and all (Torres and Manyozo, 2020; Chowla, 1983).

2.2. Satellite instructional television experiment (SITE)

It is an experimental satellite communication project, designed collaboratively by NASA and the Indian Space Research Organization (ISRO). It is known to be one significant techno-social communication experiment in the field of education and rural development (Nair, 2007; Rani, 2006). Through this project, informational television

programs became availableto rural India with the aim of educating the economically and socially backward and illiterate people via satellite broadcasting. It also aimed to assist India in achieving technical experience in satellite communication (Naganathan, 1985). Initially, the one-year experiment was undertaken between August, 1975 and July, 1976 with the purpose of providing direct broadcasting of instructional and educational television in 20 districts in Madhya Pradesh,Rajasthan, Orissa, Andhra Pradesh, Bihar and Karnataka (Naganathan, 1985). The programs were produced by AIR and broadcasted by NASA's ATS-6 satellite stationed above India (Singh and Narayanan, 1985). It provided TV programs to rural adults on better agricultural practices, news, medical health and family welfare (Gupta, 1995; Bhuiyan, 1992). India then launched its own satellite program INSAT satellite in 1981 after previous experiences and positive gains.Later on, a series of INSAT satellites were launched and are being used for nationwide TV telecasts for education, entertainment and developmental purposes (Nagendra, 2016; Baskaran, 2001).

2.3. Community radio (CR)

CR focuses on issues related to agriculture, health, education, environment, rural and community development. As per the Ministry of Information & Broadcasting, 47 CR stations were employed in India by 1 November 2009, including 45 campus-based stations run by educational institutions and two community-based stations run by non-governmental organizations (Sethi et al., 2012). Till December 2009, the number of community radio stations operated by civil society groups had gone up to seven, including Sangham Radio (Pastapur, Medak District, Andhra Pradesh), Mann Deshi Tarang (Satara, Maharashtra), Radio Mattoli (Wayanad, Kerala), Radio Bundelkhand (Orchha, Madhya Pradesh), Kalanjiam Samuga Vanoli (Nagapattinam, Tamil Nadu), Namma Dhwani (Budikote, Karnataka) and Barefoot (Tilonia, Rajasthan) (Devi, 2012; Ghosh, 2011).

2.4. Anna FM

It is India's first campus community radio station that became functional on February 2, 2004 by Anna University, Chennai. The listeners of Anna Radio are low and middle-class communities from the nearby urban clusters in a 5–10 km range of Anna University. Esther S. Kar'sstudies inferred that the radio stations played a significant role in empowering women socially, economically and politically. Social empowerment took place in terms of knowledge and skill development. It happened at both the individual and the collective level. Political empowerment happened in terms of knowing the Panchayat representative and voting in assembly as well as general elections. Economic empowerment occurred by acquiring working skills through radio, and freedom to disburse money ultimately resulting inan increase in their income. Community radio has given voice especially to women and marginalized communities. Anna Radio's women's empowerment is significant among the CR listeners (Kar, 2010).

2.5. Sangham radio

Sangham Radio is the first community-based radio station, licensed to a non-government organization (NGO) and launched on 15 October 2008 at Pastapur village, Medak district in the Indian state, Telangana. This radio station broadcasts on 90.4 MHz, licensed to the Deccan Development Society (DDS), an NGO that works with the economically weak groups of Dalit women (Goswami and Kashyap, 2021). The term 'Sangham' implies village-level women's collectives. It intends to communicate to the excluded in general and to women in particular. The radio comprises 11 journalists (women reporters), who do ground reporting by visiting each village and then discussing their problems and two radio programmers, mostly from the Dalit community. The radio broadcasts to a radius of 25 km including about 100 villages and to a population of around 50,000 (Nirmala, 2015). The radio was running on contributions of Rs 50 per individual from the villagers, along with other funding sources. But now, there's no funding available. It is on the verge of shutting down due to a financial crisis. The DDS is looking to crowdsource funds from Milaap to keep it alive and serve its community.

