

Role of Digital Technologies in Governance

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ABSTRACT

Development in a country is fostered by its efficient governance. To ensure betterment of their citizens, governments over the world have accepted Sustainable Development Goals (SDGs), announced by the United Nations Development Programme (UNDP) in the year 2015, as acceptable governance targets for all. Information and Communication Technologies (ICTs) serve as meaningful contrivances to engage with all the cross-currents linking the 17 SDGs together. Digital technologies were initially deployed in the early 1990s as means of dissemination of public services and information. In present times, these technologies have also been accepted as means for co-creating values for citizens as insisted by participatory models of governance too. This paper attempts to examine all aspects of employing digital technologies in accelerating the processes of governance. Based on an analysis of the related academic literature and extensive field experience of the author, the paper seeks to address the following questions:

- *How digital technologies are expected to help achieve the SDGs and strengthen the relationship between the state and its citizens?*
- *What are some of the challenges that usually confront the uptake of digital technologies in governance especially in Indian context?*
- *What is expected to be the face of governance in the wake of emerging technologies including artificial intelligence, transparently immersive techniques, and newer digital platforms?*

After addressing these questions, the paper attempts to propose some viable strategies that can strengthen the application of digital technologies in governance, especially in the context of developing countries like India.

1. INTRODUCTION

1.1 The Changing Realm of Governance

The concept of governance has evolved over a period. It can be understood as the manner in which power is exercised for the management of a country's affairs to facilitate development. Policies, institutions, market and stakeholders including citizens interact together to drive governance in a country. The emphasis on citizens as its prime stakeholder had been laid down by the guiding principles of New Public Management -NPM (Pollitt, 2000)². Gradually 'citizens' and 'local governance' have been widely accepted as two

¹Information communication technologies-ICTs, erstwhile referred as Information Technologies (IT), are electronic/digital computing and communications technologies that encompass desktops, networking, internet, mobile, cloud, websites, web-portals, social media, emerging technologies and so on; the generic reference term used in the theme paper for ICTs, is 'digital technologies'

²Pollitt, C. (2000). *Public Management Reform: A Comparative Analysis*. USA: Oxford University Press

major constituents of high quality governance, especially in the context of democratic countries. To monitor governance in a country as well as to undertake meaningful cross-country comparisons, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) also proposed a set of six composite indicators, called World Governance Indicators (WGIs)³, which present a good idea of an ideal form of governance in present times. The paradigm of ‘good governance’ that insists on achieving happiness-for-all, has been accepted world over as a benchmark of a utopian form of governance. Review of literature (for instance, *Magno & Serafica, 2001*)⁴ vouches that digital technologies promote good governance in three basic ways: by increasing transparency, accountability and maximising the use of available information; facilitating accurate decision-making through effective public participation and ensuring the efficient delivery of public goods and services. Within the framework of good governance, the universal governance goals have been established by the SDGs. There has been a global effort to achieve social development, economic development and environmental sustainability through the achievement of 17 aspirational Sustainable Development Goals (UNDP, 2015). The SDGs too beseech digital technologies as means to ensure collective action amongst various governance stakeholders. Participatory decision-making approach, critical for attaining SDGs, is also more easily achievable if digital citizen engagement platforms such as MyGov of India are employed (*Malhotra, 2018*)⁵. Undoubtedly, the demand on governance to improve has led to dramatic changes, and digital technologies seem to be the panacea to manage these changes. The paper attempts to demystify the critical role of digital technologies in governance by elucidating the related aspects in its six sections as briefed below.

1.2 Overview of the Paper

The first section titled ‘Introduction’ has already set the tone of the paper wherein it has summarised the evolution of the concept of governance from its initial version of the NPM to the present paradigm of good governance and the Sustainable Development Goals. The second section titled ‘Digital Technologies in Governance’ differentiates the notion of ‘e-Government’ from ‘e-Governance’. Its subsection titled ‘Emerging Technologies- the Changing Realms of e-Governance’, strengthens the readers’ awareness about contemporary digital trends including artificial intelligence, transparently immersive techniques, newer digital platforms, Smart Cities and Smart Villages. The section also attempts to present the role of each of these technologies in the public sector by presenting global and national strides on this front. The third section titled ‘Measuring Global Digital Ecosystem’ depicts how the world as well as India is faring on global e-Government landscape by using e-Government Development Index (eGDI) and e-Participation Index (ePI). Taking a cue from these rankings, the next section titled ‘The Indian Scenario’, makes an attempt to first summarise the ‘Governance reforms that Catalysed the Role of Digital Technologies’ followed by a time-line approach to chalk the “Growth of e-Governance in India” (Year 1990- till now). It further moves on to describe “Some Interesting Cases of Digital Technologies in Indian Governance”, elucidating the vision and pillars of the ambitious “Digital India” programme which links “Digital India to SDGs”, and concludes by creatively presenting “A Use Cases of Agriculture”. The fifth section summarises the “Challenges confronting e-Gov Implementation in India”; subsequent to which the section titled “Way forward for e-Governance in India” elaborates possible strategies to overcome these challenges. The paper closes with the recommendation of establishing a “Centre of Excellence” (CoE) in India, preferably at IIPA that would undertake R&D activities so that the “digital unite” and “accessibility for all” ideas become cornerstones of a digitally united country in a more equitable global economy.

³WGIs have permitted meaningful cross-country comparisons of governance across almost 200 countries since 1995 and include six indicators *viz.* Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption (www.govindicators.org).

⁴Magno, A. and Serafica, R. (2001). Information technology for good governance. Manila: Yuchengco Center for East Asia, De La Salle University

⁵Charru Malhotra (2018) “*Enhancing Citizens’ Participation in the Processes of Governance Digital India and MyGov*”, International Journal of Open Government [2018 – Vol 7], pp 193-198 URL: <http://ojs.imodev.org/index.php/RIGO/article/view/250>

1.3 Methodology

The learnings for this theme paper flow from the quantitative and qualitative research undertaken by the author to decipher the uptake of digital technologies in governance, especially in the Indian rural context. The primary study of various e-Government initiatives, that form the basis of this paper include RASI (Tamil Nadu), Common Service Centres- CSCs (Haryana and Mizoram), *TaraHaat* (Madhya Pradesh), *Nemmadi* (Karnataka), *Akshaya* (Kerala) and *e-Mitra* (Rajasthan). This entailed field study undertaken by the author in approximately 50 villages covering seven states of India, spread over almost five years. Learnings from these initiatives were synthesised by the author in the conduct of *Nagarik Paramarsh Daur / Citizen Consultation Round (CCR)* and *Officers Response Round (ORR)* both at IIPA in 2009. These initiatives have been hailed as ‘innovative requirement-elicitation models for e-government’ in the literature. Armed with substantial primary data, these learnings were consolidated as a framework on the design of citizen-centric e-Governance initiatives, validated by 48 international and national experts over three Web-based Delphi rounds (*IIPA, 2009-10*). The conceptual framework, awarded as “Innovative Approaches for e-Governance” by Deakin University, Australia (2012) coupled with her 30 years of domain expertise, helped the author to weave this paper in six sections.

2. DIGITAL TECHNOLOGIES IN GOVERNANCE

It was in the early 1990s that the concept of governance underwent a major transformation, with the acceptance of digital technologies. During this period, digital technologies had been primarily deployed for the delivery of public services and information and this was popularly referred to as ‘e-Government’. Slowly and gradually, it became relevant for democratic countries to include the ‘voices’ of its citizens in core strategic issues of governance. As a result, the initial version of ‘e-Government’ started being identified through its more all-encompassing *avatar* of ‘e-Governance’. Several agencies (*UNPAN, 2005*)⁶ and researchers (*Malhotra et al., 2007*)⁷ have clearly elaborated the conceptual difference in usage of the terms ‘e-government’ and ‘e-Governance’. However, for popular consumption, both the terms could be used interchangeably. The primary delivery models of governance using digital technologies are Government-to-Citizen/Customer-G2C, Government-to-Business-G2B, Government-to-Government -G2G, and Government-to-Employees-G2E. In the last few years, digital technologies have transmuted with an uncannily rapid pace from their earlier versions to more ubiquitous and intrusive versions, which would obviously have impact on governance models too.

2.1 Emerging Technologies - The Changing Realm of e-Governance

Social media, Mobility, Analytics and Cloud (SMAC) have shown immense growth in last decade. The synergy created by these tools provides an additional competitive advantage to the organisations. Newer technologies/products have also emerged for almost all existing forms of technologies. Inspired by ‘Gartner Hype Cycle for Emerging Technologies’ report⁸, emerging technologies can be summarised (**Table-1**) in three distinctive categories.

Category-I : ‘Artificial Intelligence-AI’ is an area of computer science that emphasises the creation of intelligent machines that work and react like humans. Based on this logic, some of the applications of AI are Machine Learning, Robotics and Autonomous Vehicles (AV).

