Technology, Policy, and Inclusion

An Intersection of Ideas for Public Policy

Edited by Anjal Prakash, Aarushi Jain, Puran Singh and Avik Sarkar

Innovations, Practice and the Future of Public Policy in India

TECHNOLOGY, POLICY, AND INCLUSION

Technology, Policy, and Inclusion looks at the intersections between public policy and technology in India. It explores the barriers in instituting effective governance and development and examines how these can be mitigated through technological interventions in developing countries.

Increased digitisation of the economy has added to the development challenges in India and issues such as exclusion and social inequality. This volume stresses the need for governments to leverage technology to bring more vulnerable and marginalised groups into the fold of financial and social inclusion. It also focuses on the importance of regulation for a responsible integration of technologies and minimising risks. The book includes examples and case studies from different areas including management of the COVID-19 pandemic through digital means, real estate digital infrastructure, digital census, e-markets for farmers, and government interventions that use technology to deliver financial services in remote areas of the country. It also outlines various solutions for fostering equity and socio-economic development.

Part of the Innovations, Practice and the Future of Public Policy in India series, this volume will be of interest to students and researchers of public policy, political science, development studies, and sociology as well as policy professionals and technocrats.

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Innovations, Practice and the Future of Public Policy in India

The field of public policy is broad, interdisciplinary, and multifaceted. It requires constant communication between stakeholders – including academics, practitioners, and the general public – to address important public policy design and concerns around implementation.

This series brings together contributions and diverse perspectives of academics and practitioners in the field of public policy in India and records innovative ideas and best practices to facilitate knowledge transfer, replication, or scaling. Public policy must be proactive and focused on the future and work on developing ideas that may be scaled up, customised or applied across jurisdictions. The books in this series focus primarily on the voices of academics and practitioners and offer crucial insights for corrective action and creation of more comprehensive policy designs. By critically analysing cases and policy designs, it offers insights into the feasibility of innovative models where theory meets practice in the pursuit of the public good.

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Amarjeet Sinha

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FOREWORD

This book by Dr Anjal Prakash, Dr Aarushi Jain, Dr Puran Singh, and Dr Avik Sarkar is a compendium of nine handpicked research papers that speak to the crossroads of technology with policy. A public servant dealing with public welfare on a regular basis can best appreciate technology's role in public policy. And therefore, I am pleased to write the foreword to this book that aligns with my personal views on the subject – technology is merely a tool to achieve ends. Technology is a means; it is a community connect, hand-holding community resource persons bridging the last mile, and grievance redressal that actually bring out the powers of a pro-poor intervention using technology.

I am a firm believer in 'technology for society'. However, technology is a double-edged sword. It can work like a magic wand in the hands of well-informed public programme/system that is user-centric in policy matters. In contrast, a mindless application of technology without last mile facilitation can cause exclusion and undesirable social consequences.

The chapters in this book bring a broad-based and diverse collection of cases of the use of technology in public welfare programmes. Each has intriguing insights that can guide public discourses and policy design at various levels. In the last several years, I have seen countless innovations that have made life easy for human beings, and many such came through forums like this, where academicians and practitioners exchange their views and converge. This collection is a similar culmination that originated from the Indian Public Policy Network's annual conference in 2020, curated by the Bharati Institute of Public Policy and the Indian School of Business. I congratulate the institutions involved in this initiative for enabling the editors and authors to bring forth an excellent output that has national relevance.

I must commend the editors' particular focus on India as the breeding ground of innovations and their application. Today, India needs technology more than ever to put together pro-public governance mechanisms and empower the masses. I believe this book will augment the current knowledge of public policy stakeholders, administrators, and aspiring researchers and nudge the public discourse on technology's role in public policy in a favourable direction.

My best wishes for the success of this book!