2.6. Namma dhwani

Namma Dhwani (Our voices) of Karnataka is the first cable community radio station in India. It came into effect in March 2003. It was launched in partnership with the Budikote community, and a couple of NGOs, i.e. MYRADA and VOICE with funding provided by UNESCO (Nirmala, 2015). VOICE is committed developing communication and capacity-building support whereas, the Budikote community performed activities relating to broadcast production. The listeners of this CR are mainly uneducated women, who have little access to information. Thisis a functional Community Multimedia Centre, with radio, video, and satellite facilities. Also, it is self-relianton locally generated revenue. Theprograms run by this CR focus on creating awareness among its listenersand enhancing the leadership qualities in women. It has created more impact on women by addressing education,health and sanitation, savings, food habits, family system, etc. (Nirmala, 2015).

2.7. Radio bundelkhand

This was India's second NGO-led community radio stationlicensed to a Delhi-based NGO named 'Society for Development Alternatives'started on 23 October 2008 in Orchha, Madhya Pradesh. It broadcasts on 90.4 MHz for four hours a day.

2.8. Manndeshi tarang

CR station Manndeshi Tarang was established on 16 December 2008 in Maharashtra by Mann Vikas Samajik Sanstha, an NGO working for the empowerment of rural and marginalized women (Nirmala, 2015). It provides relevant programming aimed at enriching civic and cultural life. The CR is operated under the guidance of the Mann Deshi Foundation but is owned by the Mhaswad village community, Satara, Maharashtra, and surrounding coverage areas. This CR station has proved to be useful to women by increasing their knowledge, showcasing their talent, and motivating them in various aspects (Iyer and Vats, 2018; Yalala, 2015).

2.9. Jagriti e-sewa

It was made to help the functioning of sustainable community-owned, citizen-centric ICT projects in rural and semi-urban areas across the country. The first Jagriti e-Sewa was inaugurated in March, 2003. The services are made available to the people by computer kiosks located at the center point in the villages where a sizeable flow of people on a regular basis occurs so that one Kiosk can serve up to a radius of about 3 km (Gorla, 2009). 'Kiosk Franchisee' -typically an educated youth or an ex-serviceman from that area owns and operates the kiosk. The franchisee receives a part of the revenue collected from the services rendered. Since the use of credit cards for payment isn't feasible in many rural areas, Jagriti developed a strategy called d-commerce, where'd' stands for 'desi'. In this model, the franchisee at the kiosk collects money and the service is provided electronically or physically. Payment may be rendered by Value Payable Post (VPP) or money order. It conducts studies in rural and semi-urban areas about the services and products that are lacking in specific areas. These studies are supervised by Jagriti on its own or are subsidized through academic/research institutions. If the studies conclude a positive contribution to the lifestyles and economy of these areas, the identified services or products are added to the Jagriti e-Sewa model.

2.10. Survey app

A mobile application called Survey is used to collect data like pavement condition, road defects tracking and road works required to be taken by the contractor for road contracting. This application is well suitable for community contracting since the budget involved in this contracting is very low and this application is handy in regular maintenance of rural roads. A person carrying a mobile with a pre-installed application and simple tools like a measuring tape was traveled by means of a bicycle or motorbike along the selected rural road from starting to end seeking any road defects that need to be repaired under community contracting. The person stops wherever he finds a road defect and loads data regarding the defect in the mobile application.

2.11. Gram panchayat development plan (GPDP) portal

The main features of the GPDP Portal are: Provision to schedule special gram sabha, assigning facilitator to a gram sabha, SMS/email-based notifications, facilitator feedback form, provision to upload images and mobile (android) application for GPDP (Verma and Kumari, 2010).

2.12. Mission antyodaya mobile app

Mission Antyodaya mobile application is used for the digitization of Gram Panchayat data. The objective of the Mission Antyodaya mobile application is to survey and collect the village infrastructure data for all the villages in the Gram Panchayat using the mobile app on 143 questions covering 29 development sectors enlisted in the eleventh schedule of the Indian constitution (Sinha, 2023; Misra et al., 2021; Elamon et al., 2021).

