

# Information and Communication Technologies (ICTs) for Inclusive Human Development: A Review

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## Abstract:

**I**nformation and Communications Technologies (ICTs) adoption is increasing globally for human development because of its potential affect in many aspects of economic and societal activities such as GDP growth, employment, productivity, poverty alleviation, quality of life, education, clean water and sanitation, clean energy, and healthcare. Adoption of new technologies has been the main challenge in rural areas and is the main reason for the growing gap between rural and urban economy. The work related ICT use have also yielded mixed results; some studies show the individual's perceived work-family conflict, negative cognitive responses e.g. techno stress while others show increased productivity, improved job satisfaction and work-family balance due to flexible work timings. This paper attempts to understand the role of ICT in human development areas of health, education and citizen empowerment taking into consideration of digital divide which exists in geographic area and within the communities through literature review.

**Keywords-** Education, Empowerment, Health, Human Development, ICT

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## I. INTRODUCTION

The concept of human development was introduced by United Nations development programs (UNDPs) in 1990 with a paradigm shift from national income as the only indicator of development to expanding the choices people has [1]. There are six basic pillars of human development: equity, sustainability, productivity, empowerment, cooperation and security [2-3]. In 2000, United Nations made a commitment to achieve eight millennium goals to eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS and other diseases, ensure environmental sustainability, develop a global partnership for development to promote human development. In 2015, United Nations made a commitment to achieve 17 Sustainable Development Goals built on the successes of the millennium development goals to “eradicate Poverty in all forms everywhere”, “end hunger, achieve food security and improved nutrition and promote sustainable agriculture”, “ensure healthy lives and promote well-being for all at all ages”, “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”, “achieve gender equality and empower all women and girls”, “ensure availability and sustainable management of water and sanitation for all”, “ensure access to affordable, reliable, sustainable and modern energy for all”, “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”, “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”, “reduce inequality within and among countries”, “make cities and human settlements inclusive, safe, resilient and sustainable”, “ensure sustainable consumption and production patterns”, “take urgent action to combat climate change and its impacts”, “conserve and sustainably use the oceans, seas and marine resources for sustainable development”, “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”, “promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels”, “strengthen the means of implementation and revitalize the Global Partnership for sustainable development” [40].

When we say development, development has different meaning in different domains like Economic, Social and environmental. The ultimate objective of development is to improve people's life. In the context of human development, it can be defined as the process of enlarging people's freedom and opportunities for improving their well being. It is about the real freedom ordinary people have to decide who to be, what to be and how to live [4]. The Centre of human development is to develop the capabilities to live happy and prosperous life in violence free society, having control on owns life and ability to participate in the process of decision making which directly or indirectly has impact on one's life. Basic capabilities, which everyone would like to include: good health, access to knowledge, and a decent material standard of living. An unprecedented progress in human development has taken place in last 2-3 decades with better living standard, quality education, health and people have access to basic social services [5].

Since we are currently living in the era of unprecedented technology development and the pace of scientific and technology knowledge is very rapid in developed/developing parts of the world, the Information and communication technology (ICT) can play a vital role to reach these development goals. The impact of information and communication technology (ICT) has been in all walks of life particularly in sectors of education, health and living standard which are the parameters to measure human development index. It has the potential to fill the learning gap through distant learning. It can act as means of learning resource material access and distribution. ICT can offer new possibilities in the area of health care through telemedicine to fill the gap of medical facilities in Rural/Urban, new ways to citizen empowerment through participation of citizens in social and governance level ([6]-[7]).

## **II. ICT AND HUMAN DEVELOPMENT**

In today's world of information rich society, ICT has potential to provide digital opportunity for social, economical and environmental development. Information is power. In the era of information, people with access to information are more powerful that who are deprived of it. ICT can bring in depth information to those who are deprived of information, which can help them in social and economical empowerment. It has potential to open up the channel of speedy and rational decision making for more transparent and inclusive government. It has potential to form strong social network for the human development. It can provide ways for inclusive growth through e-commerce. It can act as engine for the distribution of knowledge in the areas of health and education, the key parameters of human development index defined by world organization (UNDP) in their Human Development Reports. There is direct link between information and development. The information can act as a catalyst in providing alternative options available for doing various jobs. Wealth of knowledge can be accessed through internet and this information can be beneficial for human development. The challenge is of capacity building to handle the ICT technology.

There are three main dimensions defined for Human Development.