Regards

Amarjeet Sinha, IAS
Former Secretary, Ministry of Rural Development, Government of India
Former Advisor to Prime Minister, Government of India

PREFACE AND ACKNOWLEDGEMENTS

Technology and policy refers to the relationship between the development and implementation of technology and the laws and regulations that govern its use and impact. This relationship is essential as technology has the potential to affect society and the environment significantly. The policymakers must deeply understand the implications and consequences of these advancements. They make informed decisions about regulating and managing technology, balancing the benefits and risks, and considering these decisions' ethical and social implications. The field of technology and policy is constantly evolving. It requires continuous dialogue and collaboration between technology experts, policymakers, and public to ensure that technology is used in a responsible and sustainable manner.

The intersection of technology and policy is a crucial arena for shaping the future of our world. As technology continues to advance and transform every aspect of our lives, it is increasingly important that policymakers understand the implications and consequences of these changes. *Technology and Policy: An Intersection of Ideas for Public Policy* provides a comprehensive overview of this critical relationship, exploring the ways in which technology and policy intersect and interact and their impact on each other. With insights from experts in various fields, including academicians and practitioners, this book delves into the complexities of this relationship, offering a multidisciplinary perspective on the most pressing issues of our time. Whether you are a policymaker, technology expert, or simply someone interested in the future of our world, this book is an essential resource for understanding the vital connection between technology and policy.

The editors would like to express gratitude to Sh. Amarjeet Sinha, Former Advisor to the PM, for writing the foreword of this book. The editors thank the organisers and participants of the India Public Policy Network Conference 2021, which led to this knowledge product. The editors would like to express gratitude to Prof Ashwini Chhatre, Executive Director, Bharti Institute of Public Policy and Chair, IPPN 2021, for his guidance and valuable suggestions throughout the publication process. Thanks to the contributors who have made this book possible; their expertise and insights have made this publication an essential resource for technology and policy.

We would also like to extend our appreciation to Routledge for their support and encouragement throughout the publication process. Suggestions from the production team – Senior Commissioning Officer Ms Shoma Chaudhury and Ms Shoka Chauhan – have been invaluable in bringing this project to fruition. Appreciation is also due to Ms Sukhmani Kaur, former Content Writer at ISB, for language edits and manuscript proofreading.

Finally, we would like to thank our families and friends for their unwavering support and understanding while we put this book together. Their love and encouragement have been a constant source of inspiration.

We hope this book will serve as a valuable resource and contribute to the ongoing dialogue on technology and policy.

Anjal Prakash, Aarushi Jain, Puran Singh and Avik Sarkar
August, 2023

1

TECHNOLOGY AND POLICY

Points of Intersection

Anjal Prakash, Aarushi Jain, Puran Singh, and Avik Sarkar

1.1 Problématique: Technology and Policy

Technological advances are known to be indispensable to the developed and developing worlds alike (Acemoglu & Robinson, 2012; Arendt, 2015; Sachs et al., 2019). Over the last two decades, the advances in digital technology, particularly information and communication technology (ICT), have transformed the way people, businesses, and governments work, communicate, and transact (Myvolla et al., 2020). These dramatic changes significantly impact capital and labour productivity, increase global market access, and lower transaction costs, ultimately feeding economic development (Bojnec & Ferto, 2012; Dahlman, Mealy, & Wermelinger, 2016). In recent years, developing countries have leapfrogged to converge with the developed world on several fronts (Arendt, 2015; Negroponte, 1998; Steinmuller, 2001). However, poor infrastructure, financial barriers, political barriers, technological barriers, and the absence of other enabling conditions continue to pose several challenges to digital adoption and use in the developing world (ITC, 2015; Nour, 2017; UNCTAD, 2018).

In the past decade, the Indian government embraced digital technology for better citizen interfacing, service delivery, efficient administration, inter-government communication, policy implementation, and minimising leakages (Nedungadi et al., 2018). These mainly include the introduction of Aadhaar, a digital identity system that is used with other digital applications to enable large-scale public programmes, such as the distribution of food and fertilisers, disbursement of pensions and scholarships, transfer of cooking gas subsidies, and access to basic banking, to name a few (Mittal et al., 2017; Gelb et al., 2018). The widespread adoption of mobile phones

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and the availability of the internet in the remotest areas have enhanced the state's capacity to implement the above-mentioned reformed digital governance systems (Gelb et al., 2018).