2.13. PHD-MSME app

PHD-Micro Small and Medium Enterprises (MSME) is a mobile app, created by PHD Chamber of Commerce with the help of students from Delhi University in 2018. It focuses on the MSME sector and provides solutions to beginners and existing MSME entrepreneurs from different areas like marketing, finance, training and capacity building, different government schemes and opportunities.

2.14. National test abhyas app

The National Test Abhyas app is launched by National Testing Agency (NTA) to help students withNational Eligibility cum Entrance Test (NEET) and Joint Entrance Exam (JEE) Main 2020 preparation is a hit among students. Approximately 45% of users belong to semi-urban and rural areas,out of which 37% are those who have no access to private institutes. This app includes mock tests for national-level entrance exams like JEE Main and NEET. Students can appear in a mock test daily. Artificial intelligence (AI) is used to observe the candidate'sperformance and also to monitor the strengths and weaknesses of the aspirants.

2.15. Computerized rural information system project (CRISP)

The District Rural Development Agency (DRDA)with the assistance of CRISP focused on observing the poverty abatement. Till now four versions of this software have been developed of which Rural Soft was the latest. Rural soft was among the beginning efforts of e-governance in India, which aids in web-based invigilation of the poverty alleviation schemes and also helps in monitoringthe works of various agencies.

2.16. Rural kiosk machine (RKM)

RKM is kiosk that contains and presents information in Hindi as well as in local regional languages. It depicts stored

information in text, audio and video information, livestock, market prices, weather forecast, health, etc. This machine consists of user-friendly interface in the local language having all the required information needed for the rural community. All the related information is updated on an hourly basis by using a wireless connection by ICT-Resilient Distributed Datasets (RDD) department which will take information from the concerned department. Its installation is sponsored by the Ministry of Information Technology (IT). It is connected directly through a wireless connection to the ICT-RDD. All the RKM Machines are operated centrally through the ICT-RDD Department.

2.17. SVC-APP (Smart village campaign mobile app)

Punjab Rural Development and Panchayat Minister launched the Smart Village Campaign mobile app in December, 2019. The aim is to bring transparency and get feedback from the citizens regarding the small village projects. The app is bilingual (English and Punjabi). The objective of the app is to put information in the public domain for development works being taken up in villages by the department. The app has a citizen interface which permits any citizen to check project status under the campaign in the state.

2.18. Soochnalaya of gyandoot

Gyandoot was started in various Gram Panchayats of Dhar district in Madhya Pradesh in January, 2000. It is owned by the rural intranet system called 'Soochnalaya', as it helps to fulfil the needs of villagers in the district. The unemployed educated rural youth were trained and they ran the Soochnalaya and are known as Soochaks. They provide various types of information related to agriculture, education, health, issues related to women, and information about the market, and a user fee is charged for all this. They are connected with dial-up lines through the internet. Above 600 villages and approximately 50% of the total population of a district are covered by the network of 31 such Kiosks. They work to make application for the services provided by the district headquarter for landownership. (Ruikar, 2020; Dixit et al., 2007)

3. MINISTRY OF RURAL DEVELOPMENT MOBILE APPS

3.1. Gram samvaad

A citizen-friendly mobile app to serve and empower the rural communities of India, by promoting single window access by citizens to information and relevant data at Gram Panchayat level on several Rural Development programs, covering inter-alia program objectives, scope and performance.

3.2. Janmanrega

It is a citizen-centered mobile app that provides an interface to improve the quality of public services under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

3.3. Meri sadak app

A citizen-centric mobile app to enable users to give their feedback related to the progressand quality of works, etc. of Pradhan Mantri Gram Sadak Yojana (PMGSY) roads to the Nodal Departments in the State Governments/National Rural Roads Development Agency (NRRDA). The app is launched under the Pradhan Mantri Gram Sadak Yojana and Bharat Nirman initiative. The app allows citizens to lodge complaints about poor road infrastructure in rural areas. Using Meri Sadak, rural people can get road-related issues solved in 60 days.

3.4. Kaushal panjee-skill register

Kaushal Panjee is a citizen-centric mobile app for Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDUGKY) and Rural Self Employment Training Institutes (RSETI) where rural youth can register free of cost and connect to training partners and banks working with the Ministry of Rural Development.