⁶ Department of Economic and Social Affairs. (2005). *UN Global E-Government Readiness Report*. (UNPAN). New York. Retrieved from www.unpan1.un.org/intrahoc/groups/public/documents/un/unpan021888.pdf; Last Accessed on August 21, 2018

⁷Charu Malhotra, Chariar, V., Das, L., & Ilavarasan, P. (2007). An Evaluatory Framework for ICT Interventions. In the Rural Areas: Review of Literature on E- Governance for Rural Development in the Indian Context, Adopting e- Governance (Eds.), pp.216-226. G P Sahu, GIFT Publishing, New Delhi: India.

⁸ CIO. Three Megatrends to drive digital business into the next decade - Gartner’s Hype Cycle August 19, 2017 Retrieved from <https://cio.economicstimes.indiatimes.com/news/strategy-and-management/three-megatrends-to-drive-digital-business-into-the-next-decade-gartners-hype-cycle/60129676>;

TABLE 1- CATEGORIES OF THE EMERGING TECHNOLOGIES / DISRUPTIVE TECHNOLOGIES

Category-I Artificial Intelligence(AI) Everywhere	Category-II Transparently Immersive Technologies	Category-III Emerging Digital Platforms
Machine learning/ Deep learning/ Cognitive learning	Assistive technology	Cloud computing
Sentiment analysis	Wearable technology	Internet-of-Things (IoT) / Internet of-Everything (IoE)
Natural Language Processing	Virtual reality	Big data / Big Data Analytics
Robotics /Drones	Augmented reality	5G
Autonomous vehicles	Nanotechnology	Cryptocurrency
Conversational User Interfaces	Connected home / Smart Home	Blockchain
Commercial UAV (Drones)	4D printing	Edge Computing
Smart Dust/ Smart Robots/ Smart Workplace	Brain-Computer Interface	Quantum Computing
Enterprise taxonomy Ontology management	Ambient/ ubiquitous technologies	Digital twin
Enterprise Taxonomy	Volumetric Displays	Serverless PaaS

(Source: Gartner, Top Trends in the Gartner Hype Cycle in 2017, Available at: gartner.com)

Category-II : ‘Transparently Immersive Technologies’ bring the physical world and the digitally simulated world closer, hence, creating a sense of immersion for the user. Real sensations can be experienced by using technologies such as augmented reality, virtual reality, assistive technologies, and wearable technologies.

Category-III : ‘Emerging Digital Platforms’ are all the technologies that provide the advanced digital connectivity mechanisms and tremendous computing power to process humongous amount of fast data and ubiquity-enabling ecosystems. These features can be best experienced through digital technologies like 5G, Cloud Computing, IoT, Big Data and Blockchain technologies.

These emerging technologies are capable of completely displacing the ‘comfort zone’ or a ‘complacence’ state established by the existing formats of technology. This obviously causes a ‘disruption’ in the organizational/ individual ‘status-quo’ (Malhotra, 2017⁹). That is why these newer forms of digital technologies are also often referred as ‘Disruptive Technologies’.

Armed with relevant application of these technological trends in governance, some of the interesting instances from each of the three categories are discussed here.

Category-I: Role of Artificial Technologies in Governance

Artificial Intelligence and its varied manifestations (category-I) can be used in multifold ways. For instance, AI-based tools/machineries/ assistants, -that ‘intelligently’ perform repetitive chores such as pothole repairs and scavenging, can be employed to improve the productivity of public workforce in mundane or unsafe scenarios (Thomas, 2018)¹⁰. AI can collect feedback on projects and government interactions to

⁹Charru Malhotra (2017). Co-Creating Good Governance using Emerging Technologies. *elets e-Gov*. Retrieved from <http://egov.eletsonline.com/2017/08/co-creating-governance-using-emerging-technologies/> is i

¹⁰Thomas, F. (2018). *Lifting performance in the public sector with an AI augmented workforce* .Deloitte.

gauge sentiments of the citizenry on city activities. AI can also make governments more vigilant about crime detection/ incident response processes/ prospective emergencies by analysing ‘digital footprints’ of certain suspicious people. New AI-based tools coupled with data mining tools are already being used by the armed forces to speculate about potential national security threats. Iceland has employed Machine Learning (ML) to provide innovations in healthcare. The machine learning sensors -also known as Össur Prosthetics Sensors uses ML for improving natural joint function in the human body. These sensors also give information, which helps the medical practitioners to understand the experience of prosthetics.

Currently in India, NITI Aayog has been mandated (NITI Aayog, 2018)¹¹ to establish the R&D- based national program on AI with a view to establishing:-

- Center of Research Excellence (CORE) that would focus on pushing technology frontiers through new knowledge creation.
- International Centers of Transformational AI (ICTAIs) to develop and deploy application based research in collaboration with the private sector.

Another popular AI implementation is that of drones that are remotely piloted aircraft systems. Drones offer low-cost, safe, and quick aerial surveys which can be used for data collection and are useful in industries such as power, mining, realty, oil and gas exploration, railways and highways. Drones can inspect tall structures and offshore rigs and can help in relief, rescue work, policing and even in agriculture for selective pesticide/ fertilizer spraying. On August 27, 2018, the civil aviation regulator in India-the Directorate General of Civil Aviation announced a licensing regime for the commercial use of drones. The policy will take effect from December 2018 and will -not permit drones in no-fly zones. It will restrict permit operations of drones only within the site and during the day at a maximum altitude of 400 feet above the ground/surface area. With the projected market size of drones amounting to \$8857 million (by the year 2021), a robust legal framework for commercial use of drones could help develop the drone market, encourage investments for local production, thereby helping the *Make in India* scheme launched by the Central Government.

Category-II: Role of Transparently Immersive Technologies in Governance

Another set of interesting emerging technologies is that of Virtual Reality (VR) and Augmented Reality (AR), which has been identified as a major megatrend that will drive businesses and governance realm into next decade. The VR uses a computer-generated environment to provide interaction with the real system, using head-mounted systems, whereas, in the realm of AR, the actual machine is augmented or supplemented by computer-generated sensory output. Hence, AR is more ‘immersive’ and ‘real’. Nokia in Finland (in collaboration with Helsinki University Hospital) live streams neurosurgical procedure to approximately hundreds of surgeons using VR with the aim of advancing the healthcare industry by training more doctors. In India, startups like ‘Smartivity’ have been selling STEM (Science, Technology, Engineering, Math)-based educational content in the form of toys, and DIY (Do-It-Yourself) kits that are AR-enabled.

Category-III: Role of Emerging Digital Platforms in Governance

The future of our existence lies in ‘interconnected’, ‘integrated’, ‘intelligent’ and ‘interactive’ smart devices, broadly represented under the category of Internet of Things (IoT) / Internet of Everything (IoE). IoT defines network of physical devices, vehicles, home appliances, which have three things *viz.* sensors, unique identifiers/ Internet address (IP address) and connectivity. Further, these ‘smart’ devices can compute and connect without requiring human-to-human or human-to-computer interaction. IoT can find applications in plethora of governance areas such as in surveillance where sensors can monitor traffic etc. It can also be used for city planning, road planning, dynamic toll pricing, flood management, etc. A startup called Agrisource Data (based out of Atlanta) is using intelligent in-field sensors for measuring water levels, soil moisture, in-field crop health, fuel levels, storage temperatures and data analytics to provide farmers with detailed crop

¹¹NITI Aayog.(2018). *National Strategy for Artificial Intelligence#AIforall*. India

and field information and ensure more efficient field management. IoE is a concept that extends the IoT concept to include people and processes.

Big Data technologies help to ‘collect and collate’ ever burgeoning, customer-generated data being induced by technologies like IoT and SMAC. ‘Big Data analytics’ helps in ‘mining’ / excavating the data meaningfully, thereby creating new business models built around knowledge generated by analysing this humongous and heterogenous data. Internationally, Security Exchange can catch illegal trading activity in the financial markets. In India, a pioneering initiative of the Maharashtra Government data-mapped and analysed three blocks of the district Chandrapur (2016-17) to create village development plans so that each of its villages could be transformed into a model village. Such contextualised, actionable insights and evidence-based decision-making by governing agencies can indeed propel a developing country to attain SDG targets by the year 2030.