The use of digital technology in public services requires the government to uniquely identify citizens, target specific beneficiaries, and create delivery mechanisms (Gelb et al., 2018). Such digital systems are mostly identity-based and require digital identity and biological data to enable access (Masiero, 2017). While such systems help governments target the users that are genuinely entitled to government benefits and avoid leakages and corruption (Maseiero, 2017; Gelb & Decker, 2012; Muralidharan et al., 2016), mechanisms that block wrongful access sometimes do not have the means to ensure the inclusion of deserving beneficiaries (Khera, 2014; Swaminathan, 2008). Therefore, system design can lead to involuntary exclusion and a digital divide in society (Ramakumar, 2010).

The fast-paced digitalisation creates several intended and unintended consequences, some of which are good, and others concerning. For developing countries such as India which are largely rural, widespread implementation of technology-based interventions can pose challenges that are multifaceted and overwhelming. These issues require focused intervention to ensure a robust digital economy that is just, inclusive, and transparent. Some of these issues are as follows:

1.1.1 Digital Divide

Over the past two decades, digital technology-related arguments have moved from *access to technology* to *digital literacy and inclusion* (Thompson, 2008; Jaeger et al., 2012). The digital divide refers to the difference in the level of access to technology by different sections of society (Jaeger et al., 2012). Digital technologies, particularly cell phones, personal computers, the internet, and mobile services, have been noted to create a divide among the population due to socio-economic characteristics of individuals, such as education, gender, age, disability, language, and digital literacy (Jaeger et al., 2012; Jaeger, Subramaniam, Jones, & Bertor, 2011; Nedungadi et al., 2018). In several countries, the digital economy has led to the polarisation of labour markets (Bejakovic & Mrnjavac, 2020) by reducing the demand for low-skilled labour (Berger & Frey, 2015).

1.1.2 Digital Literacy

Digital literacy refers to the skill and ability required to access the technology once it is available (Jaeger et al., 2012). Rural populations are among the most affected by the lack of awareness and literacy of digital tools and processes (Nedungadi et al., 2021). India faces a challenge in increasing digital literacy, from its current level of 38% households in India with at least one

person with digital literacy. Digital literacy in urban areas is 61% compared to 25% in rural areas. Central India has lower digital literacy levels ranging between 20 and 40%, compared to southern parts of the country with 40–60% level of digital literacy.[1] The variation in digital literacy influences the perceived relevance and value of literacy, which leads to uneven adoption of technology and employability. With the rise in digital citizenship, several countries including the USA, South Africa, and Europe have developed digital literacy frameworks to enable individuals to develop technical abilities and skills (Nedungadi et al., 2018; Bejakovic & Mrnjavac, 2020).

1.1.3 Digital Inclusion

Digital inclusion refers to the policy of bridging the digital divide by promoting digital literacy (Jaeger et al., 2012). Several countries have adopted digital inclusion projects to overcome digital divides and their consequences (Hunt, 2001; Kanungo, 2003; Salvador, Sherry, & Urrutia, 2005). In addition to digital access, such projects also focus on capacity building, learning, and social inclusion (Trauth, Howcroft, Butler, Fitzgerald, & DeGross, 2006). However, the interventions in this direction are challenged by the skewed adoption of digital technology, leading to lopsided demand for government benefits, employment, health, and other services (Haenssgen, 2018). The digitalisation of health services has been noted to disadvantage the deprived population by creating intensified competition for scarce health resources (Haenssgen, 2018).