3.5. GSA 18

GSA 18is a public-centered mobile app which is specially made to monitor the events organized for the rural areas during Gram Swaraj Abhiyan (14th April 2018 to 5th May 2018).

3.6. NREGA soft

NREGASoft is a web-enabled management information system conceptualized by the National Informatics Centre (NIC), along with the Ministry of Rural Development and other stakeholders to address the planning & monitoring needs of the NREGA scheme. The first version of NREGASoft was launched along with the launch of the scheme in 2006. NREGASoft is a regional language-enabled workflow based e-Governance system and is available in both offline and online modes to look after the activities under NREGA at the center/state/district/block as well as panchayat level. A highly customized interface is provided to each stakeholder of NREGA e.g. an illiterate worker is provided with sound based, icon-based, touch screen kiosk model to access information on the portal to enforce the right-based framework of the law. The state, districts, and gram panchayats have local language interface whereas the Ministry works in English language.

3.7. Awaas soft and awaas app

A citizen-centric mobile app to inspect and report the houses constructed under Pradhan Mantri Awaas Yojana-Grameen (PMAYG) or other rural housing schemes for implementation and monitoring of program. AwaasApp is a mobile application used to monitor real-time, evidence-based progress of house construction through date and time-stamped and geo-referenced photographs of the house. All payments to beneficiaries are done through

Direct Benefit Transfer (DBT) to the beneficiary's bank/ post office accounts registered in AwaasSoft MIS. The geo-tagged photograph of the recipient in front of the dwelling unit, their address and the proposed site on which the beneficiary proposes to build the house should be captured using AwaasApp and uploaded on AwaasSoft. At the time of registration of the beneficiary on AwaasSoft, details of bank account, name of nominee, MGNREGA job card number of beneficiary and Aadhar number are captured.

3.8. Mobile vaani

Gramvaani (a social tech company incubated out of IIT-Delhi) worked on a mobile-based platform called Mobile Vaani. The concept of Mobile Vaani is like community radio but using a phone. Mobile Vaani is a social media information-sharing platform for social development in rural areas. It provides an intelligent IVR (interactive voice response) system that allows rural and low-income people to call a number and leave a message about their community, local announcement, problem, or report about malfunctioning of govt. schemes such as PDS (Public Distribution System) and MNREGA or listen to problems or messages left by other people. From agriculture to health information, from bringing accountability in local governance to conducting e-commerce, to information on employment, the platform is expected to address all such issues. The Mobile Vaani network spans 20 districts in Bihar, Jharkhand, and MP. Mobile Vaani basically works on 4 categories of contents (a) Culture and entertainment-folksongs, poetry competition, (b) Information-health or agriculture-Question and Answer, (c) Feedback on govt. schemes- problems & feedback on the implementation of schemes (d) Local updates & announcements - youth fair, local career fair, etc.

3.9. P-notice board mobile application

P-Notice Board mobile application has been developed by the Department of Panchayat & Rural Development, Govt. of Chhattisgarh, to send messages by authorized persons to panchayat and common citizens. If any information is issued by Panchayati Raj Institution, registered citizens will receive an SMS with the subject of the information. On this app, a person has the option of taking printouts of notice too. The citizens can have access to both recent or old information issued by his/her gram panchayat or any other PRI (Primary Rate Interface) from anywhere in India.

3.10. Shramik bandhu

To help migrant labourers and daily wage workers after the COVID-19 pandemic lockdown, Vikas Bansal, Co-founder of Prakriti E-Mobility along with Shailesh Dangwal, Director from Prishitech, launched an app "Shramik Bandhu" which is an employment generation platform for the skilled and unskilled workforce in India. It offers distinguished categories across manufacturing, construction, hospitals, garments and leather, power and steel, construction, and automobile. Worker skills include carpenters, domestic helpers, gardeners, drivers, masons, electricians, plumbers, and more. The aim was to connect labourers with sectors such as construction, manufacturing, transportation, agriculture, and hotels to help a worker get employment according to skillset and location, and help companies fulfil the human power shortage. It is available across India and has benefitted a lot of labour in finding jobs during the pandemic and later.

