

Digital Kerala: A Study of the ICT Initiatives in Kerala State

Dr. Jacob Joju¹ and Dr. Manoj P K²

¹(Post Doctoral Fellow, Department of Applied Economics, CUSAT, Kochi, Kerala, India)

²(Assistant Professor, Department of Applied Economics, CUSAT, Kochi, Kerala, India)

Abstract

The state of Kerala in Indian union is ahead of other states in many respects. The high achievements in universal literacy, healthcare facilities, infant mortality rate, standard of living etc. area few indicators in this regard. In respect of adoption of ICT (Information and Communication Technology) and ICT-based services, including E-Governance too, the state has been quite ahead in India. As India is moving ahead with its ambitious 'Digital India' dream, this study seeks to make a closer look into 'Digital Kerala' – the ICT initiatives in the state of Kerala and it offers a few suggestions based on the findings of the study.

Keywords: Digital India, ICT, E-Governance, FRIENDS.

1. Introduction

World is passing through a new revolution called Knowledge Revolution. Much the same as the move from a hunting society to an agrarian society, thereafter to industrial society and further to post-industrial society and so on, the current turn is to a Knowledge society. This radical change is enabled essentially because of the fast advancements in the Information and Communication Technology (ICT) front, termed as ICT Revolution. These two mutually inter-related developments (viz. ICT revolution and Knowledge revolution) could bring about a radical change in the manner the businesses are being done, organizations are being administered, and governance of the states is being carried out. ICT has come up as an effective tool for development as early as the 1980s, in the developed and developing nations, both. It is noted that worldwide rapid advances in the ICT front and its rapid propagation across all sectors has resulted in radical changes in the socio-economic status of people from all walks of life (Barton and Bear, 1999; Fullantelli & Allgera, 2003; and Liu and Luo, 2003). It is noted that besides the promotion of information industry (Barton & Bear, 1999; and Bhasker, 2003), ICT could clearly support the growth of many a traditional industry and that too at all levels– local, national and global, e.g. both manufacturing and service sector concerns functioning in competitive scenarios (Barton & Bear, 1999; Wang & Hou, 2003; and Pease & Rowe, 2003). Above all, it is noted that thrust on IT-enabled activities enable industries to raise quality and also offer more delivery channels as per customer expectations (Mohammed, 2002); through transforming the marketing and production operations which are supposed to be vital for production of new products. John Paul, Robert Katz and Sean Gallagher (2004) have remarked that ICTs have immense potential to catalyze development in some of the poorest regions of the world. So, in short, ICT is widely accepted as the crucial element and vital catalyst which enables the rapid economic progress of a nation; whether as a whole or in parts. By increasing the pace of creation of 'knowledge societies' and 'knowledge economies', ICT has proved its immense developmental potential during the last

three decades or more; these developments being more prominent in the case of the newly industrialized nations and also in some of the developing countries like India.

2. Analytical Significance of the Study

In the globalized world order of today and that too in an increasingly services-sector oriented, knowledge-intensive and information-intensive market, the role of ICT as a developmental tool need not be over emphasized. This is particularly relevant in respect of a developing economy like India which is striving to become the 'global services hub', primarily by leveraging its strength in ITO and BPO sectors. Furthermore, in the specific case of Kerala state in the Indian union, the role of ICT in economic development is even more significant because of its peculiar socio-economic, industrial and political environment. This is characterized by exceptionally high level of skilled as well as technically qualified manpower, literacy rate that is almost 100 percent, very high level of NRI population and hence huge level of NRI remittances, extremely high degree of social development and living standards comparable with the advanced nations, etc.