1.1.4 Digital Governance

Digital governance in India rests on JAM trinity, i.e. Jan Dhan Bank Account, Aadhaar number, and Mobile phone (Department of Economic Affairs, 2015). Several subsidy programmes of the Indian government have leveraged the JAM trinity for G2P services and direct transfer of benefits to the targeted population segments. These schemes include the distribution of food and fertilisers, disbursement of pensions and scholarships, transfer of cooking gas subsidies, and access to basic banking, to name a few. As the Indian government increases digital dependency, issues such as identifying the beneficiaries, targeting the beneficiaries, and delivery mechanisms need to be handled cautiously (Gelb et al., 2018). Further, digital governance requires dealing with the challenges of managing data systems, data integrity, data ownership, and user protection due to the possibilities of cybercrime, fraud, and data leaks.

1.2 How Is This Book Organised

This book contains ten chapters. The chapters are broadly divided into three areas. Chapters 1–5 focusses on digital systems. Chapters 6–8 discuss

the technology and policy challenges, while chapters 9 and 10 talk about impacts and policy options.

1.2.1 Digital Systems

Chapters 2–5 illustrate the use of digital systems through four unique case studies on welfare and data management systems. In Chapter 2, Aarushi Jain, Ankit Anand, and Isha Mahajan address digital governance issues with a case of COVID-19 management in India. The COVID-19 pandemic has been described as a once-in-a-century event which brought chaos and disruption in its trail. The systemic shock was experienced not only in the health services domain, but the subsequent mobility restrictions and nationwide lockdowns caused havoc in the lives of citizens as the delivery of even common governance services was disturbed. The unknown nature of the virus and the misinformation around its emergence and spread only added to the mayhem. This chapter talks about how digital governance helped the Government of India in not only managing the pandemonium caused by COVID-19 but also ensuring the continuity of delivery of government services using a variety of digital applications. It discusses how the Digital India Mission laid the groundwork for this exercise wherein the focus of the government was on creating digital infrastructure, such as UPI, Diksha, Ayushman Bharat, etc., across sectors and building standardised digital solutions using the IndEA framework. These initial head starts played a pivotal role in the management of COVID-19 as the Government of India used its existing applications and developed a few specialised ones for preventive communication, disease management, and delivery of governance services. Specifically, we address how the emergence, use, and continuous improvement of applications, such as the MyGov platform, Aarogya Setu, CoWin, UMANG, and DigiLocker, helped in the timely dispensation of authentic information coupled with citizen-centric services, thereby providing relief to citizens as well as allowing the government in better management of its resources. The chapter concludes with the key impediments that limit the effectiveness and acceptance of these digital solutions in today's day and time.

In Chapter 3, Abhishek Jain and Varinder Kaur look at the digital census of 2021 and the applications of advanced technologies in census mapping. They show that an accurate, comprehensive, timely, and high-quality census is a prerequisite for achieving Sustainable Development Goals and effective governance. The Census 2021 of India, enumerating roughly 1.35 billion population (with India becoming the most populous country by 2026), costing INR12,695 crores (or US$ 1.7 billion) and deploying 30 lakh enumerators, has significant evidence value for countries across the world, especially for 59 countries where census is scheduled in or after the year 2022. Originally scheduled for the years 2020 (first phase) and 2021 (second phase),

data enumeration from citizens through field visits had been postponed up till June 30, 2022, due to COVID-19. Considering India's rank (100 of 193 countries) in the UN E-Governance Development Index 2020, the digital census is not an easy task. Providing a practitioner's perspective, this study finds that India is taking a quantum leap in its 150 years of census through the 'Digital Census' for the first time, which may take place in 2022–23. The digital census includes digital data collection, digital self-enumeration, digital mapping, digital management and monitoring of field operations, digital payments, and digital data dissemination. Digital data enumeration is done through indigenously built mobile apps in 16 languages. A digital self-enumeration option is being provided to households. Digital mapping is in Houselisting Block Mapping, Digital Ward Mapping through ArcGIS software, and Built-Up Area (BUA) Digitisation Project. Complete automation of census management and monitoring has been envisaged through CMMS Portal. All payments are going digital through Public Financial Management System (PFMS) and Direct Benefit Transfer (DBT) while data dissemination will be done through Census-as-a-Service (CaaS). Advanced technologies are also being applied in census mapping in the upcoming census in India. The digital census is likely to make the Indian census faster, more efficient, and more useful. The application of all these disruptive technologies being introduced for the first time in the Indian census on such a massive scale is likely to digitally transform the census operations in India completely.