**Longevity:**-The ability to live a long and healthy life.

**Education:**-The ability to read, write and acquire knowledge.

**Command over Resources:**-The ability to enjoy a decent standard of living and have a socially meaningful life [8].

When a person is living healthy life with less number of illness episodes over a long period, it gives a feeling to him of a well-being. As per saying "Healthy mind lives in Healthy Body" make a person to look the life with a positive attitude. It makes a person to work hard and lead a useful life.

Possession of high level of education with technical skills makes a person aware about what is happening in society to play a role of good citizen. It helps a person to become professional, which is a mean of empowerment. Socially deprived person becomes enabled to be part of mainstream of the society after attaining the high level of education.

In economic terminology, well being of the human being is measured in terms of per capita income/expenditure. It is the indicator for sustaining a decent standard of living. In other words, having a reasonable income enables a household to experience the benefit of economic well being and lead a socially meaningful life. The development of nation, organization and people can be measured by Human Development Index, which is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have decent standard of living.

Information and Communication Technology (ICT) are crucial for creation of knowledge based economy and plays an important role in accelerating the pace of economic growth and promoting sustainable

development. The usage of ICT is making the difference between nations, organizations, communities and people.

### **III. METHOD**

The present study is mainly qualitative, explorative, and descriptive in nature utilizing a wide variety of secondary data collected from various research papers, Government Publications on human development. An overview of the impact of ICT on the different sectors of life is presented in section IV with discussion of the barriers to adoption of ICT in general in section V.

### **IV. IMPACT OF ICT ON DIFFERENT SECTORS OF LIFE**

#### **A. Impact on Health**

There is a great challenge for the well being of people and public health care system. There is direct relationship between health and economics. Public health facilities in developing countries like India are not sufficient to meet the challenge of good health care for the people of country. Private sector is the primary source of health care in urban and rural areas of the country. The main reason is the poor quality of health care in public sector, which burden the out of pocket expenses for treatment [9]. The demand for better health care is increasing. e-Health, which describes the application of Information and telecommunication technology to various functions of the health sector from doctors to the hospital manager, Nurses, Data processing specialist and of course patients, is one of the options to meet the health's quality challenge. e-health provides the opportunities to the citizens for improved access to better health system. It empowers patients through information to take responsibility for their own health and quality of life, which reduces the health care cost by reducing the frequency of ill health. The use of e-health technologies improves the collaboration between patients and medical professional for prevention and treatment of diseases. ICT can reshape the health care delivery mechanism to make it citizen-centric ([10]-[11]). Lives can be saved, patient care processes can be improved in cost effective manner through e-health.

ICT for health systems includes health Information Network, Electronic Health Record, and Telemedicine services. Health portal and other ICT based tools for disease prevention, diagnosis, treatment, health monitoring and life style management. ICT can be used to facilitate two way information exchanges in health care between providers and receivers; provide access of latest health information to the lower strata of society and feedback to health official about ground level health issues.

ICT can play a vital role as instrument for continuous education that will enable doctors to be informed and trained in the use of advances in medical services and knowledge. It can be used to increase the transparency of governance and hence improving the availability and delivery of public health services. The specialist support can be provided to the people of remote area through tele-consultation, leading to reduction in reallocation of the specialist. In case of epidemics, information can be shared of treatment practices and guidelines with health care professionals, researcher and policy makers. Facilitating intra and inter governments co-ordination on health care enhancing government planning, increasing health awareness and methodology of disease prevention contents across all the departments.

ICT is being used in many developed/developing countries to facilitate remote consultation, diagnosis and treatment. It has potential to extend the scope of clinical services, data can be captured from various sources and analyzed and can help in improved treatment programs, without moving doctor to patient or vice versa. In rural part of the developing countries, such as India where the specialized treatments are almost nonexistent in rural area with 70% population, patients can seek advice from the distant specialists [12]. One way of this can be video conferencing.

The use of ICTs in medicine has been common in developed countries for several decades but in the developing countries such as India with more than 60% population with low financial resources living in rural area, where the health facilities are not in good shape, has a great potential for telemedicine. The health system database created by accumulated data can be analyzed and the information can be used by health practitioners and policy designers [13]. The efforts have been done by the private and public sectors in this area like Apollo Aragonda Project, Fortis Health Care, WockHardt, Heartcare India New Delhi etc ([14]-[15]). There is number of leading telemedicine consultancies in India like online telemedicine Research Institute Ahmedabad, Medisoft telemedicine Ahmedabad, Tata Consultancy Services etc.