In spite of these favourable features, it does not have a commendable track-record or even conducive climate for the healthy development of manufacturing industries in a big way, so far in its history; nor does it endowed with natural resources, whether it is land resources or mineral resources. Because of the above dichotomy – abundance of human and financial resources on the one hand but very little level of investment for economic activities on the other hand – it is widely recognized that Kerala has to depend primarily on its knowledge resource for its development. Moreover, in respect of knowledge resources with which it is richly endowed, so far there has been quite notable performance as is evidenced by significant success in its ICT initiatives; especially those in e-governance. It is in this context that a systematic study of the current ICT initiatives in the state and the potential of such initiatives to bring about economic development of the state assume special significance. This attempt becomes more meaningful when we consider 'Digital India' dream at the national level; here the attempt is to trace the progress towards 'Digital Kerala', particularly the initiatives in the E-Governance front.

3. Methodology of the Study

Methodology of this study involves extensive review of literature relating to ICT and allied aspects, particularly those on the role of ICT in economic development. The data for this study are mainly secondary data retrieved from authentic and reliable sources. These sources include, inter alia, the official publications of NASSCOM, Economic Review (Planning Board, Govt. of Kerala), Indian Economic Survey (Govt. of India) etc.

4. Objectives of the Study

- (i) To study the ICT initiatives in Kerala, their progress over the years, suitability and sustainability, in the context of the special socio-economic status of the state;
- (ii) To make suggestions for the more effective and efficient use of ICT for bringing about faster economic development of Kerala, based on the findings of the state.

5. ICT for Economic Development of Kerala: An Overview

Kerala state stands out as one of the most advanced states in India. Kerala can boast of a number of incomparable accomplishments. These include, near full level of literacy, high level of PQLI (physical quality of life index) comparable with developed countries, social development indicators that are on par with global standards. Healthcare services, educational services and public distribution system are available even in remote villages of Kerala, and the industrious nature of Kerala's population is well-known worldwide. Today Kerala is in the front line of the global trend towards attaining 'knowledge society' – Kerala's unique

socio-economic environment being very conducive towards this shift. Kerala can embrace ICT better than any other region of the developing world. So, Kerala has unique potential to create economic activities and generate job opportunities with the least pressure on land, environment and other resources. ICT could enable Kerala to create industries of modern days that are people-friendly as well as environment-friendly.

Recognizing the immense potential of ICT, the Government of Kerala has initiated many measures that use ICT as an enabler or facilitator. The use of ICT for Governance (or, E-Governance) is the first in this regard. ICT is being used for enhancing the living standards of the people and delivering a many Government services to them. Above all, ICT ensures transparency in governance of the State apart from empowering them and enabling them quicker and easier access to their information needs.

5.1. ICT Initiatives in Kerala: Some Special Advantages

Kerala's unique advantages while adopting ICT initiatives vis-à-vis the advanced countries of the world and other states in the Indian union are given below:

- (i) Being a highly advanced society, the media in Kerala enjoy wide mass base, and the high penetration of communication technologies could make it an almost 100 percent internalized State— very truly, an information society (knowledge society).
- (ii) Among the states in India, Kerala being a state with the highest level of literacy, the state has got the greatest degree of exposure to various kinds of media. So, whatever the industry prefers the most is whatever this state possesses abundantly i.e. educated people, both men and women, who seek mainly the white collar jobs.
- (iii) Kerala is the state in India with the largest percentage of its population residing outside the state. The migrants from Kerala are exposed to the best among the latest of products, services, technologies and life styles. This enables them to duly exhibit strong 'demonstration effects' on people living within Kerala state itself.
- (iv) By their very nature, Keralites possess high awareness about the most recent or the latest available and are also willing to embrace these. Due to the peculiar cultural heritage of Kerala that comprises of quite varied but very cordial religious as well as communal segments, these people possess high degree of tolerance towards other cultures, customs, etc. All these make ICT adoption easy for them.
- (v) Kerala society attaches topmost importance to education, and it is ready to make heavy investments to acquire marketable skills. So, it got one of the largest pools of graduates in engineering, science, etc. in India who can easily speak in English.
- (vi) Kerala possesses abundant availability of most of the infrastructural facilities that are needed for propagation of internet and allied ICT-based services. No other major state in India has got such a wide-ranging and elaborate network of fibre optics as possessed by Kerala. This extensive network that can reach down even to the block level. This coupled with many digital exchanges (mostly with ISDN capability) could create a strong backbone for a fully networked and intelligent state like Kerala. With the launching of the two submarine cable landings in Kochi (central Kerala), the state has become a major telecom gateway for India.
- (vii) The coastal city located central Kerala viz. Kochi (Cochin) has emerged as a prominent second-tier cosmopolitan city in India. Kochi is rapidly budding into a exclusive IT destination in India. Its unique advantages of location, infrastructure etc. have contributed to this achievement. As per a recent NASSCOM Report on 'Super ITES Destinations in India' Kochi got second rank. Further, in another NASSCOM Report on cities ideal to do business it was ranked third. Besides, Kochi has direct connection to two submarine cables as well as satellite gateways. This connection in turn is being used to cater to other cities like Bangalore. Hence, Kochi has got clear