Let us now move on to demystify a trusted/ assured data storage technique referred to as ‘Blockchain Technologies’ (category-III). A block chain is a distributed database of records of all those transactions that have been ever executed. Once the information is entered, it can never be erased and each transaction is verified by the consensus of the participating people, making it both immutable and dependable, and hence Blockchain technologies are also called ‘Smart Contract Technologies’. The Dubai Government has already initiated the usage of Blockchain technologies in management of land record system (<https://www.dubailand.gov.ae>). In India, NITI Aayog has developed the largest blockchain network by the name of ‘IndiaChain’¹² so that records/contracts based frauds are reduced, etc. IndiaChain will be linked to India-Stack and other government digital identification databases to further strengthen transparency in transactions. It has already proposed several application areas, including land records management, supply chain management (a la’ public distribution system, pharmaceutical supplies, etc), and electronic health records. Taking a cue from such trends, Andhra Pradesh Government has already announced some suggested use-cases based on Blockchain technologies to resolve trust concerns in governance, especially for its record-keeping based activities. Municipal Corporations in West Bengal like the Bankura Municipal Corporation and the Durgapur Municipal Corporation have opted for blockchain ID verification solution for providing birth certificates.

2.2 Convergence of Emerging Technologies

It is also pertinent to note here that the three categories of emerging technologies are not ‘stand-alones’. To provide transformative experiences to its recipients, the technologies listed in one category could seamlessly collaborate with other technologies of the same category and/or with technologies listed in any other category. Let us decode this with an easier example of a Smart Home (category-II), where majority of the gadgets, including refrigerators, washing machines and cars are expected to be ‘Smart’- fitted with IoT technologies (category-III). It is not impossible to visualise that all these domestic gadgets could also be connected to conversational user devices (category-I) and have been safeguarded using Blockchain technology (category-III). The enormous data that is expected to be continuously streamed by all these domestic gadgets of Smart-Home could be leveraged by the owner of the house using big data analytics techniques (category-III) to plan family investments / expenditures, etc. On similar lines, there are several innovative ways in which these digital technologies can be integrated to contribute to the achievement of SDGs (Table 2).

2.3 Smart Cities and Smart Villages

The heady thought of chalking out innovative futuristic possibilities in the public sector has already started tantalising our policy makers, academics, designers and practitioners to brainstorm together newer possibilities of our urban existence. Major components of city lifescape include roads, transport, buildings,

¹²Sen, S. & Murali, A. (2017, November 13). IndiaChain: Niti Aayog starts on IndiaStack-linked, large-scale Blockchain projects. *Factor Daily*. Retrieved from <https://factordaily.com/indiachain-indiastack-blockchain/>

TABLE 2. SUGGESTED APPLICATIONS OF EMERGING TECHNOLOGIES FOR ACHIEVEMENT OF SDGS

Sustainable Development Goals	Suggested Application of Emerging Technologies
SDG 6 Ensure availability and sustainable management of water and sanitation for all	Using smart meters, soil sensors, remote irrigation management system, rainwater harvesting systems etc.
SDG 7 Ensure sustainable energy for all	Using smart grids, smart appliances, energy storage, predictive analysis, demand response technology.
SDG 11 Make cities and human settlements inclusive, safe, resilient and sustainable	Smart City Mobility- driverless mobility, interconnected infrastructure using IoT; Smart Building- Alarm management and automation, big data analytics and energy management, monitoring, detection and diagnosis technologies.
SDG 12 ensure sustainable production and consumption patterns	Smart Village- optimised farm management and automated irrigation system, soil sensors and satellite and integrated real time weather information, traceability and tracking system.
SDG 13 Combat climate change and its impacts	All digital solutions including smart villages, smart buildings, smart energy, smart manufacturing, smart mobility
SDG 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Smart ways of conservation through advanced mapping and data technologies, sub-marine, coastal and inland smart sensors, real time satellite imaging

(Source : Achieving Sustainable Development Goals through ICT Services- Ono, Lida., & Yamazaki, 2017¹³)

utilities, waste management, healthcare, housing, green space, and community spaces, commercial as well as public are all stitched together in a digitally interconnected ecosystem.

For instance, the capital city of Estonia- Tallinn has become the center of economic development for all of Estonia, harnessing ICT by fostering high-tech parks. It has developed a large-scale digital skills training programme, extensive e-Government, along with smart ID card for all its citizens. Ever since 2012, it has been using blockchain technologies in maintaining all its records/registries such as national health, judicial, legislative, security and commercial code systems, and plans to do so in other spheres like personal medicine as well. Similarly, South Korea's Seoul Metropolitan Government (SMG) has developed various combined platforms that provide solutions to various issues to its citizenry by sharing information on various issues including city news, welfare, housing, traffic and much more on a real-time basis. SMG has also created a social network service (SNS) that enables two-way communication among the government and citizens using social media services. SMG has been acknowledged as the best municipality for employing emerging technologies, including mobile. It has, for instance developed a smartphone application, christened 'M-Voting' that allows citizens' to vote online on various contemporary issues or real life critical situations on real time basis. Another credible instance is of Singapore's citizen engagement portal, 'reach.gov.sg', which consults and collaborates with citizens' on relevant governance issues by employing techniques such as focus group discussions, surveys, and open meetings available on several channels including websites, mobile apps and social media. These achievements of Estonia, South Korea, and Singapore affirm that the quality of urban living can be substantially enhanced using emerging technologies. However, developing countries like India that are primarily rural require technology intervention in their villages too. For instance, majority of hundred crore of unconnected people live in rural India; therefore, the concept of 'Smart Village' has picked up gradually in recent times (**Figure-1**).

¹³Ono, T., Lida, K., & Yamazaki, S. (2017). Achieving Sustainable Development Goals through ICT Services. *Fujitsu Science Technology Journal*, 53(6), 17-22.

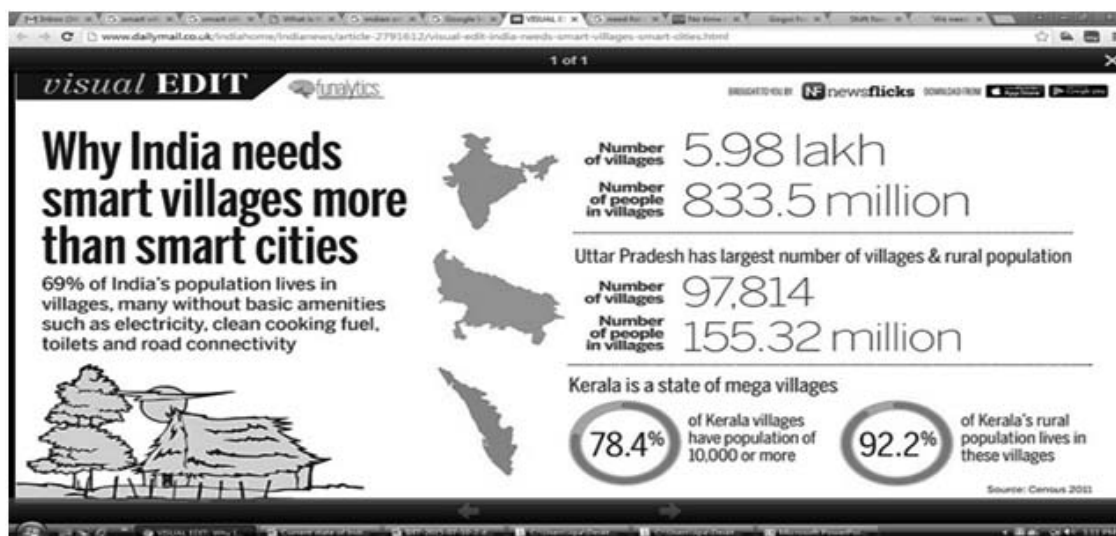


FIG. 1. WHY INDIA NEEDS SMART VILLAGES MORE THAN SMART CITIES.

(Source: <https://www.dailymail.co.uk/indiahome/indianews/article-2791612/visual-edit-india-needs-smart-villages-smart-cities.html>)

The aim of a smart village is to provide a sustainable ecosystem created by an interconnected and integrated village. Digital technologies are leveraged to bring ease of access to government services, diversified livelihood opportunities and technology based micro enterprises, IT based classrooms, cashless transactions and so on. In India, the Nokia's Smartpur Project plans to digitise villages by creating a hub to provide connectivity to villages and enable applications in the domains of healthcare, governance, education, digital-finance, and entertainment (<http://smartpur.in/the-project/>). In phase-1 of the project, announced in May 2018, a pilot has been rolled out in Haryana and Tamil Nadu to develop ten such villages in each state. The digital possibilities of our urbane and rural existence are mindboggling and so are the anticipated advantages. However, one must acknowledge that planners and architects alone do not build the cities/villages; the successful implementation of these new blueprints actually requires a very sturdy digital ecosystem that is unique to each country.