Although telemedicine has enormous potential to reach a large number of people, and technically feasible but the critical success factors include affordable, reliable and high speed net connectivity. It can be made economical viable with the support of Government and sharing services using the same infrastructure. Social acceptance of e-health technologies among the citizens and medical professional needs to be strengthened which may act as key pillar under digital India programme. Some of initiatives under e-health under taken in India; National health portal, e-aushadhi, asha soft of Rajasthan, Hospital management information systems (HMIS) of various states; e-mamta of Gujarat [13]. A Number of Mobile Apps such as Dr Path Lab, Credihealth, Tweet2Health, MedciExpress, HealthonPhone have been developed in the field of health.

### **B. Impact on Education:**

ICT in context of education is defined as “diverse set of technologies tools and resources used to communicate, to create, disseminate, store and manage information. These technologies involve computer, internet, radio, television and telephone. The online information offered by ICT has immense potential to fill the gap of learning resources particularly in developing world ([16]-[18]). ICT can act as tool to enhance learning, which is visible across the world. Changes are taking place in the nature of educational system. Teacher centered education system is being replaced with learner centered environment. Learner centered environments are those that “pay careful attention to knowledge, skills, attitude and beliefs that learner bring with them to the classroom”. Learners are not passive receivers, rather the knowledge is created through an active process in which the learner transforms information, constructs hypothesis and makes decisions using his/her mental models [19].

The communication between teacher and learner is done through e-mails, on line lectures and even with video conferencing. As a result ICT has created new possibilities for “reaching the un-reached” and feasibility of education for life long. These trends can imply a revolution provided efforts are made in developing appropriate technologies for the delivery of education.

The capacity of ICT to reach learners in any place and at any time is bringing revolutionary changes in traditional class room teaching. The demand based learning material is available to the learners. Learners can interact with teachers and peer groups without much of constraints.

The interactivity through ICT can help the teacher to understand better learner’s needs, performance, make more effective assessments and develop improved system of certification. ICT helps in improving, motivating, facilitating acquisition of basic skills and preparing the individuals for technology driven world. On the teaching side, ICT enhances the quality because teachers can use technology tools for their training and up gradation of knowledge, skills and teaching methodology regardless of their geographical distances [20]. The education provider can manage the learning resources efficiently at lower cost by sharing the resources.

The use of ICT in education is not without challenges. The digital revolution has created dilemma for the “less educated”. On one hand it creates job opportunities and on the other hand it requires high skills, which learners do not have. There is distinct need for utilizing technology to serve those on the “downside of privilege”.

In ICT infrastructure, computer plays a major role but the computer being the tool, themselves brings very little to the learning process. ICT alone does not have special power that would revolutionize the education. It is the teachers and learners commitment to use the powerful tool, can improve learning process. There is no substitution for formal schooling. The role of technology is supportive not of the replacement. Technology can play a part to the children or adults, who cannot go to school, can meet the different learning and training needs of the society. Computer simulation, video – Audio, conferencing along with educational TV and Radio have the potential to reach to large audience.

**1) Use of ICT in Distance Learning and Non Formal Education:** Traditional way of teaching requires more space and resources, which can be reduced while using ICT in reaching out to the learners in remote areas. Provisions can be made to reach children through distance education in the developing world. ICT based distance education has been used to overcome time, space and geographic restriction, allowing teachers and learners to interact and share the resources using network technologies. Distance education platform for Primary, Higher and Vocational education have been created. Such on line schools offers excellent teaching and systematic curriculum resources, better resources management and access to best teaching resources. This holds good for countries such as India and China where millions live in remote/rural areas. Distance education has proved successful in countries such as China, India, Indonesia, Thailand etc ([21]-[23]).

There are number of specific projects experimenting with the use of ICT in education in India. For instance, in 2004, the Government of India announced an ambitious program titled 'ICT@school', to create computer laboratories with Internet access facility across 1.08 lakhs schools. The scheme of ICT @school is subsumed in rashtriya madhyamik shiksha abhiyan (RMSA) [24].

National digital Library of India [41], Study Webs of Active Learning for Young Aspiring Minds (SWAYAM) [25], Saransh, i-share for India [26], e-pathsala [27], National programme on Technology Enhancement Learning (NPTEL) [28] are some of the initiatives under Digital India Programme.

Distance Education in formal and informal environment has helped to raise the quality of education and contributed to economic and social development in most countries, where these initiatives have been taken. It has helped to reach the remote communities and provide education to marginal sections of society.

The education with the help of ICT can improve the female education without disrupting the cultural tradition in the male dominated societies. TV/Radio/Internet based technologies enables the girls to continue their education from home or small centers.