telecom infrastructural advantage and better reliability and also reduced tariffs. Another major attraction of Kochi is the presence of 'Infopark'. It was given the status of Special Economic Zone (SEZ) in Sept. 2006 by the Govt. of India. Above all, Kochi hosts a mega IT project viz. 'Smart City' – a project of Govt. of Kerala (16 percent stake) in collaboration with M/s. Dubai Internet City (DIC), Dubai, UAE (84 percent stake). 'Smart City' project, started in 2011, is expected to offer over 33,000 job opportunities in the coming decade.

- (viii) Kerala's development experience is characterized by remarkable strides in field of 'ICT for Development' (ICT4D). Through focused initiatives, the ICT4D seeks to attain specific goals relating to investment, development of infrastructure and job opportunities created. An outstanding project in this regard is the project termed 'Akshaya'. This project strives to reach all the 64 lakh families in Kerala in its 14 districts. For the first time in India a 'Citizen's Call Centre' was opened in Kerala state – a unique achievement by Kerala's ICT4D initiative.
- (ix) In Kerala, constant rise has been noted in the use of computers and internet services, in the sale of PCs, computer accessories etc. and also in the thrust given on the state's E-governance sector. PC is growingly being reckoned as a vital tool for education and as a means of entertainment by household users. A survey by MAIT (Manufacturers' Association in IT) has revealed that the sale of hardware is fast rising in Kerala. Not less than 7 ISPs (Internet Service Providers) are operating in this state – one of the highest among the different states in India.

6. Major ICT Initiatives in Kerala and their Performance: A Review.

Electronics and Information Technology Department of the Govt. of Kerala, and Kerala State IT Mission, a society formed by the Govt., an autonomous nodal IT implementation agency could undertake many ICT initiatives in Kerala successfully over the years. At present, IT Policy 2017 gives the broad guidelines for implementing various initiatives as above. The Government have taken many bold and imaginative policy initiatives for exploiting the ever-growing opportunities in the field of ICT, with due regard to peculiar socio-economic situation of the state which is quite conducive for the growth of various ICT initiatives, as already noted. In fact, way back in the early seventies itself, the state had taken steps to promote electronics development in a big way. Thus, the formation of KELTRON (Kerala State Electronics Development Corporation) in 1972 was a landmark achievement in this direction. Keltron denotes the first state-level electronics development corporation in the whole of India. It is actively engaged in the manufacture and marketing of a wide array of electronic goods and is a leader in the manufacture of communication products. It has got the capacity of being a partner in popularizing the use of ICT in Government and also in the formation of the State Information Infrastructure. The ICT initiatives in Kerala consider ICT both as both a production sector and an enabler of socio-economic development. E-Governance part of the service sector is noted to offer immediate and the largest growth opportunity for Kerala; thus underscoring the need to stimulate market. There have been measures for promoting ICT as a production sector which consists of IT, ITES and Hardware sectors. Of these, the ITES sector offers the greatest potential for absorbing large number of graduates. But the major constraint in this regard is the lack of relevant qualities in them (like, for instance, command over English language, and also communication, presentation and other soft skills). ICT investments in Kerala over the last three decades fall under the following five heads viz. (i) Physical and Information Infrastructure, (ii) Training and other services, (iii) Industry (Hardware & Software), (iv) E-Governance, and (v) ICT for Development (ICT4D)