In Chapter 4, Mausmi Hajela, Girish Sharma, and Sudhir Chaudhary envision a smart real estate digital infrastructure in Madhya Pradesh. They show that the Urban Development and Housing Department, Government of Madhya Pradesh, brought forth and implemented the Madhya Pradesh Real Estate Policy, 2019 to give an impetus to the real estate sector in the state. Considering the changes recommended in the policy document, a draft framework has been designed under the 'Smart Real Estate Digital Infrastructure' for stimulating the workflow and progress of an application. It comprises an interoperable framework for real estate services and a Single Window environment and helps in achieving a high level of ease of doing business in the sector. The environment is designed and articulated for public agencies and the technology community (enterprises/start-ups) – ensuring e-governance systems, disaster recovery management systems, and inter-departmental operational processes which currently operate in silos. An e-governance service would be a change agent which supports citizens, businesses, and innovation ecosystems alike. The proposed composite single-window portal professes the same. The ultimate service/objective of the citizen need/requirement is to fulfil by synchronising and orchestrating the data flow/interpretations between inter-departmental operations and processes. Thus, this digital infrastructure enables a service-oriented e-governance environment with a dedicated interoperable layer and the shared digital

assets authenticated via blockchain, thereby realising real estate policy in letter and spirit.

In Chapter 5, Ankit Anand focuses on critical success factors for enabling a National Data Exchange Platform in India. He talks about data governance and utilisation which has emerged as one of the key focus areas of global administrations. Countries have responded to this challenge by crafting their data strategies that have data exchange platforms at the core. There have been varied discussions on the need for and importance of data exchanges, even in India, but there is a lack of a comprehensive review on the building blocks of such a National Data Exchange from a policy perspective. This chapter is an attempt to recognise these critical factors for enabling a National Data Exchange in the Indian context that involves a whole-of-government approach and includes the participation and accountability of all stakeholders involved. It discusses the need for a coherent and exhaustive policy framework that protects the rights of the participants and provides due space for innovation. The discussion also focuses on the need for incentivisation for public authorities as well as private organisations to stimulate and accelerate their participation in the data exchange. Finally, the chapter throws light on the need to evaluate and overcome the gaps in the digital infrastructure as well as the skill set of public authorities that are crucial for designing and maintaining any such data exchange platform. This analysis is based on secondary research focused on the literature review of domestic and global studies. The chapter could also serve the purpose of a compendium of the present policies, programmes, and institutions within the Indian government set-up and could very well be used as the initial reference point for a detailed study on any of the critical factors discussed in the chapter.

1.2.2 Technology and Policy Challenges

Chapters 6–8 map the challenges inherent in technology and policy. In Chapter 6, Charu Malhotra and Anushka Bhilwar examine the Data Protection Bill of India. They talk about how digital platforms have undoubtedly expanded the social existence of their users. However, it has also exposed its users to inconceivable misuse of their personal sensitive data by corporates or any other partnering agencies which deal with the collection, selling, analysis, and dissemination of individuals' personal data. Personal data once captured could be misused for targeted marketing, targeted campaigning, or any other kind of unilateral commercial and social gains of the corporate body. The situation could get further aggravated if this data cannot be erased or 'forgotten'. The policy of Personal Data Protection (PDP) could, thus, serve as an invaluable tool to cement the trust of digital users for these technological advances. The Government of India recently introduced its Data Protection Bill, 2021, through adequate constitutional processes,

initiated formally in 2018. Mapping its journey chronologically, the study attempts to present a policy analysis perspective on the most critical aspect of data protection in India. The study highlights that this bill is indeed a timely attempt to support individuals' privacy vis-à-vis corporates (or any of other partnering agencies which deal with the collection, selling, analysis, and dissemination of individuals' personal data), henceforth referred to as 'body corporate' in the study. While doing so, the study also attempts to pragmatically critique the bill for some of its nascent provisions for instance, the study unabashedly affirms that no matter how timely and useful this bill is, it still strikes a discordant note on the unbridled authority this bill provides to the Government of India to access the personal data of the Indian citizenry. Therefore, the study asserts the need to find the balance for data required for innovation by body corporates pitied against the trust of the digital users, who, we should not forget, are the creators and real owners of this data.