The impact of ICT in education services is increasing. Although the teaching through ICT involves the large initial cost for setting up network technologies but because of its reach to larger number of people, the cost/person will be lower than traditional way of teaching.

Although ICT plays a significant role in learning through effective, relevant and flexible mode to the un-reached sections of the society but it requires a total paradigm shift in teaching methodology. This shift needs to be taken into consideration before shifting to new method of teaching. There are various factors which should be taken into consideration like infrastructure limitations, localized contents, cost of installation and maintenance, learning skills, literacy level, age, gender of the learner. One of the major challenges in usages of ICT in education is training of teachers in new environment. Teachers needs new learning environment. It requires paradigm shift for teachers from passive instructors to active instructors. This is required because ICT will make some teaching resources obsolete. Teachers will need to reappraise the methods by which they meet children's learning needs.

In order to do so, a holistic approach comprising of training (skill, knowledge, delivery) access to ICT resources, provisions of localized supportive environment for teachers is required for the effective implementation of new teaching methodology.

### ***C. Impact on Living Standard:***

In order to lead a decent living, one needs money apart from health and education. Constant economic growth will increase the per capita income, hence the living standard. All the new technologies used to restructure production and increase productivity can, reduce the level of poverty. As such it can raise the per capita income and contribute to reduce the income disparity for example, the Green Revolution which is no doubt is a success story in India as far as agriculture productivity and economic growth are concerned. For the diffusion of technology, the access and spread of information play an important role. Community efforts play a crucial role in the process. This has happened in case of Green Revolution where large number of farmers were given the information.

In order to address the issue of human deprivation worldwide, ICT directly or indirectly offers a great promise. It can help directly through employment generation for the poor section of the society. Indirectly, it can reduce the costs of delivery of information and services.

Radio used to be very popular ICT tool for information in Urban/Rural poor section of society because of low cost, usage requires less skill and flexibility in the content and language for delivery of information. Evidence suggests that access to relevant and timely information through radio helped in poverty reduction. The radio penetration in rural area has been replaced by television to large extent but still radio has found new audiences both in rural and urban areas. Another ICT instrument, which helps in development projects, is telephone whose role has further strengthened with mobile technology. One such example, in which telephone is called as successful story is Gramin Bank's village pay phone initiatives. Gramin Bank is a village based micro finance organization in Bangladesh. The women members were given the loan to buy cellular phone. They can further rent out to other villagers in the villages on commercial basis, which has helped in income generating activity. This initiative has proved that ICT can help provide goods and services that directly benefit the poor [29]. When we look at modern ICT including the internet, we can use this technology in poverty

alleviation through helping small and medium farmers to improve the farming practices and increase their revenue by providing them access to information of agricultural know how and market development, improving the marketing for the products of artisans in rural area thorough e-commerce, providing rapid and effective communication during disasters.

The farmer can be provided information about the significant economic contents such as agriculture products real time price, weather, pest control/ agriculture extension water use, social management, live stock management, availability of micro credit, govt. subsidies and grants. These timely information will help the farmer in getting better prices for their produce by bye-passing the middleman, farmers can have judicious discussion about what crops to be produced where to sell and the produce and buy the inputs.

**1) Impact on Agriculture:** Some of the ICT based initiatives for providing information to people associated with agriculture are: Call centers, National Agriculture market (NAM) [30] , Agmarknet (AGMARKNET) [31], National Portal for agriculture [32] etc.

## **V. BARRIERS RELATED TO ICT ADOPTION AND IMPLEMENTATION**

ICT adoption and implementation issues at individual level can be categorized into different perspective representing age, cost, anxiety about the use of technology, and low computer ability [33-35] , whereas at organizational level (firms, NGOs, MNCs etc) the barriers to ICT adoption are financial capital, skilled manpower and technology Upgradation [36]. The companies working at very low margins have very limited educational and technological initiatives. The other factor which acts as barrier to ICT adoption is infrastructure bottleneck which includes electricity, IT penetration, teledensity, poor digital connectivity, integration and its IT enabling policies to transform India as knowledgeable society. Illiteracy, poverty and unemployment in India are a big factor for creation of digital divide which may also act as barrier to technology adoption and implementation. Digital divide may be defined as the gap that exists between those who have and those who do not have access to technology (telephones, computers, Internet access) and related services; digital divide exists between those in cities and rural areas, educated and uneducated, economically well off and deprived classes; developed, developing and least developed countries. Digital divide may also be explained on the basis of race, gender, geography, economic status, physical ability; in access to information; in skills, knowledge and ability to use information and other technologies etc. ICTs may act as one of the enabling tool to bridge the gap between digital divide through connectivity provision, content creation, capacity augmentation, cost reduction, competence building, community participation etc ([37]-[39]).