6.1. Physical and Information Infrastructure

Kerala State Wide Area Network (KSWAN):

Kerala has set up Kerala State Wide Area Network (KSWAN). It has got the four major components viz. (i) State Information Infrastructure with Data Centres, (ii) District Level Connectivity, (iii) Block Level Connectivity and (iv) Rural Connectivity Infrastructure. The above components of are briefly discussed in the following paragraphs.

(i) State Information Infrastructure (SII): Kerala has already launched a State Information Infrastructure (called 'DIAMOND') using the funds from the Union Govt. Accordingly, a State Information Backbone connecting the major cities (viz. Thiruvananthapuram, Kochi and Kozhikode) is set up. The free bandwidth (2 Mbps each) offered by the private service providers (viz. Reliance, Bharti and Asianet), in return for the 'Right-of-Way' given to them has been aggregated at the Data/Network centres. These Data / Network centres function on a 24x7 basis and are well-equipped with server banks which can effectively meet any sort of IT needs of the Government departments or other organizations. Apart from the above, a 5000 sq. ft State E-Governance Data Centre has also been set up at Thiruvananthapuram which consists of multiple servers along with storage/backup and other requisite facilities, all being arranged in a very highly secured environment. Besides, the Data Centres located at Kochi and Kozhikode ensure the necessary redundancy and also meet the networking needs of various Government departments in the State and other agencies. The Government departments can share/co-locate servers at the Data Centres and can manage the servers remotely as well. The above facilities offer huge savings in capital investment, as are otherwise required individually for the various Government departments and other agencies. Moreover, even wireless link has been established between the SII and almost all the major buildings that house various Government offices in Thiruvananthapuram – the State capital.

(ii) District Level Connectivity: The state has already started a project connecting all the District Headquarters to the Network Centres of the State Backbone. The above infrastructure is supposed to provide in future the facility for video conferencing between the Districts and Kerala's Secretariat and also other Govt. offices for the general public located in the capital city (viz. Thiruvananthapuram) like, Vikas Bhavan, Office of the Advocate General, Kerala House and so on.

(iii) Block Level Connectivity: Besides, District-level connectivity, the State Government has is in the process of connecting all Block Headquarters to the State Information Backbone and also the State Data centre by means of the state's KWSAN network.

(iv) Rural Connectivity Infrastructure: This infrastructure which is based on Wireless technology covering over 3,500 square kilometers has already been implemented in Malappuram district. This is supposed to be the largest IP based outdoor network in the whole globe. To this network, all police stations in each district of the state are connected.

Further, the Government is planning to connect all offices of Kerala State Electricity Board (KSEB), Revenue Offices and Agriculture Offices to this network. Moreover, to ensure the access to ICT enabled services in every Panchayath, the Government has implemented the Akshaya e-Kendra project in Malappuram District as a pilot project. Currently it is in the process of implementing the same in other panchayaths of the state as well.

6.2. Training & Other Services

Technopark

Technopark campus in Kerala was envisaged as an integrated IT set up equipped with all relevant basic and advanced infrastructural facilities which are required by the industry. Government has exempted this campus from a number of clearances and the only approval required from the State Government is the clearance from Chief Electrical Inspectorate

relating to power safety. Technopark works as a single-window contact point for obtaining almost all clearances, approvals etc. that are issued by the Government of India. In 2004, Technopark was granted ISO 9001: 2000 Certification for setting up and keeping up quality system for generation and marketing of infrastructural and other support services for the IT campus. Technopark is the first service organization that is conferred the CMMI level certification (in 2004) by Carnegie Mellon University of USA.