3. MEASURING GLOBAL DIGITAL ECOSYSTEM: EGDI AND E-PI

3.1 e-Government Development Index -eGDI

To measure the development of national e-Government capacities, the United Nations has been generating the UN e-Government Development Index (eGDI) biannually since the year 2001. The eGDI is a composite indicator comprising three aspects *viz.* Online Service Index, Telecommunication Index and Human Capital Index, which are equally weighted. It compares and describes the progress of this index for the member countries and elucidates the factors contributing to successful e-Government implementation in these countries. South Korea has managed to grab the first place in eGDI ranking three times consecutively. As already discussed earlier, the mVoting initiative of South Korea has been rated very high that has made the decision making process transparent, quick, and credible. Several other e-services of South Korea are quite effective *e.g.* 92% of its bidding is done electronically that generates a whopping amount of transaction to USD 34 billion per year. India has jumped 22 ranks from the year 2010 to the present year 2018. In year 2010 it was ranked 119 (total 193 countries) and in the year 2018, it has jumped to 96th rank (193 countries). This remarkable improvement in eGDI scores of India can be attributed to its various digital policy reforms such as National IT Policy, Digital India and so on.

3.2 e-Participation Index (ePI)

When participatory forms of governance are becoming more and more evolved, another interesting index *viz.* e-Participation Index (e-PI) has been included since the year 2010. e-PI is defined “as the process of engaging citizens through ICTs in policy, decision-making, and service design and delivery so as to make it participatory, inclusive, and deliberative” (United Nations e-Government Survey, 2018). Singapore’s initiative ‘reach.gov.sg’ can be hailed as one of the best practice of citizen engagement using digital platform. Through various e-government action plans and five-year master plans, Singapore has brought about convergence of information technology and telecommunications that transformed the concept of service delivery. Citizens and businesses can access more than 1600 online services and have access to more than 300 mobile services through digital platforms including Myecitizen¹⁴ and CitizenConnect¹⁵. Singapore has 28 Citizen Connect centres islandwide provided at accessible locations. Singapore is also utilizing Web 2.0 through its eVoice and Interactive TV to reach out to non-tech savvy population. Indeed, invoking citizen participation in governance matters using digital technologies seems to have become the top most priority for majority of the democratic countries. India has climbed up by 43 ranks on its e-participation index (from 58th rank in the year 2010 to 15th rank in 2018) which could also be attributed to the presence of digital engagement platform of India, MyGov (launched in July 2014).

The paper now attempts to explain this upward trajectory of India’s growth in use of digital technologies in governance. It can be best traced by first demystifying its governance spectrum that contributed to strengthen its digital profile (section 4.1) and then by chronologically analysing the e-Governance milestones in the process (section 4.2).

4. INDIAN SCENARIO

4.1 Governance Reforms that Catalysed Role of Digital Technologies

India is a large and developing country with a robust democratic citizen-centric framework guiding its governance. It has 29 states and 7 union territories. As per Census 2011¹⁶ 68.8% of the population is in the rural areas while 22.2% of the population stays in cities. A review of literature indicates that Indian governance, spurred by uptake of digital technologies, has been gradually propelling itself towards transparency and accountability (*Malhotra, 2014*)¹⁷. The advent of phenomena like liberalisation, privatisation and globalisation (after 1980s) catapulted sporadic use of technology in public administration. 1991 onwards the economic reforms adopted by the Government of India paved the way for a shift in the vision of state-led development. In this transition, ICTs emerged as an important policy priority, for their twin potential for catalyzing growth and for enabling systemic reforms in governance structures. A positive trend towards regeneration of reforms in Indian governance got a further impetus with setting up of Second Administrative Reforms Commission (2nd ARC) in the year 2005 by Government of India (<https://darpg.gov.in/arc-reports>). Several of its reports, such as report on Right to Information (Report 1 of 2nd ARC), report on e-Governance (Report 11, 2nd ARC) and report on Citizen-centricity (Report 12 of 2nd ARC) are commendable recommendations that have spurred a technology based citizen-centric perspective to the governance paradigm of India. In the similar vein, even India’s 10th Plan (2002-07) outlined all ingredients of good governance. Government of India (GoI) is aiming to be more approachable to its citizens with public tools such as citizens’ charters, social

¹⁴Portal for all private and public sector services

¹⁵Centers to provide access terminals and personal assistance to those who do not have the means or ability to transact online with the Government

¹⁶Planning Commission. (2011). *Census 2011*. Retrieved from http://planningcommission.nic.in/data/datatable/data_2312/DatabookDec2014%20307.pdf

¹⁷Charu Malhotra (2014). Public Tools for Open Governance: Review of RTI Act and Social Media in Indian Context. *Governances publiques, IMODEV*, 5(2).

media, open governance portal (<http://www.ogpl.gov.in>) and much more. Even the use of social media for mobilizing mass movements on governance issues (corruption, violence against women and so on) has become popular in the country (Mirani, Pannu, Malhotra, 2014)¹⁸.

4.2 Growth of e-Governance in India (Year 1990 - till now)

1990s: Railways & other initiatives

As indicated earlier (section 4.1), it was in early 1990s, that the application of digital technologies started smattering government workplaces - both for internal automation as well as for public service delivery. Online railway reservation system (irctc.co.in) became the most prominent initiatives.

Year 2000- Information Technology Act

In the year 2000, Indian government announced the 'IT Act 2000' of India that provided a legal framework to the digital initiatives in the country. Amongst other legal provisions, this Act has accorded 'legal sanctity to all electronic records and other activities carried out by electronic means', given 'legal recognition to the digital signatures', initiated 'regulation of certifying authorities', recognised 'the penalties and adjudication for various offences', described 'hacking as a cybercrime and prescribed its punishment'. It has also bestowed 'powers to the police to enter and search, without any warrant, any public place for the purpose of nabbing cyber criminals and preventing cyber-crime'.

Year 2006- National e-Governance Plan (NeGP)

GoI announced National e-Governance Plan, referred as NeGP, in the year 2006. It comprised of twenty-seven Mission Mode Projects (MMPs) and eight components to "make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency and reliability of such services at affordable costs to realise the basic needs of the common man". Some of the MMPs included Passport, MCA 21 (Central MMPs), Land Record, e-District (State MMPs) and e-Courts and e-Procurement (Integrated MMPs). Even the primary ICT infrastructure was established such as State Data Centers-SDCs, State Wide Area Network-SWAN, and State Service Delivery Gateways-SSDG. More than 1.2 lakh rural telecentres, called Common Service Centers (CSCs) were also made operational as service delivery outlets across all the States/UTs.

Year 2008 to 2013 - IT Act Amendments, NSDG, National IT Policy , Cloud and Mobile Seva

- a. The year 2008 saw amendments in the IT Act 2000. These amendments include - 'Enabling central government to issue rules time to time related with electronic signature as per the evolution of technology', 'Provision of stringent provisions on Data Protection and Privacy', 'Provision of stringent punishment to address child pornography', 'Introduction of modes and methods for encryption for secure use of the electronic medium' and so on.
- b. In the same year, 2008, National Service Delivery Gateway-NSDG was launched as a standards-based messaging switch to provide seamless interoperability and to help in tracking and time stamping all transactions of the Government. (Recently, its modified and more updated dashboard version, *e-Sangam*-e-Governance Service Integration Framework has been launched).
- c. 'The National Policy on IT' was approved in the year 2012 to 'encourage adoption of ICTs', 'to provide fiscal benefits to SMEs', 'to create a pool of 10 million additional ICT skilled manpower', 'to adopt Open standards' and with several such IT focused national goals.

¹⁸Mirani, S., Pannu, P., & Charru Malhotra (2014) "Empowering Women through ICTs: Cyber Campaigns on Violence against Women in India", The Indian Journal of Public Administration, New Delhi .ISSN 0019-5561, pp: 679-695.

- d. In the year 2013, Government of India announced “GI Cloud” christened ‘*Meghraj*’. It was rolled out to utilise and harness the benefits of Cloud Computing¹⁹ in governance domain.
- e. In the year 2013, Mobile Seva (the national mobile-Governance initiative) was also formally launched with the aim of making India a world leader in harnessing the potential of mobile governance for inclusive development. Mobile Seva provides an integrated platform for all Government departments and agencies for delivery of public services to citizens and businesses over mobile devices using SMS, USSD, IVRS, CBS, LBS, and mobile applications. It is easily accessible through Mobile Applications Store (m-App Store) and the Mobile Governance Portal ([https://mgov.gov.in/.](https://mgov.gov.in/))

Year 2014 & 2015- MyGov and e-Kranti

- a. Indian citizen engagement platform called ‘Mygov.in’ was established in the year 2014. It is pertinent to mention here that two other equally important portals had already been launched as a precursor to MyGov portal. The first portal, called as ‘National Portal of India (india.gov.in)’ was launched in the year 2005 to provide online service delivery through a centralised unified portal. The second portal, called as ‘Open Government Data (data.gov.in)’ had been launched in the year 2012 to bring coherence in the fragmented data spaces of each department and ministry of GoI.
- b. Further, in the same year, 2015, *e-Kranti* : National e-Governance Plan ver 2.0, was initiated with the vision of “Transforming e-Governance for Transforming Governance” and had 44 Mission Mode Projects (MMPs) that were to be now implemented with substantially revised model of service delivery. Launch of ‘e-Kranti’ paved a way for Digital India program.