## **VI. CONCLUSION**

There is no doubt that ICT can act as catalyst for the Human Development by generating more employment opportunities and by increasing productivity, reducing cost and enhancing economic return. The usage of ICT is skill dependent, which can be obtained through literacy and education which comes in the way of adoption by the under privileged groups of the society, negating the aspects of Human Development. In order to provide quality education to the under privileged groups, the scope of supply side of education in cost effective manner should be achieved. ICT has the ability to fill the gap of supply side of quality education in the cost effective manner over a wide geographical area but its use needs a new teaching paradigm. There are number of issues which should be dealt with before shifting to new teaching methodology such as cost of infrastructure installation, localized content availability, literacy level of learners, socio – culture aspects, teacher training in using ICT etc. ICT can also act as an enabling tool to bridging the digital divide too and finds a step towards human development.

## **REFERENCES**

- [1] Human Development Report, Published for United Nations Development Program, New York (1990).
- [2] Hirai, Tadashi, "The Creation of the Human Development Approach", Springer (2017).
- [3] About Human Development, 2017, [Online]. Available: <http://www.measureofamerica.org/human-development/>
- [4] (UNDP) Human Development Report. 2016. Page 3. [Online]. Available: [http://hdr.undp.org/sites/default/files/2016\\_human\\_development\\_report.pdf](http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf).
- [5] (UNDP) Human Development Report. 2016. Page 216-218. [Online]. Available: [http://hdr.undp.org/sites/default/files/2016\\_human\\_development\\_report.pdf](http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf).