3.11. E-gram swaraj portal

Prime Minister Narendra Modi launched the E-Gram Swaraj Portal on April 24, 2020 on National Panchayati Raj Day. The portal can be accessed at egramswaraj.gov. in. The platform provides records of the developmental works of villages from planning to implementation in every village panchayat under the Gram Panchayat Development Plan. Monitoring and recording the work help accelerate the implementation of projects in rural areas.

3.12. Rozgar setu portal (employment bridge portal)

The portal was launched on June 10, 2020, during the Covid-19 pandemic. The 'Rozgar Setu' portal of Madhya Pradesh facilitates permanent employment to migrant workers according to their skills and efficiency. In this, all migrant labourers as well as employers have been registered. This includes large industries, MSMEs, labour contractors, builders, placement agencies and commercial institutions. The vacancies are posted by the employers on the portal. The selection process is based on qualifications and experience of the migrant workers.

3.13. Rural access to services through the internet

Tamil Nadu has modified and renamed its Sustainable Access in Rural India (SARI) project as Rural Access to Services through the Internet (RASI).The objective was to provide both telephone and Internet through Wireless in Local Loop technology developed by the Telecom & Network Group at IIT Madras. The project was undertaken in collaboration with Harvard's Center for International Development, IIT Madras and the MIT Media Laboratory to show that viable markets exist for information and communication services in rural poor areas by using innovative technologies, impact assessments and creating business models.

3.14. Champions

Champions, abbreviated ascreation and harmonious application of modern processes for increasing the output and national strength, is a tech-driven control room-cum-management information system launched on May 9,

2020 by the MSME, Government of India with the aim to support enterprises. The portal is for expanding the smaller units by addressing their grievances, motivating, aiding and handholding. The system is validated by Artificial Intelligence, Data Analytics and Machine Learning besides ICT tools, including telephone, internet and video conference.

3.15. iDream learning app

Aide et Action in partnership with iDream Education started a free digital learning mobile application "iDream Learning App" that serves the K-12 education segment. The mobile application intends to provide free, uninterrupted access to learning while staying at home and enable holistic development for children residing in rural areas. The initiative was launched in the wake of the lockdown triggered by the COVID-19 pandemic, which has led to the closure of schools, leaving digital education as the only choice to sustain the momentum of academics. Taking into account that most children in rural areas begin their education in the mother tongue, the app provides diverse content in 9 languages- Hindi, English, Telugu, Tamil, Kannada, Marathi, Gujarati, Bengali, and Oriya. The app caters to all the subjects for classes 1 to 12 with content available in the form of animated video lessons connected to real life, free activities and project making, and life skills, including a digital book library.

4. CONCLUSION

ICT is the key for rural development. Rural citizens should be educated to use ICT efficiently. Provisions should be made for subsidies in phone recharge and internet subscriptions to increase affordability. Erratic power supplies and network fluctuations should be minimized through development of necessary infrastructure. Specific local needs should be examined while designing an ICT initiative. Future studies should focus on combining connectivity and inclusion issues to shape 'customized policies' for poorly connected and digitally excluded rural communities.

5. REFERENCES

Alston, P., 1979. The United Nations' Specialized Agencies and Implementation of the International Covenant on Economic, Social and Cultural Rights. Columbia Journal of Translational Law 18, 79.

Anonymous, 1956. Plan, S.F.Y., Planning Commission, 1956. Government of India. New Delhi, 1-6. Available at: https://jalshakti-ddws.gov.in/sites/default/files/xiplan_bharatnirman.pdf.

Bandyopadhyay, S., Bardhan, A., Dey, P., Bhattacharyya, S., 2021. Bridging the education divide using social technologies, Springer.

Baskaran, A., 2001. Competence building in complex systems in the developing countries: the case of satellite building in India. Technovation, 21(2), 109–121.

Bhuiyan, S.I., 1992. Satellite communication and rural development in a changing Asia: Policy Issues. Media Asia, 19(4), 191–199.