Infopark, Kochi:

Infopark set up at Kochi, in central Kerala is another glaring example of the bold ICT initiatives of the State Government. This is a 92 acre Park with a built up area of 3.5 lakh sq.ft. It hosts reputed IT companies which include, inter alia, Wipro, ACS, TCS, OPI, IBS and so on, the total number of companies being more than 35 at present. It provides employment to over 1400 people. The total investment here by the various companies is about Rs. 80.43 crores and the total exports from here is to the tune of Rs. 32.00 crores. Way back in Sept. 2006, Infopark has been conferred SEZ (Special Economic Zone) status by the Government of India – another milestone in the history of its achievements.

Smart City Project

‘Smart City’ is yet another major IT project of the State Government. The State Government is in the advanced level of making negotiations with the Dubai Internet City (DIC) on the setting up of Smart City at Kakkanad in Kochi. As per the current proposal, the State Government will acquire the land required by the DIC and transfer the rights to the Infopark for the purpose of promoting IT industry. The Infopark in turn will lease the land to the DIC for setting up the Smart City. A major portion of the land initially required for the project is already under the control of the Government since it is with public sector institutions such as the Kerala State Electricity Board and the Kerala Infrastructure Development Corporation.

IT Industry (Hardware & Software)

Nearly 40 ‘Spoken English’ trainers were engaged for short-term assignments for undertaking ‘Spoken English’ programmes at the Industrial Training Institutes (ITIs) in Kerala. Accordingly, around 3000 students of the 31 Government ITIs in Kerala were given training in English communication skills. Thus, 80 per cent of the students, who underwent the Call Centre training at the ITES Habitat Centre, Kochi got placement in reputed organizations.

E-Governance

Kerala has gone a long way in respect of ICT initiatives in E-governance. This is obvious from the fact that the State has been selected as the Second Best State in the entire India in E-governance implementation. This award which is instituted by Indiatech Foundation has been declared at the Telecom India 2005 Seminar in Mumbai. Apart from the remarkably high investments in E-governance among the various States of Indian Union, there are other reasons as well for Kerala to be proud of. These include, inter alia, its achievements like, having the India’s first fully computerized Panchayat, fully computerized Collectorate etc. Some of the major initiatives of the State in E-governance front are briefly discussed in the following paragraphs.

Fast Reliable Instant Efficient Network for Disbursement Services (FRIENDS):

‘FRIENDS’ is a single-window system using which citizens can pay all kinds of taxes and other financial dues payable to the Government. FRIENDS strives to provide the advantages of complete computerization of various departments of the Government to all citizens, even when the entire computerization of backend operations of such departments is not fully attained. The most glaring attribute of FRIENDS is the effective integration of IT as well as logistics with a view to provide requisite services to all citizens. Payments to various departments as well as organizations under Government of Kerala and Government of India

can be made through the FRIENDS centres. Kerala Government is in the process of replicating the FRIENDS Janasevana Kendram as sub-centres at the municipality and block levels. So, the FRIENDS centres at district headquarters could function as the district co-ordination centres for each sub centres.

E-payment facility (E-pay):

The State Government introduced an on-line bill payment facility named 'E-pay' through its Akshaya e-kendras, by way upgrading of the FRIENDS project functioning in the district of Malappuram in Kerala in Aug. 2004. At present, remittances of the Electricity bills, Telephone bills (both mobile and landline) can be made through this E-pay facility. The facility of internet banking available with the State Bank of India (SBI) is being used by FRIENDS for transferring funds. E-pay facility is being extended to other Akshaya Centres established in other districts of Kerala, in the second phase of Akshaya roll-out.

Information Kerala Mission (IKM):

IKM is another revolutionary initiative of the State. Launched in 1999 IKM is the single largest initiative for computerization relating to local bodies. It involves the usage of software developed in an Indian language in the entire country. IKM has successfully implemented Jansevana Kendras in all Municipalities, and has also piloted the Panchayath Computerisation projects in two Panchayaths (viz. Vellanad and Talikkulam) by making them the first 'Computerized Panchayaths in the country. Further, IKM is implementing another project named 'Hospital Kiosks' connecting all hospitals of the five cities of the state with the respective Corporation offices for on-line registration of births and deaths.