- [6] P.C. Lila, M.V.L.R. Anjaneyulu, "Modeling the Impact of *ICT* on the Activity and Travel Behaviour of Urban Dwellers in Indian Context", *Transportation Research Procedia*, Volume 17, 2016, Pages 418-427
- [7] Arnab Jana, Noboru Harata, "Provisioning health care infrastructure in communities: Empirical evidences from West Bengal, India", *Socio-Economic Planning Sciences*, Volume 54, June 2016, Pages 37-46
- [8] National Human Development Report, 2001, State of Human Development chapter 2 page 4, [Online]. Available: <http://planningcommission.nic.in/reports/genrep/nhdrep/nhdch2.pdf>
- [9] NATIONAL FAMILY HEALTH SURVEY (NFHS-3), 2005, Chapter 13, [Online]. Available: [http://rchiips.org/nfhs/NFHS-3 Data/VOL-1/India\\_volume\\_I\\_corrected\\_17oct08.pdf](http://rchiips.org/nfhs/NFHS-3 Data/VOL-1/India_volume_I_corrected_17oct08.pdf)
- [10] Daniela Haluza, David Jungwirth, "ICT and the future of health care: aspects of health promotion", *International Journal of Medical Informatics*, Volume 84, Issue 1, January 2015, Pages 48-57
- [11] Adam C. Powell, Jasmine K. Ludhar, Yuri Ostrovsky, "Electronic health record use in an affluent region in *India*: Findings from a survey of Chandigarh hospitals", *International Journal of Medical Informatics*, Volume 103, July 2017, Pages 78-82.
- [12] Nikunj Agarwal, M.P. Sebastian, Shikhar Agarwal, "Assessing the adoption of a home health provisioning system in *India*: An analysis of patients", *Health Policy and Technology*, Volume 5, Issue 1, March 2016, Pages 74-83.
- [13] National Health Portal. 2016. [Online]. Available: <https://www.nhp.gov.in/>
- [14] Deepalakshmi, K. (2008) "Public healthcare service takes IT route" [Online]. Available: <http://www.expresshealthcare.in>
- [15] Hiramani, A.B. and Neelam Sharma. (1992), "Health Communication in India: A Policy Perspective", (pp. 262-263) in S. R. Mehta (ed.) *Communication and Development: Issues and Perspectives* Jaipur: Rawat Publications.
- [16] Johary A. (2004). The impact of instructional technology (IT) culture on developing countries In *International review*. A. Johari (Ed.). *ETR&D*, 52(3), pp. 91-111 ISSN 1042-1629.
- [17] Suat C., Ahmet Kara. "Discussion of ICT Integration within Developed and Developing World Context from Critical Perspectives", *Procedia - Social and Behavioral Sciences* 191 ( 2015 ) 56 – 62
- [18] Oksana Ivanova, "Translation and ICT Competence in the Globalized World", *Procedia - Social and Behavioral Sciences*, Volume 231, 5 October 2016, Pages 129-134
- [19] Victoria L. Tinio, 2002, "ICT in Education" [Online]. Available: [http://wikieducator.org/images/f/ff/Eprimer-edu-ICT\\_in\\_Education.pdf](http://wikieducator.org/images/f/ff/Eprimer-edu-ICT_in_Education.pdf)
- [20] Milos Maryska, Petr Doucek, Renata Kunstova, "The Importance of ICT Sector and ICT University Education for the Economic Development", *Procedia - Social and Behavioral Sciences*, Volume 55, 5 October 2012, Pages 1060-1068
- [21] Sarka Hubackova, Blanka Frydrychova Klimova, "Integration of ICT in Lifelong Education", *Procedia - Social and Behavioral Sciences*, volume 116, 21 February 2014, Pages 3593-3597.
- [22] Robert Holmgren, "Preparations for Practical Exercises in Vocational Education: Can ICT-based Distance Instruction be an Alternative to Face-to-face Instruction? An Empirical Contribution", *Procedia - Social and Behavioral Sciences*, Volume 46, 2012, Pages 1152-1161.
- [23] G Dhanarajan, "Open Educational Resources: An Asian Perspective", 2013.
- [24] (MHRD), 2016, [Online]. Available: [http://mhrd.gov.in/ict\\_review](http://mhrd.gov.in/ict_review)
- [25] (MHRD) e-pathshala, 2017, [Online]. Available: <http://mhrd.gov.in/ICT-Initiatives-e-Pathshala>
- [26] (MHRD) Saransh, 2017, [Online]. Available: <http://mhrd.gov.in/ICT-Initiatives-saransh>
- [27] (MHRD) Swayam, 2017, [Online]. Available: <https://swayam.gov.in/>
- [28] NPTEL. [Online]. Available: [www.nptel.ac.in](http://www.nptel.ac.in)
- [29] GRAMEEN TELECOM: THE VILLAGE PHONE PROGRAM. [Online]. Available: [http://siteresources.worldbank.org/INTEMPPOWERMENT/Resources/14648\\_Grameen-web.pdf](http://siteresources.worldbank.org/INTEMPPOWERMENT/Resources/14648_Grameen-web.pdf)
- [30] NAM, [Online]. Available: <http://www.enam.gov.in/NAM/home/index.html>
- [31] AGMARKNET. [Online]. Available: <http://agmarknet.gov.in/>
- [32] National Portal of India, [Online]. Available: <https://india.gov.in/topics/agriculture>
- [33] Koen Saleminck, Dirk Strijker, Gary Bosworth, "Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas", *Journal of Rural Studies* 54 (2017) 360-371.

- [34] Louis Leung, Renwen Zhang, “Mapping ICT use at home and telecommuting practices: A perspective from work/family border theory”, *Telematics and Informatics* 34 (2017) 385–396.
- [35] Prashant Palvia, Naveed Baqir, Hamid Nemati, “ICT for socio-economic development: A citizens’ perspective”, *Information & Management* (2017), <http://dx.doi.org/10.1016/j.im.2017.05.003>.
- [36] David M. Weber , Robert J. Kauffman, “What drives global ICT adoption? Analysis and research directions”, *Electronic Commerce Research and Applications* 10 (2011) 683–701.
- [37] Siriginidi Subba Rao, “Bridging digital divide: Efforts in India”, *Telematics and Informatics* 22 (2005) 361–375.
- [38] Shing H. Doong, Shu-Chun Ho, “The impact of *ICT* development on the global *digital divide*”, *Electronic Commerce Research and Applications*, Volume 11, Issue 5, September–October 2012, Pages 518-533.
- [39] Jeffrey James, ”The *ICT* Development Index and the *digital divide*: How are they related?”, *Technological Forecasting and Social Change*, Volume 79, Issue 3, March 2012, Pages 587-594
- [40] Mapping SDGs, [Online]. Available: [http://niti.gov.in/writereaddata/files/Mapping-SDGs%20V19-Ministries%20Feedback%20060416\\_0.pdf](http://niti.gov.in/writereaddata/files/Mapping-SDGs%20V19-Ministries%20Feedback%20060416_0.pdf)
- [41] National Digital Library of India, 2017, [Online]. Available:: <https://ndl.iitkgp.ac.in>