Year 2014-2015 - Digital India Program

Government of India announced its umbrella programme called Digital India in the year 2014 and formally launched it in the year 2015 with an aim to “transform India into a digitally empowered society and knowledge economy” for deriving economic, social, and environmental benefits from digital technologies (the details of this programme follow later- Section 4.4).

Because of this gradual e-Governance evolution in India, the role of digital technologies had started becoming more and more pronounced, both at the Centre and at the State level of the country. Some interesting digital initiatives (picked up randomly from the literature and reproduced verbatim) would help us to validate this assertion more lucidly.

4.3 Digital Technologies in Indian Governance – Some Cases

The cases presented here attempt to describe application of digital technologies in some of the critical aspects of governance including education and disaster management and in the process also include the digital initiatives of the Centre, North-Eastern State and a Southern State, while tracing a time period ranging from early 2000s till now.

a. Bridging Digital Divide in Education Domain

Traversing the Digital Literacy journey of India, Malhotra (2014)²⁰ recounts the launch of a dedicated satellite, EDUSAT (September 2004) for educational services. It was specially configured for audio-visual media, for employing digital interactive classrooms and for multimedia multi-centric systems. In 2009, the Cabinet Committee on Economic Affairs (CCEA) gave its approval for a new centrally sponsored scheme

¹⁹Cloud computing is the practice of using a ‘network of remote servers’ hosted to store, manage, and process data/ hardware/ services on the Internet, instead of using the same on your own local server or personal computer. The concept is of ‘on demand’ computing on ‘pay as you use’ model akin to any other utility such as water, electricity or PNG gas, accessible through any input device with internet connectivity including smartphones. Cloud services can be provided by ‘private’ operators, ‘public’ organizations or could be a ‘hybrid’ of both.

²⁰Charu Malhotra (2014). Building Blocks of e-Literacy, Vision Digital India-Towards an Empowered Knowledge Economy, *Microsoft Perspective*, pp: 17-19.

by the name of National Mission on Education through Information and Communication Technology (NME-ICT) under the HRD Ministry. Malhotra further enumerates national projects that leverage the power of ICTs to increase the outreach of educational services in the country. Some of the major projects are Sakshat, eGyanKosh, Flexilearn, NPTEL, Virtual Labs, MeLT, N-LIST, CEC, Institute of Lifelong Learning (ILLL), e-PG Pathshala. Ministry of Human Resource Development (MHRD, 2018²¹), Government of India, had initiated *Rashtriya Madhyamik Shiksha Abhiyan* (RMSA) scheme for Government as well as Government aided Secondary and Higher secondary schools in December 2004 (revised in the year 2010), that prominently includes the application of ICTs in schools. This provided opportunities to build ICT capacities of the secondary students and make them learn through computer aided learning process thereby bridging the digital divide amongst students who cannot afford these digital facilities. The scheme also provides support to States/UTs to establish computer labs in these schools.

b. Digital Technologies for Disaster Management

In state initiatives, Malhotra and Chatterjee (2016)²² prominently laud the application of Geographic Information Systems-GIS that when clubbed with satellite imageries helped to support the design of Environmental Impact Assessments and Managements Plans in the state of Andhra Pradesh. In 2009-2010, using the PARAM supercomputer it was possible to link more than two thousand monitoring stations located at vulnerable water bodies and waterways. Relevant weather parameters, water quality, water-flow levels, and speeds were recorded by over 2000 stations and using the SMS mode provided by AIRTEL and MTNL, this data was sent online to the PARAM located in the Secretariat at Hyderabad. Every day, hourly data was processed and survey-number wise printouts were taken to show those river points, lakes, or coastlines in danger of flooding. As these diagrams were in 25000 scale, it was possible to send SMS messages to *tehsildaars* and collectors to take preventive action against floods or other natural threats giving details of the survey numbers and habitations under threat and needing preventive action. This analysis helped to prevent large-scale human and animal casualties during cyclones and floods in the state.

c. Digital Technologies for Empowering North East

Chaudhri and Dash (2006)²³ elucidate that in a step towards fulfillment of its ICT4D vision, Government of India (GoI) had earmarked an impressive budget of 200 crores in the year 2002, to establish 487 Community Information Centres (CIC) through National Informatics Centre (NIC), in all 487 blocks of North-Eastern states and some more too. The ultimate goal of CIC was to provide ICT infrastructure for providing easier access to socio-economic databases, e-literacy, e-governance applications, and related government to citizen services in these remote regions. Based on her primary research, Malhotra (2012)²⁴ further affirms that in certain instances some of the Mizoram *Kolasi (blocks)* had been using CIC as control rooms to send electoral reports to other CICs and NIC using chat-facility on the provided ICT infrastructure. A few of the motivated Mizoram officers had also mentioned using CICs for submission and receipt of examination results of local schools. Another notable initiative is present in North-East India where the local NGOs are working with corporate partners for training rural youth in job-specific ICT and spoken English skills. The entire curriculum is downloadable from the cloud so that while internet connections work, students can use VoIP and while it is slow they can complete offline exercises.

²¹Human Resource Development (MHRD), Government of India (2018). *Information and Communication Technology*. Retrieved from http://mhrd.gov.in/ict_overview; last updated on 11 March, 2016

²²Charru Malhotra, & Chatterjee, T. (2014). ICT4D: Innovating Governance to be more Citizen-Centric using ICT. *Management in Government: Journal of Administrative Reforms*, 46(1), 1-14.

²³Chaudhri, N. and Dash, S.S.(2006), *Community Information Centres (CIC's) – e-governance for Development in Delivering e-Government* (eD.), G.P. Sahu, Gift Publications.

²⁴Charru Malhotra (2012). Enabling Citizen services delivery in North-East States of India. In Syed S.Kazi (Ed), *North East India's Best ICTD Practices: Digital Inclusion for Inclusive Growth in North East India*. (pp 24-26), ISBN : 978-81-910139-2-4.

d. Real Time Performance Monitoring in Andhra Pradesh

Government of Andhra Pradesh launched “Real Time Governance- RTG” (on November 26, 2017) through ‘CM Office Real-time Executive Dashboard (CORE Dashboard- launched in December 2016). CORE is an integrated dashboard to display category-wise key performance indicators- KPIs of various departments/schemes in real time of various departments/schemes/programmes, which are expected to be updated by each department every one hour. The dashboard displays current situation and department reports (e.g. agricultural land area sown, rainfall status, demand/supply of power, irrigation) to both public and officials alike. Due to its cohesive design, it has managed to improve decision-making, has imposed higher accountability of the concerned officials, as well as has contributed to increased awareness of the citizens about the status of public service delivery systems of their state along with a statistics based justification of decision making by the political/ executive leaders.

e. PRAGATI- Proactive Governance & Timely Implementation

PRAGATI (Pro-Active Governance and Timely Implementation), launched by the Prime Minister Narendra Modi on March 25, 2015 (*Figure 2*), is a unique interactive platform (www.pmindia.gov.in/en/tag/pragati/) for ushering transparency and accountability in governance, with real-time exchange of information. ‘Pragati’ aims to address common people’s grievances, while simultaneously reviewing and monitoring progress of important programmes/projects of both central and state governments using three digital technologies in conjunction *viz.* Digital data management, video-conferencing and geospatial technology for effective governance.

These few random examples, presented in no specific order delineate the role and relevance, and successful uptake of digital technologies in Indian governance scenario. Understandably, these advancements, applications, and various digital technology related schemes in the country are a cumulative effect of many decades of efforts, traced using a timeline approach in the previous section; however the golden chapter in the history of e-Governance of India is the launch of ‘Digital India’ programme (section 4.4) that demands special attention.

4.4 Digital India

Digital India is a canopy initiative that aims to transform India into digitally empowered society and knowledge economy. Digital India is rooted in three vision areas and nine pillars. Three vision areas are



FIG. 2 . PM’S TWENTY-SIXTH INTERACTION THROUGH PRAGATI (MAY 23, 2018).

(Source: <http://www.pmindia.gov.in/wp-content/uploads/2018/05/T2018052346994.jpg>)

‘Digital Infrastructure as a Utility to Every Citizen’, ‘Governance & Services on Demand’ and ‘Digital Empowerment of citizens’. These key areas are expected to be achieved by nine pillars of DI that include Broadband Highways, Universal access to mobile connectivity, Public Internet access programme, e-Governance: Reforming government through technology; *e-Kranti* – electronic delivery of services, Information for all, Electronics manufacturing, Information technology for jobs and Early harvest programmes. Out of these nine pillars, four are about provision of Internet and access, and the other pillars focus on providing governance and services on demand. Digital India programme has received appreciation world over for its innovative approach of mobile first and involvement of citizens in co-creation of next generation public services coupled with robust approach towards planning, monitoring and service level strategies. The announcement of PM about initiation of Digital India was followed by a spate of other initiatives such as launch of MyGov, Biometric attendance, *Jeevan Praman* and GeM and *Swayam* Portal being some of the recent ones (**Figure 3**).