Secretariat Wide Area Network (Sec. WAN):

The State Government decided to set up a Secretariat WAN that connects the Secretariat, Annex building of the Secretariat, Vikas Bhavan building and the Public Office Complex – all these being situated in the capital city of Kerala viz. Thiruvananthapuram. At present, there are nearly 1400 computers installed in the Secretariat, out of which about 500 Nos. works in the networked environment as above. It is planned to enhance this facility up to 3000 in the final phase. Further, a tele-printer system for connectivity of the Secretariat to all the District Headquarters, Advocates General's Office and the office of the Special Representative in New Delhi has already been replaced by a network of computers at all these locations, called 'Internet Based Messaging System'.

Knowledge Archive System for Secretariat (K-BASE):

For enabling an effective knowledge management solution in the Government Secretariat the implementation of a Knowledge Archive System (K-BASE) is in progress. The main objectives of K-BASE are creating of knowledge repositories for effective decision support system, improving the speed, transparency, objectivity and consistency in decision making and to provide public access to important Acts, Rules and Orders of the State Government.

AKSHAYA – the Revolutionary Project of Kerala IT Mission:

'Akshaya' is a path-breaking, people-oriented, grass root level project, similar to the FRIENDS project discussed earlier. This was launched in Nov. 2002 by the Kerala State IT Mission. In Kerala, the inception of 'Akshaya' project was originally conceived to combat the issue of digital divide in the state. Simultaneously, it was supposed to play a catalytic role in bringing about socio-economic development of Kerala as well. The centres of Akshaya are being used to collect information regarding cultivation for various crops for the purpose of improving production. Every Akshaya centre has commenced in the participation in one out of ten revenue earning and employment creating e-commerce operations as suggested by IT Mission team and the entrepreneurs concerned. Akshaya centres are envisaged to provide e-transaction services or those enabling various local payments in collaboration with the respective FRIENDS office.

6.3. ICT for Development

The State initiatives in respect of using ICT for developmental purposes have been equally remarkable as are those in respect of information infrastructure, E-governance, training and other services etc. The major initiatives are discussed below.

IT @ School:

This project of the Kerala Government seeks to provide computer education to high school for the purpose of qualitative improvement in the traditional systems of learning, as well as to enable the teachers to utilize computers as an effective tool for imparting education. It is now being implemented in all high schools of Kerala state. Besides, this project also has an effective supply chain management solution for the management of text-book inventory, updation of SSLC data base and messaging systems between 51 offices. Moreover, this project is using the facilities of 'Edusat' for promoting e-learning.

E-Krishi:

This project of Kerala state seeks to form a networked community of farmers throughout Kerala who have access to information on market demand, prices, good agricultural practices, quality agricultural inputs etc. Key components of this Platform include: (i) a farmer community numbering about 50,000 cultivating priority crops as determined by the market demand, (ii) enrollment of buyers or exporters in key markets including manufacturers in processing industries, (iii) enrollment of agricultural input providers, seeds, plants, fertilizers, pesticides, providers/consultants of technology/methodology, (iv) test –laboratories, (v) establishment of a robust IT-enabled platform where the members can seek information, transact & make or receive electronic payments, etc.

Collaborative Content Management:

Akshaya e-Kendras in the community space and IT @ School project covering the schools are expected to bring in huge demand for large amounts of content. The Collaborative Content Management platform envisages teachers and experts as well as those having access to educational contents to upload educational materials, explanatory examples, teacher notes etc, for use by the schools or member student community. Thus, this platform offers the requisite facility for collaborative content management.

Tele-medicine:

Tele-medicine project envisages establishment of a networked Public Healthcare Program and Tele-medicine system in the State. It has been proposed to pilot this program in Malappuram district where intranet connectivity on wireless has already been in place, as a part of the Akshaya Project.