In Chapter 7, Jyoti Sharma discusses inequality that has always persisted in our society in different forms. The COVID-19 pandemic has been a changing phase for the entire mankind. The pandemic has highlighted many inequalities that persist in our society, among which the inequality of opportunity seems glaring. The pandemic has impacted every social institution of society, and education is one of them. Even before the COVID crisis, basic school education was not accessible to everyone in our country, and the pandemic further widened the gap in our education system. Schools were shut down, and the entire system shifted from physical to virtual education. This highlighted the digital divide in our country. Many students were not able to attend school because of a lack of resources, such as no electronic devices and no proper internet connection. This research, keeping in mind the social situations created due to the pandemic, will try to understand the concept of the 'digital divide'. The research will analyse secondary resources such as newspaper reports, research conducted on the digital divide, the use of technology, and government policies made to reduce the digital divide in our country.

In Chapter 8, Anant Kamath presents a fresh perspective on the complicated liaison between new technologies and disadvantaged castes in India. It aims to deepen the understanding of the impact of digital communication technologies on the lives and livelihoods of socially and historically deprived castes in peri-urban south Bengaluru. The chapter relies on verbal accounts to uncover the engagement of Dalit castes in this region with new digital technologies, such as mobile phones, over the last decade and a half. Reading these verbal accounts against conceptual and empirical perspectives in the existing literature, the chapter puts forth three questions: first, what has been the nature of engagement of the region's Dalit castes with digital communication technologies, such as mobile phones? Second, have

these technologies bypassed or been insufficiently harnessed by these historically disadvantaged social groups? Third, have these technologies assisted in the reinforcement of socio-economic exclusion for some members of these groups? The contemporary socio-technological outcomes among subaltern communities in peri-urban south Bengaluru are a result of a convergence of three elements – (a) the durability of caste in peri-urban metropolitan India, (b) the social construction of the usage of ICTs (information and communication technologies – in this study mobile phones), and (c) myopia in the conventional policy and popular understanding of the digital divide in India. Recognising this convergence helps build a new perspective on the relationship between caste, ICTs, and development policy. The chapter argues for a re-look at the idea of the 'digital divide', a concept often encountered in development policy related to ICTs, and for expanding our understanding of the social construction of the usage of this technology. In the process, it calls for deeper documentation of the experience of the subaltern in the history of technological change in metropolitan India. The chapter entails discussing issues and themes around the research questions, followed by an explanation of the methods and theoretical approach. In the end, the researcher presents his empirical findings.

1.2.3 Impacts and Policy Options

In this section, two chapters map the impacts of technology on the lives of the people and the policy choices we have for the future. In Chapter 9, Abhisheik Vishwakarma and Amrita Chakraborty focus on doubling farmers' income through various action-based methods, such as improved market linkages and self-sustainable models. The government has worked on optimal return and sustainability on farm produce, better resource utilisation, and extending knowledge-based services. The e-NAM was one of the latest digital interventions with the objective of achieving 'one price in one market in one nation'. The e-NAM platform provides a digitally accessible market space to farmers. This widens their reach to different markets and empowers them to avoid price manipulation due to a lack of buyer options. This study furthers the need for such a platform, tries to identify current gaps, and elaborates upon the improvement of the process. Simultaneously, it builds a case to recognise the platform as a public good by highlighting the potential of such a platform to be part of a digitally powered future. The study investigates the process and impact of digital platforms introduced by the government. It uses secondary data and case studies for analysing the successful outcomes of platform implementation. Additionally, the sectoral experts were consulted, and their opinion was sought to produce actionable recommendations. Finally, the study highlights the need for focused efforts towards improving Indian agriculture marketing through e-NAM.