Now, a summarised glimpse of initiatives launched since the year 2014 would give a wiser insight into the core functionalities and features of Digital India programme.

1. MyGov- A platform to encourage participation of citizens in governance by seeking their ideas and suggestions (mygov.in).
2. e-Hospital- A platform for connecting the patients, doctors and the hospitals to provide a one-stop solution for the citizens(<https://www.nic.in/projects/e-hospital/>).
3. DigiLocker- A platform that provides ‘private space on public cloud’ especially for storage, issuance and verification of documents and certificates in a digital way (<https://digilocker.gov.in/>).
4. *Jeevan Praman*- A biometric enabled digital service for pensioners for securing the life certificate (<https://jeevanpramaan.gov.in/#>).
5. *Aadhar*- A 12 digit number issued by the Unique IDentification Authority of India (UIDAI) to the residents of India to be used as a basis/primary identifier to roll out several government welfare schemes and programmes (<https://uidai.gov.in/your-aadhaar/about-aadhaar.html>)
6. Direct Benefit Transfer (DBT) - This scheme entails transfer of subsidies directly to the bank accounts of the beneficiaries, without any intermediaries in between. This is being now supported by a mobile app called *Jan Dhan Darshak*, which will help in locating financial touch points across the country.

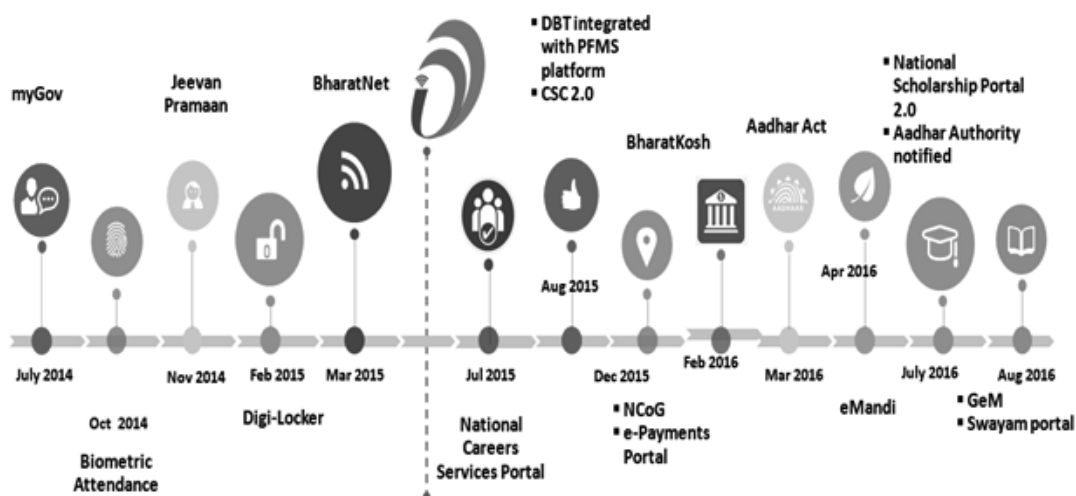


FIG. 3. KEY INITIATIVES LAUNCHED (YEAR 2014-TILL NOW; SOURCE : MEITY)

7. Government e-Marketplace (GeM) - A one stop Government e-marketplace to facilitate online procurement of common used goods and services required by various government organizations and PSUs (<https://gem.gov.in>).
8. UMANG (Unified Mobile Application for New Age Governance)- A single mobile platform for all Indian citizens to access central, local and other government services that provides seamless integration with popular customer-centric services including Aadhaar and Digilocker. It has been made available through mobile application, web, IVR and SMS. and is expected to revolutionize the way how an Indian citizen avails government services today. (<https://web.umang.gov.in/web/#/>).

A blatant listing of Digital India initiative would be irrelevant, until these initiatives are not mapped to the governance goals, defined by SDGs. Therefore, as a formal acknowledgement of critical position accorded to digital technologies in governance landscape of India, parallels have been drawn between various SDGs and Digital India initiatives (*Malhotra et al, 2017*)²⁵ in the subsequent section.

4.5 Digital India and SDGs

The first commonality between Digital India and SDGs is that the vision of the former insists on overall wellbeing and (digital) empowerment of its citizens that resonates well with the spirit of SDGs. Even the nine pillars of Digital India program echoes the spirit of seventeen SDG goals in one way or another. For instance, in sync to the SDG Goal of ‘No Poverty’ (SDG 1), several mission mode projects (MMPs) can be sighted that have been weaved around poverty alleviation and rural development, such as financial inclusion through JAM, DBT, CSCs, Public Financial Management Systems (PFMS) etc. Further, Government of India is trying to make all these initiatives available through its BharatNet scheme that assures to provide Gram Panchayat/ village level connectivity through optic fibre network. The second SDG *i.e.*, ‘Zero Hunger’ is expected to be achieved through successful culmination of schemes including SMS based mid- day meal, targeted PDS (TPDS) as well as encouraging application of innovative technologies to increase crop production within the country through ‘Agriculture 2.0’ using emerging technologies in agriculture (Details can be sighted in the subsequent section -Section 4.6). Similarly, achievement of ‘Good Health for All’ (SDG 3) is expected to be achieved in India through MMPs focusing on telemedicine, ORS, e-healthcare and e-consultations. ‘Quality Education’ (SDG 4) would be aided through MMPs on Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA)/ National Digital Literacy Mission (NDLM) and by web initiatives including National Scholarship Portal, National Mission for Education through ICT, e-Pariksha, e-Pathshala, e-Basta thereby eliminating digital divide in the education realm. In order to address issues of ‘Gender Equality’ (SDG 5) various schemes have been launched by the Government, along with some interesting mobile apps such as, ‘selfie with daughter’, to increase awareness about the pride of having a daughter, notwithstanding the ill-rooted conservative approach towards females in the country. Having ‘Access to Clean Water and Sanitation facilities’ (SDG 6) has been always known to be basic human rights; efforts being made by *Swachh Bharat* mission through its *Swachhata* app as well as through large scale projects including Clean *Ganga* where a massive digital repertoire is being made on *Ganga* and all of its tributaries in its path. SDG 8 which places emphasis on having ‘Decent work and Economic Growth’ can be mapped to the National Service Scheme, Skill Development Mission, developing software technology parks of India, whereby IT can be taken up for jobs, social welfare and *Jeevan Pramaan*. Online portals by State Governments are present for both the employers and candidates to facilitate in employment generation. ‘Industry innovation and developing infrastructure’ (SDG 9) is of equal importance and is being addressed by initiatives like Start- up India, Make in India, with the help of FDI policy so as to levy equalization tax, projects like MCA21 which is an e-Government initiative from the Ministry of Corporate Affairs.

Issues of inequality are being addressed under the SDG 10 and under the aegis of Digital India there are

²⁵Charru Malhotra, Anand R, & Singh.S. , 2017, Applying Big Data Analytics in Governance to Achieve Sustainable Development Goals.

MMPs that focus specifically on marginalised communities as well as women and child development. Digital India initiatives such as PAHAL- DBT scheme, and MGNREGA programme cater to the provision of social benefits. Similarly, even SDG 11 *i.e.* Sustainable Cities and communities is expected to be successfully achieved through initiatives including JNNURM (Jawaharlal Nehru National Urban Renewal Mission) and AMRUT (Atal Mission for Rejuvenation and Urban Transformation) and National Geo-spatial Information Systems NGIS (MMP). Climate Change (SDG 13) is a global emerging issue that needs timely addressal, for achieving this the National Action Plan on Climate Change has been put in place wherein use of technology for planning is being emphasized' similarly application of GIS through National Centre of Geo-Informatics (NCoG) is equally made relevant. Similarly, successful culmination of NGIS can aid in the achievement of Life on Land (SDG 15). SDG 16 (maintaining 'peace, justice and strong institutions') is expected to be addressed by creating networked policing institutions. India has already initiated several digital initiatives in this direction such as Crime and Criminal Tracking and Network systems (CCTNS), e- Jails, e- Prosecution through e- Courts, as well as implementation of Right to Information (RTI) through its online portal (<https://rtionline.gov.in/>). Since achieving such ambitious goals alone is not possible (SDG 17 - the need to have partnerships for goals) can be achieved by providing information to all its citizenry using digital means including digital engagement platforms like Mygov.in and e-Sampark.

This macro analysis clearly establishes a healthy correspondence between SDGs and Digital India programme. In the subsequent section, the microanalysis of case study of 'Agriculture' - the prime target of Indian governance, too would vouch for the critical role digital technologies now play in the Indian context.