Education Grid:

This initiative seeks to link 30 colleges of Kerala and accordingly to equip both students and teachers with the capability to design, develop and also share the limited educational resources. Hence, it strives to upgrade the standards of instruction in education.

Indian Institute of Information Technology and Management–Kerala (IIITM-K):

This Kerala Government institution is equipped with the state-of-the-art systems and network and servers with quality Internet connectivity. It offers Post Graduate level course IT. This institute, over the years, has come a long way with several innovative programmes and projects of great significance to the future of the State in particular and India in general. It is now well recognized as a premier institute of IT at the PG level both within the State and in the rest of the country. Three batches have already passed out and all the students have been well-placed in leading IT companies. The major features of instruction at IIITM-K are to expose the students to real world scenario and professional situations and the high technology learning ambiance. The Institute has close rapport with several leading IT companies and also premier institutions like IITs, IIMs, NITs etc. The Institute on its own initiative with the

support from concerned State departments has launched the Education Grid, the KISSAN, the Police Portal and the like.

Police Portal:

Kerala has the unique distinction for having launched the Community interaction portal associated with the City Police office at Thiruvananthapuram – the state’s capital city. This portal seeks to locate and redress the crime and disorder problems in the state.

Software Technology Parks of India - Thiruvananthapuram (STPI-T)

Since its commencement, 336 companies have been registered with STPI-T and 120 companies are exporting software regularly. The total export from STPI-T in FY 2005 is for Rs. 300 crores; 38 percent higher than the previous year. The software exports from STPI-T units for have shown consistent growth over the years. STPI-T is a 100 percent export oriented unit engaged in development of software and also software exports. Due to the very low investment involved as well as the availability of incubation facility in its premises, STPI-T is one of the sought-after sites for the export oriented units in the ICT field of small and medium types. In fact, many companies have been registered under STPI-T and most of them are having exports on ITES besides exports of computer software. Hence, Kerala has remarkable track-record in ICT implementation.

7. ICT for Economic Development of Kerala: Some Strategic Imperatives

In view of the above discussions, here an effort is made to suggest some measures which are of utmost significance in ensuring the overall economic development of Kerala.

- (1) Given the special features of the Kerala economy, the best IT strategy for the State appears to be that of stimulating the market for the service sector. Within this sector, those initiatives for economic development and e-governance, indeed, offer excellent prospects. It is widely recognized that this market offers the largest growth opportunities for the State in the immediate future. As such, this strategy needs to be implemented on a war footing, primarily because it enables the use of ICT as an enabler of fast socio-economic development of the State. In the specific case of Kerala economy, given its unique characteristics, the following areas seem to offer maximum prospects for its fast economic development:
 - (i) **ICT for Micro finance and Women Empowerment:** The State’s micro finance initiative for women empowerment named ‘Kudumpasree’ as well as a large number of similar initiatives by various private agencies and reputed socio-cultural organizations are observed to be very victorious in Kerala. The banks in Kerala have been eager to provide funding for such efforts. Apart from enabling women empowerment tremendously, ICT can immensely improve the reach as well as operational efficiency of Microfinance Institutions (MFIs). ICT can hence play a crucial role in Kerala’s economic development as well as empowerment of the poor, the women, and the marginalised.
 - (ii) **ICT for promotion of Micro, Small and Medium Enterprises (MSMEs):** The creation of an active MSME sector has been largely recognized as one of the vital needs for achieving long-term and sustainable economic growth, both for developing and developed nations. In a country like India, increasing the viability of MSMEs is of vital significance among the strategies for the overall development of the economy. Hence, in the current backdrop of the global, knowledge-based economy, the use of ICT to help originate, nurture, and facilitate MSME development has become an imperative rather than a choice. For Kerala economy which is suffering from rather poor industrialization and low

productivity, the need for embracing ICT to improve the efficiency of MSMEs and also to expand their market need not be overemphasized