In Chapter 10, Sanal Gupta and Puran Singh focus on technical challenges in the agent banking model in India. The agent banking model is a leading financial inclusion intervention that extensively uses technology-based solutions to deliver financial services in rural areas. Once on the brink of extinction, the agent banking model in India has revived in the past decade due to technology-based solutions. While technology-based solutions have helped agent banking tap previously unfeasible market opportunities, they pose several challenges. The documented Indian experience of the agent banking model points to the need for improvement in the quality of technology infrastructure. The struggle with technology makes banking a high-effort business and can discourage banking agents from continuing banking operations. In this context, the study gauges the impact of technology in shaping banking agents' continuity. It proposes that the friction due to technological challenges discourages the banking agents to continue. Using an ordered logistic regression, the researchers regress agents' intention to continue on their technical exposure, the quality of equipment, the quality of technical infrastructure, and the quality of technical support. They have used data from a field survey of 301 banking agents in Himachal Pradesh to find that exposure to financial technology, internet connectivity, and agents' satisfaction with technical support are significant predictors of agents' intention to continue. The findings are helpful for policy groups and agent banking stakeholders to improve the technology infrastructure to minimise agent attrition.

1.3 The Way Forward

Digital Technology has significantly impacted people's lives through the huge adoption of such technologies by private parties and the government. The digital technologies adopted by the Indian government over the last decade focused primarily on digitising services, linking databases or entities across the country, unification of interfaces, easing the process of citizen authentication, etc.

The first chapter in this edition provides a detailed overview of some of the significant digital transformations by the government in India. Just 30 years ago, citizens had to stand in long queues to purchase a railway ticket to travel from one place to another. The Center for Railway Information Systems (CRIS) undertook the activity of rapid digitalisation, linking the ticketing information across railway stations and a centralised booking system to ease the citizen in the ticket booking process. The ticket booking process was further simplified through the online ticket booking system by IRCTC (Indian Railway Catering and Tourism Corporation). We see many digital technology-based systems that have eased the daily process for citizens, like reducing the time for transfer or withdrawing funds from the government-owned

Employee Provident Fund Organisation (EPFO) from a few years to a few weeks. The Aadhar or Unique Identification Authority of India (UIDAI)-based authentication and linking is one of the major digital technology-based innovations that provided a platform for many of these innovations. This technological innovation by India enabled a mechanism for uniquely identifying every Indian so that various services can be provided.

The landscape of digital technologies is ever-evolving, and the emerging technologies' current focus is to provide a granular collection of data, better intelligence, automation, and trust. Enhanced citizen engagement is possible through multiple touchpoints like social media, technologies like drones, and the Internet of Things (IoT) which enable granular, large-scale, and real-time data collection, while artificial intelligence (AI) has brought automation in the decision-making process and blockchain helps by ensuring trust in digital transactions. The state governments or Government of India and outside are adopting these technologies to make lives easier for people, but there is a lack of definitive policy directives for the use of these technologies which calls for enhanced policy-based discussion on technologies and their use. We see several domains impacted by these emerging digital technologies.

Digital Economy is constantly evolving, and we see several innovations around it – transforming the lives of citizens. Some of the innovations in recent years involve the delivery of goods at doorsteps by e-commerce platforms, food or grocery delivery through online mobile apps, ride-hailing services through online platforms, and discussions on social media leading to the instantaneous spread of information. Several of these innovations are currently operating under no regulations, and there is hardly any liability for the harm that can be caused to citizens through these players. One chapter in this edition talks about the aspects of data protection by these online platforms, and another proposes a marketplace for data sharing from these platforms. Today, we see an intrinsic role of social media in the spread of information, and this is used as a potent tool by political parties during elections. In recent years, we have experienced unethical practices by some social media players operating in this unregulated space. There are several issues that the new digital economy poses which need research and deliberation by policy practitioners, like aspects of minimum pay or social security to online gig workers, adapting to this changing nature of work on these platforms, etc. How do we check the authenticity of the information shared on these social media platforms?