4.6 A USE CASE of Agriculture

India is primarily an agrarian economy. Unfortunately, agriculture sector has been marred by numerous levels of middlemen across the supply chain of agricultural produce (from farm-to-retail shop) taking away huge profits that could otherwise have benefited the farmers by adding to their income. Recently, several initiatives have been implemented under the Digital India Programme that are not just helping to eliminate economic information asymmetry between the demand and supply sides but also helps in providing customised information to farmers to increase soil productivity, and to take more 'informed' decisions to manage risks associated with agriculture scenario.

a. Agrimarket App

The Digital India Programme includes an initiative called the "Agrimarket App" which aims to eliminate economic information asymmetry between the demand and supply. It keeps farmers abreast with crop prices and discourages them to carry-out distress sale. Farmers can get information related to the prices of crops in markets within 50km of their location. This app automatically captures the location of the farmers using mobile GPS and fetches the market prices of various crops. Such geo-targeted data when used in conjunction with the information available from other sources enables farmers to make informed business decisions while ensuring that the profits are maximised without being siphoned out by intermediaries. The app is currently available in English and Hindi language.

b. Plantix App

Other notable digital initiatives in India have been sighted in the state of Andhra Pradesh, where a mobile app, called "Plantix App", an interactive dashboard and big data analytics help farmers to increase farm productivity, profitability and manage risks in support of SDG 12 (Responsible Production and Consumption).

c. Kisan Suvidha Mobile App

The *Kisan Suvidha* Mobile Application (mkisan.gov.in), helps to integrate relevant information for the farmer from multiple aspects including weather, market prices, seeds, fertilizers, pesticides, agriculture machinery, dealers, agro advisories, plant protection and integrated pest management practices. This information is available instantly on demand and is supported by 'push alerts' for extreme weather situations, market prices of commodities, etc.

d. Fertilizer Monitoring System (FMS)

FMS checks for fake claims, pilferages, etc., and thus aims to create an ecosystem where the subsidized fertilizers are delivered to the actual farmers and proposes to generate substantial savings to the tune of several thousand crores every year.

e. Soil Health Card

The Soil Health Card Scheme was launched in the year 2015 to promote Integrated Nutrient Management (INM) of the soil through judicious use of chemical fertilizers. It provides tailored information on secondary and micronutrients present in the soil in conjunction with organic manures and bio-fertilizers to help provide customised soil test-based recommendations.

f. 'e-National Agriculture Market- eNAM' (enam.gov.in)

eNam serves as an electronic trading portal that has aggregated all the existing Agriculture Produce Marketing Committee (APMC) *mandis* (market places) across the country. eNAM serves as a unified national digital marketplace with a single window access for all the agricultural commodities. It provides information about commodity arrivals and their prices; purchase and selling trade offers; provision to respond to trade offers, etc. Hence, eNAM ensures that farmers are not exploited due to lack of knowledge and are able to make sound economic decisions.

Proposed Enhancements to existing e-Agriculture Scenario of India

Several digital advents, apps and information systems can be seen splashed across various agriculture realm of the country. However, some added features into these initiatives are expected to bring in more considerable change in the ways agriculture sector can improve in India. The utopian solution could be that all these initiatives get unified as just one initiative provided on a single platform, per se “Kisan One” - that combines all aspects of a farmers’ life such as seed procurement, sowing cycles, availability of fertilizers, crop prices, etc. Considering the practical life of a farmer in India, the author in her extensive rural visits realized that an Indian farmer, depending on his region, also turns to alternative livelihood options such as horticulture, prawn/ shrimp raising, etc., during lean farming seasons. The utopian version of Kisan One should also link menu-options for ‘Alternative Livelihood’ options for farmers. Using Big data analytics and AI algorithms, such humongous farmer-specific data may then be aggregated and analysed zone-wise for prudent zone-wise policy decision making. Such an output would help to map the resource-requirements as per the needs of the area. Further, financial grants/ capacity building / sensitisation drives required to upgrade the skills and knowledge of laboratory staff, extension staff and farmers can also be customised according to their needs. Further, Kisan One should be ‘personalised’ and ‘contextualised’ to the individual needs of each farmer in a particular region/zone. Therefore, it should also support just one interactive dashboard in local language to answer agriculture queries on local issues, may include AI-based chat feature, support feature phones using USSD (Unstructured Supplementary Service Data) platform and SMS service along with a desktop portal version available free of cost at self-serving kiosks having internet access and pre-trained facilitator. IoT can also be leveraged for online tracking of the actual produce by embedding computing devices connected to the Internet in the packaging of the produce, hence ensuring that theft, pilferage and/ or hoarding does not occur at any stage of the movement of the produce from the farm to the retailers. To strengthen the trust component in the related information systems (like FMS), blockchain technology solution can be developed to monitor the movement of agricultural products at various stages in their value chain to avoid data tampering. Related information such as details of agriculture produce, the list price of different produce, product wise/state wise details of dispatch and receipts of produce at different destinations across the country can also be made available on the cloud platform. For doing so, we also need to incubate an “agritech “ culture in the country, where innovative application of emerging technologies in agriculture initiated by our startups may also be seamlessly integrated in “Kisan One”. If we adopt such a holistic and integrated approach then the Prime Minister Modi’s aim of doubling the average income of farmers by the

year 2022 would be much easier to attain. Agriculture sector can then again beckon a ‘culture of hope’ in the country.

Apart from agriculture, such digital changes have been liberally sighted in other domains of Indian governance too such as e-health, e-transport, e-education, etc. However, technology-led development based on technological determinism assumptions might unintentionally conceal the complex governance realities or might let these go largely unquestioned, especially in the case of developing countries like India. The next section attempts to list the challenges assailing technology-led governance processes.

5. CHALLENGES CONFRONTING E-GOV IMPLEMENTATION IN INDIA

Since e-Governance initiatives have such a broad scope, crippling issues have a greater scope to occur. Extensive field-exposure of the author across the entire length and breadth of the country has given her fair exposure to delineate some of these challenges. For instance, close informal interactions of the author (in the year 2007) with approximately 28 district collectors / deputy commissioners from the state of Mizoram, gave some interesting insights into the challenges that an implementation of the Community Information Centres (CIC) project was encountering. Majority of the officers²⁶ had indicated glaring issues such as inadequate technical, erratic power supply with limited supply of kerosene fuel to run the power backup generator machines, lack of customised software and absence of meaningful content. As a result, the CIC project, according to them had not yielded anticipated development outcomes, which were initially envisaged by the policy makers of CIC project. In recent times, in global context the investigation by the US national agencies into the rigging of US elections in the year 2016 poses issues from the other end of the spectrum. In this case, social media data of the American citizens had been captured by a British agency called Cambridge Analytica to ‘influence’ the perception of US voting community in favour of a particular candidate. This is an example of gross (mis) use of big data analytics and affirms the cascading repercussions of invasive potential of digital scenario on global governance. Clearly, these stray instances of CIC implementation in Mizoram (India) and Cambridge Analytica episode (US) reveal that there are several challenges and risks assailing e-Governance scenario. The author has broadly classified the headwinds to e-Governance implementation as *Technological* challenges, *Human Resource* challenges and *Governance* challenges.

5.1 Technological Challenges

The ‘beehive’ of technological challenges comprise of varied issues ranging from e-Waste damages, to the last mile-connectivity, to cybersecurity concerns and to the pertinent challenge of ‘digital divide’²⁷. In addition, there are lack of national technology standards for the same service that causes apparent disruption in user-experiences and convenience (*Satyanarayan and Malhotra, 2018*)²⁸. Further, a lack of robust cyber security mechanisms to protect hardware and software while not causing hindrance to privacy can also pose a challenge. One cannot be oblivious of the fact that the increased use of digital technologies coupled with fast obsolescence of devices creates ‘electronic litter’, popularly referred to as ‘e-Waste’. According to Global e-Waste Monitor Report (2017) by ITU, around 44.7 million metric tonnes of e-Waste was generated in the year 2016. In developing countries like India, e-Waste is a bigger challenge because of unplanned discarding that makes disposal difficult as well as costly (*Dasgupta, Debsarkar, Chatterjee,*

²⁶As per discussions with Shri C.C. Lalchhuangkima, Block Development Officer Reiek, Mamit District, Mizoram and Shri Jacob Lalawmpuia, Additional Private Secy. to CM, Chief Minister Office, Mc Donald Hill, Aizawl-796001, Mizoram.

²⁷Digital divide refers to the inability of the citizens to access digital technologies, primarily due to economic constraints. According to the International Telecom Union (ITU) ICT Facts and Figures, 20% of households in developed countries and as many as 66% of households in developing countries do not have internet access, leaving almost 4 billion people from developing countries offline.

²⁸J. Satyanaraya & Charru Malhotra (2018) “*Universalization and Replication:-Towards a consistent service experience- The role of a Digital Service Standard (DSS) in Citizen Centric Governance*”. In ‘Technology for Accelerating Development’, DARPG and NASSCOM Publication, Government of India: New Delhi. URL: <https://community.nasscom.in/docs/DOC-1696>.