Brown, D.L., Schafft, K.A., 2011. Rural people and communities in the 21st century: Resilience and transformation. Polity Press. ISBN-13:978-0-7456-4127-0 (hardback) ISBN-13: 978-0-7456-4128-7 (paperback).

Chowla, N.L., 1983. Change: an Indian overview. Media Asia, 10(2), 79-83, Available at DOI: https://doi.org/10.1080/01296612.1983.11726112.

Devi, L.M., 2012. Empowering women through alternative media. In -International Conference on Interplay of Economics, Politics and society for Inclusive Growth, Royal Thimpu College, Bhutan.

Elamon, J., Sukanya, K.U., Ganesh, A., Yadhu, K.R.S., 2021. Evaluation of the incentivization of panchayats scheme of mopr the report. Available at: http://dspace.kila.ac.in:8080/jspui/handle/123456789/672.

Fatima, S., 2020. Government sponsored programmes of poverty alleviation and employment generation in India: A study of multi-dimensional programmes to combat rural poverty and urban poverty upto eleventh successive five year plans. Globus - An International Journal of Management and IT- 12(1), 46–65.

Gangopadhyay, D., Mukhopadhyay, A.K., Singh, P., 2008. Rural development: A strategy for poverty alleviation in India. India Science and Technology (Online). Available at SSRN: https://ssrn.com/abstract=1473041.

Ghosh, A., 2011. Initiatives in ICT for rural development: An Indian perspective. Global Media Journal: Indian Edition 2(2), 1–8.

Gorla, N., 2009. A Survey of rural e-Government projects in India: Status and benefits Information Technology for Development 15(1), 52–58. Available at DOI: https://doi.org/10.1002/itdj.20064

Goswamy, P., Kashyap, S.K., 2021. NGO based community radio stations: mobilizing community voices in rural development. Journal of Community Mobilization and Sustainable Development 16(3), 799–804

Gupta, P.C., 2024. Indian economy and structural reforms: e-Book of Indian economy and structural reforms. Thakur Publisher.

Gupta, V.S., 1995. Third revolution in Indian perspective: Contemporary issues and themes in communication. Concept Publishing Company.

Iyer, K. and Vats, A., 2018. Community radio as force

multiplier of financial empowerment for rural women: a case study of alfaz-e-mewat. International Journal of Advance and Innovative Research 5(4)(XIV), 166–169. ISSN 2394–7780. Available at: https://www.researchgate.net/publication/329424070_an_analysis_of_various_training_evaluation_models#page=181

Kapur, R., 2019. Rural development approaches and strategies. Acta Scientific Agricultural 3(7), 167–173.

Kar, E.S., 2010. Social impact of community radio stations in India: enhancing participatory development and women empowerment. Indian Institute of Management Bangalore. Available at: https://repository.iimb.ac.in/handle/123456789/9290.

Kovács, I., Lopes, M.C., 2010. Employment and sustainable development: education, training and R&D in the regulation of the labour market, Instituto Superior de Economia e Gestão–SOCIUS Working papers nº 9/2010. Available at: http://hdl.handle.net/10400.5/2555.

Kumar, A., Singh, K.M., 2012. Role of ICTs in rural development with reference to changing climatic conditions. ICT for Agricultural Development under Changing Climate. In: Krishna, M., Singh, M.S., Meena (Eds.), Narenda Publishing House.

Manoj, D., Belwal, R., 2007. E-panchayats: A case for democratizing decentralization. In: Menon, S. (Ed.), Panchayati Raj: Perspectives and experiences. India: ICFAI Books, 56–76. ISBN-13:978-8131412039.

Chethan, Mayya, S., 2015. Role of non-governmental organisation in rural development: a study in Dakshina Kannada district. Sumedha Journal of Management 4(4), 27. ISSN: 2277-6753 (online). Available at: https://www.indianjournals.com/ijor.aspx?target=ijor:sjm&volume=4&issue=4&article=003

Misra, D.C., Sharma, M., Mittal, P.K., Hariharan, R., Sengupta, S., Khaneja, M., Rajiv, G., 2021. Digital transformation of rural governance and service delivery. In - Citizen Empowerment through Digital Transformation in Government, 61–84. Chapman and Hall/CRC.