- (iii) ICT for Distance Education: The State is yet to start an Open University on the lines of IGNOU (Indira Gandhi National Open University) which is a Central University offering quality courses in distance education mode. Many states in India have already started state-level open universities in the pattern of IGNOU. All these universities are increasingly going 'virtual' to enhance the efficiency and quality of their course delivery. It is high time that Kerala too join the bandwagon, especially when Union Government gives so much of importance to open and distance learning (ODL), in line with the global trend.
- (iv) ICT in Tourism and Medicine: Kerala is believed to be the 'God's Own Land' by foreigners, given its vast and serene coastal area, excellent climatic conditions, high level of cleanliness, public hygiene, serene hillocks, lakes etc. This has helped it to become one of the most sought after tourist destinations of the entire globe. Similarly, the traditional system of medicine (Ayurveda) of Kerala is well-known the world over and many foreigners come here in search of this traditional treatment. Quite often, the pursuits of foreigners to Kerala are both tourism and medical treatment. Thus, ICT initiatives for development of tourism (e-tourism) and medicine (e-medicine) can definitely reap rich dividends for the State, in the days to come.
- (v) Further boost to ICT initiatives already in place: The State has already taken to launch a few very revolutionary schemes, which need further boost in the days to come. These mainly include (i) Kiosks for farmers (KISAN has already been launched by the State), (ii) initiatives for promotion of Agriculture (e-Krishi has already been launched by the State), and (iii) Tele-centres (the State has already launched a similar scheme as part of its comprehensive e-governance initiative 'Akshaya').
- (vi) ICT for development of Handicrafts and other indigenous products.

However, for successful implementation of such e-governance schemes as mentioned above, the necessary pre-requisites need to be put in place, like, development of applications and content, ensuring the availability of internet resources and adequate IT literacy for the population; and Government's political will power and commitment.

- (2) For promotion of ICT as a production sector (which broadly comprises of three major sectors viz. IT Service, ITES and IT Hardware) urgent steps need to be taken for creating the requisite infrastructure, human capability, urban facilities and other amenities like the relevant life style options. ITES sector has the potential to absorb even larger number of graduates in Kerala. To fully tap this potential the students of Kerala needs to be trained meticulously so as to equip them with the exact needs of the industry. High degree of command over English language, good communication skills and leadership abilities, and such other skills need to be nurtured. The Government can very well act as a facilitator for private initiatives in the above fields. Given the huge opportunity for training manpower for ITES sector in the state, like, the Call Centers, Kerala has already lured so many leading training institutes. The need of the hour now is in establishing standardization and evolving guidelines for such training activities based on globally acceptable standards. Specialized training schemes on various fields of ITES need to be organized for certification of manpower at different levels (agent-level, supervisory-level etc.) to ensure that suitably skilled and highly trained staffs are available to the industry.

8. Concluding Remarks

The achievements of Kerala state in embracing various ICT initiatives may be noted to be very appreciable and commendable. In fact, many other states in India are trying to replicate the Kerala's model in this regard. In spite of the small per-capita income and substantial financial shortage which Kerala encounters, the state could make rapid strides in adopting the latest in ICT advances and implement them successfully. The achievements of Kerala in E-governance front, in particular, is very remarkable. The very favourable socio-economic conditions in Kerala, especially the abundant number of technically qualified and skilled manpower and also the high degree of social equity, offer excellent prospects for the state in bringing about ICT-led economic development and that too in a balanced and equitable manner. This ensures faster economic prosperity without the issue of digital divide. Kerala has already become a role model for other states in India in many aspects particularly in E-Governance implementation. The forthcoming Governmental initiatives in this regard, particularly those in tune with the current IT policy, namely, Kerala IT Policy 2017 (which pertains to the period 2017-2022) appears to be a very meaningful one that ensures continuing with the state's ICT initiatives more vigorously. However, raising the required financial resources seems to be a challenge in this regard. Further, Kerala has to take urgent measures to further improve the PC penetration rate in the state from the current level. Then only the desired dividend from the large-scale ICT implementation becomes really meaningful.

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