Gangopadhyay & Chatterjee, 2015)²⁹. Also, with growing amount of connected digital devices, unauthorised access to personal sensitive information also poses challenge, especially in a country like India where data of almost 132 crore citizens is at stake. In present context, the implementation of emerging technologies (listed in section 2.1) requires a constant and a strong internet connection; therefore, a possibility of Internet blackout would completely retard the progress (*Kathuria, Kedia, Varma, Bagchi, & Sekhani, 2018*)³⁰. In context of emerging technologies, the programmers too should not end up ‘creating’ AI driven machines that could morph to create unpredictable ‘Frankenstein’ kind of unwieldy situations. Therefore, to counter these uncontrollable self-destructing scenarios, very strong emotional and spiritual IQ must be inculcated in AI programmers to create digital systems of our future, especially the ones that are employed in governance context (*Malhotra, Kotwal & Dalal, 2018*)³¹.

5.2 Human Resource Challenges

Human resource challenges are created for several reasons including lack of exposure, lack of easy availability or/and lack of skills. Further lack of trust, privacy challenges, and fear of inadequate security in the mind of masses too hamper the uptake of technology. The challenge confronted by the unaware citizens and reluctant employees is another critical aspect that stalls the smooth implementation of e-Governance. In a diverse country like India that boasts of varied profile and preferences of its citizens, digital divide phenomenon too manifests itself in more complicated manner. It ripples down to also include divide created in ‘haves’ and ‘have nots’ segregated by age, literacy, awareness, demography, disability, gender, connectivity, infrastructure, etc. Digital citizen engagement platforms do espouse participatory forms of governance; however, the aspirations of the citizenry evolve very fast, almost at tandem with the trends of digital technologies. These recursive variations in needs and aspirations of citizens could lead to an unmanageable kind of fluidity in otherwise rigid institutional setups.

5.3 Governance Challenges

Issues of information management and electronic records preservation constitute one part of governance challenges (*Palanisamy, 2004*)³². Sponsor dictates, outdated institutional frameworks, and inefficient partnership models further aggravate Governance challenges. Digital surveillance by establishments and e-hegemony / data autocracy by the developed nations impede uptake of digital technologies by the developing nations. Lack of robust regulatory mechanisms may further end up creating a national psyche of insecurity against uptake of digital technologies in governance.

6. WAY FORWARD FOR E-GOVERNANCE IN INDIA

After gauging the complexity of challenges (section 5.0) that could constrain the role of digital technologies in governance, time is now ripe for our governments to evolve robust institutional frameworks and national strategies.

6.1 Institutional Frameworks and National Strategies

At the institutional level, most important factors that must be incorporated are components of Information Security and Data Integrity, Sourcing and Outsourcing, Performance Measurement, Regulatory non-compliance, Technology management infrastructure and Strategy Building and Risk Management and Disaster

²⁹Dasgupta, D., Debsarkar, A., Chatterjee, D., Gangopadhyay, A., & Chatterjee, D. (2015). Present E-waste Handling and Disposal Scenario in India: Planning for Future Management

³⁰Kathuria, R., Kedia, M., Varma, G., Bagchi, K., & Sekhani, R. (2018). The Anatomy of an Internet Blackout: Measuring the Economic Impact of Internet Shutdowns in India

³¹Charru Malhotra., Kotwal, V., & Dalal, S. (2018). Ethical Framework for Machine Learning, Submitted for publication .

³²Palanisamy, R. (2004). Issues and Challenges in e-Governance Planning. *Electronic Government an International Journal*, 1(3). DOI: 10.1504/EG.2004.005551

Recovery Planning aspects (*Chandiramani, 2007*)³³. There is a national need for realigning our approach towards ‘managing technology’. A comprehensive and persistent national focus is required for designing more robust regulatory frameworks. Rather than laid back staid approach to usher in new IT-related Bills/ Acts / Amendments. India needs a more proactive, collaborative and recursive recourse to initiate and implement legal amendments in Indian Penal Code/ IT Act, etc. Even the access to public data should be controlled at several levels for safeguarding privacy, security, and integrity of data. Managing e-Governance implementation is also about ‘managing changes’. Hence, there is a strong requirement to address the issue of change management for which a commitment of our political and executive leaders is crucial. To ensure hassle free and smooth transition from governance to e-governance, our leaders must follow eight step model that insist on creating a sense of urgency, building a core coalition, forming a strategic vision, getting everyone on board, removing barriers and reducing friction, generating short-term wins; sustaining acceleration and finally, setting the changes in stone (*Kotter, 1996*)³⁴. To support the creation of state-of-art institutional frameworks as well as to formalise the change management strategies for the nation, a Center of Excellence (CoE) on ‘Digital Technologies in Governance’ in India should be established. Such a research-oriented centre would help to propel an innovation-led progress model for the country and help to formulate a cohesive approach for all the institutions to achieve more speedily the vision of our Prime Minister to establish India as a global leader in delivering digital services.

6.2 Establishing a Center of Excellence on ‘Digital Technologies in Governance’

The proposed Center of Excellence (CoE) can help to inculcate highest standards for conduct of research, innovation, and learning in the ever-evolving field of digital technologies, both at the institutional as well as at the national level.

Proposed Objectives of CoE

The Centre could help the stakeholders:

1. To design, consolidate, operationalise and disseminate cutting-edge global knowledge and learnings on use of digital technologies in governance.
2. To contextualise the technology based trends and innovations to the local conditions of the states and the local level.
3. To catalyze knowledge exchange amongst various categories of its stakeholders e.g. amongst ‘practitioners and intellectuals’, ‘leaders and laggards’ and so on.
4. To support capacity-building endeavors, preferably in a hub-and-spoke model or using training-of-trainers based approach.

Indicative List of Activities of CoE

Respecting its premium, position in the national governance landscape as well as the global acceptance of the Institute boldly affirms that IIPA can be entrusted with the responsibility of being the proposed CoE. Moreover, IIPA also upholds almost seven decades of its experience in dealing with all the stakeholders of governance. It has established itself firmly in e-Governance ecosystem and boasts of a unique national network that is well established through its regional and local branches spread across the country. The Centre will undertake the activities required to plan, design, implement, and monitor e-Governance initiatives commissioned to IIPA by MeitY, NeGD and other government agencies. In addition, the proposed Centre can undertake following activities:

- a. Enable Government agencies access to a range of knowledge related services and help them apply

³³Chandiramani, S. (2007). Information Technology and Corporate Governance. Retrieved from <http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN026699.pdf>

³⁴Kotter, J. (1996). *Leading Change: Why Transformation Efforts Fail*. Harvard Business School

this knowledge in the delivery of their functions, roles, and responsibilities as mandated by the Digital India agenda.

- b. Showcase India's best practices globally and help neighbouring countries learn from Indian experiences through South – South Exchange programmes.
- c. Undertake field research and impact assessment of implemented initiatives of Digital India, etc.
- d. Carry out research in the emerging technologies including mobile governance, big data analytics, citizen engagement, and ICT4D studies.
- e. Build a digital repository of case studies, policy papers, research reports, training content, and other studies related to achievement of Digital India agenda.
- f. Facilitate deliberations amongst governance stakeholders such as government representatives, donor agencies, civil society organisations, industry, and practitioners through regular consultation events.
- g. Design, develop, and constantly update curriculum, pedagogy, and training kit (including web-based content) for direct e-Governance trainings for State, Centre, local bodies, and public sector units. Rapid research would be undertaken to develop such e-Governance related training modules.
- h. Establish a formal as well as an informal network of distinguished think tanks, academics (drawn from IIT, IIM, JNU, IGNOU, DU and so on), cyber advocates, practitioners, industry stalwarts, as well as grass root experts.
- i. Provide linkages with global institutes for knowledge and faculty exchange.

The core strategy for developing the COE would be to incubate indigenous innovations, simplify technology trends, and advance technological development in governance by bringing together the complementary resources.

CONCLUDING REMARKS

Digital technologies chisel governance systems to be responsive to the present and future needs of society and their usage can be synergised to the sustained development goals. The existing digital initiatives spearheaded under the Digital India scheme have accomplished a lot in governance domain, particularly in delivery of public services, education, health, agriculture, etc. However, these digital initiatives must not wither away as erratic experiments. To sustain these digital initiatives, the governance agencies must provide citizens with what exactly they need and aspire rather than just an aped model where 'one size fits all'. Only a citizen-centric and citizen-inclusive approach can bridle the ever-changing facets of technology and help to design a recursively self-regulated ecosystem of e-Governance. Keeping 'citizens' as the nucleus of governance / e-Governance systems would help us to achieve a more sustainable and equitable global economy, where digital technologies act as an expedient means and not an 'end'.



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