Mukherjee, S., 2011. Application of ICT in rural development: Opportunities and challenges. Global Media Journal, 2(2), 1–8.

Naganathan, K.D., 1985. An analytical study of India's satellite instructional television experiment. Oklahoma State University.

Nagendra, N.P., 2016. Diversification of the Indian space programme in the past decade: Perspectives on implications and challenges. Space Policy 36, 38–45.

Nair, T.S., 2007. Development communication in india an institutional perspective. In - Understanding Development Communication, Edited by Jacob Srampickal, Arul Aram, Media House, Delhi, 163.

Nirmala, Y., 2015. The role of community radio in empowering women in India. Media Asia 42(1-2), 41–46.

Peng, X.Y., Fu, Y.H., Zou, X.Y., 2024. Gender equality and green development: A qualitative survey. Innovation and Green Development, 3(1), 100089. DOI: https://doi.org/10.1016/j.igd.2023.100089

Rangayasami, A., Kannan, K., 2022. Information and advanced technology applied at agriculture and livestock development. In Agro-biodiversity and Agri-ecosystem Management, 323–339. Singapore: Springer Nature Singapore.

Rani, N.U., 2006. Educational television in India. Discovery Publishing House.

Robinson, G.M., 2024. Building the rural future and alleviating rural poverty. In Transforming Rural China. Edward Elgar Publishing, 225–252. Available at DOI: https://doi.org/10.4337/9781803928586.00015

Rodney, B.D., 2020. Understanding the paradigm shift in education in the twenty-first century: The role of technology and the Internet of Things. Worldwide Hospitality and Tourism Themes 12(1), 35–47.

Roldan, C.S., Giraldo, G.A.M., Santana, E.L., 2023. Sustainable development in rural territories within the last decade: a review of the state of the art. Heliyon. DOI: https://doi.org/10.1016/j.heliyon.2023.e17555

Ruikar, V.R., 2020. E-governance in rural India. Sanshodhan, 9(1), 86–90.

Sethi, D., Tiwari, R., Meena, L.R., Gulyani, R., 2012. Community radio for location specific knowledge management in rural India. Interaction 30(1), 54–67. Available at : https://www.indianjournals.com/ijor.aspx?target=ijor:jcs1&volume=30&issue=1&article=010

Shaktawat, P., Swaymprava, S., 2024. digital agriculture: exploring the role of information and communication technology for sustainable development. Ed. Biswajit Mallick and Jyotishree Anshuman published by PMW, New Delhi, 31.

Shehu, H., 2018. Rural development, inclusive growth and poverty alleviation: Nigerian and Indian perspectives. European Journal of Social Sciences Studies 3(3), 263–285.

Singh, J., Narayanan, K., 1985. Broadcasting-satellite service in India. IEEE Journal on Selected Areas in Communications 3(1), 233–245.

Sinha, K., 2023. From Isolated, male-dominated fiefdoms to connected and empowered hubs – the new gram panchayat. In - The future of india's rural markets: a transformational opportunity, Emerald Publishing Limited, Leeds, 67–73. https://doi.org/10.1108/978-

1-80455-822-520231037

Torres, C.S., Manyozo, L., 2020. Asian contributions to communication for development and social change. In: Servaes, J. (Ed), Handbook of communication for development and social change, 421–441. Springer, Singapore. ISBN 978-981-15-2014-3. DOI: https://doi.org/10.1007/978-981-15-2014-3_22

Van der Ploeg, J.D., Renting, H., Brunori, G., Knickei, K., Mannion, J., Marsden, T., De Roest, K., Sevilla-Guzmán, E., Ventura, F., 2017. Rural development: from practices and policies towards theory. In- The Rural, Routledge, 201–218.

Verma, R.K., Kumari, A., 2010. E-governance at grassroots level in South Asia: a study of citizen-centric e-panchayats in India. Asia-Pacific Journal of Rural Development 20(1), 131–150.

Wright, V., 2019. Reshaping the state: the implications for public administration. In- The State in Western Europe, Routledge, 102–137.