Artificial Intelligence (AI)-based digital technologies provide cognitive intelligence by making smart, automated decisions that would otherwise require human intervention and effort. The AI-based technologies provide advice to farmers which helps them in increasing their farm yield or helping Anganwadi workers to keep track of the growth parameters of children to help them fight malnutrition or detect traffic violations in real time. Several

state governments or central ministries are engaging in AI-led projects without a clear policy direction on accountability, trust, and citizen safety. The policy landscape for Artificial Intelligence is evolving in India with NITI Aayog coming up with India's AI strategy in 2018, followed by several white-papers by the Ministry of Electronics and Information Technology (MEITY) for accelerating the AI adoption in India and a couple of white papers by NITI Aayog on Responsible AI for India. As AI systems are increasingly becoming capable of replacing humans in repetitive and mundane activities, there is fear of job losses in the near term which needs to be addressed by policymakers while promoting this technology. It is still a long way before we see any definitive policy directions in this sector, which require policy practitioners and researchers to engage in discussions in this domain.

Drones (Dynamic Remotely Operated Navigation Equipment) are unmanned aerial vehicles that can fly over a designated area to capture pictures or other data points of interest dependent on the type of sensor mounted on the drone. The Budget 2022 has suggested the use of 'Krishi drones' in the agriculture sector for crop assessment, digitisation of land records, and spraying of insecticides and nutrients. Flying drones in public areas is still not legal, and the Ministry of Civil Aviation has come up with the Digital Sky platform which requires all drones to be registered before flying. There are some no-fly zones that have been designated, and citizens can add to that list too. Flying drones had been banned in India for a very long time, and the Draft Drone Policy was floated in 2021. How can the Ministry keep track of all drones that are flown across different parts of India? Who is liable if an unidentified drone creates damage to property or life? There is a need for deep technology-based policy discussions on these topics to realise the benefits of drones without causing harm to people.

The Internet of Things (IoT) is a seamlessly connected network of devices that interact with each other or generate data from these systems. These devices can be embedded or positioned on/around the object or area of interest. For example, an IoT sensor positioned in an agriculture field can provide real-time data on aspects related to soil characteristics and humidity which can help the farmer take real-time action. In the dense forests of Assam, IoT sensors (need not be cameras) are installed to track the movement of rhinoceros and poachers. In a Smart City, an IoT device attached to a dustbin in a public space can keep track of the number of usage details of the dustbin and send notifications to the city authorities when the dustbin is full. In 2015, the Government of India formulated the Draft IoT Policy with a vision to develop a connected and smart IoT-based system for our country's economy, society, environment, and global needs. IoT devices run the risk of data loss and data security which requires the development of standards around the same. Currently, these IoT devices are manufactured by different companies, and there is a lack of standardised protocols for communication between these

devices. Further, internet connectivity becomes an important aspect on which these devices can operate, and we have seen in various chapters of this edition that the lack of internet in rural areas can be a major disadvantage for citizens in accessing services through digital platforms. There is a need for in-depth policy research in these areas for wider adoption and usage of IoT devices.

Blockchain is a record of transactions that are distributed across multiple databases, and these are encrypted, so there is no possibility of discretely tampering or editing the record. Due to this nature, the information stored on the blockchain provides an enhanced level of trust and security. Blockchain-based systems have been adopted in several countries to capture land records. Such systems have been implemented in several countries like the USA and Estonia. Also, initial pilots for such applications have been developed in the Indian states of Madhya Pradesh and Andhra Pradesh for the benefit of citizens. A chapter in this edition has focused on the detailed technical implementation of a blockchain-based system for managing land records in Madhya Pradesh. Blockchain-based issuance of education certificates has been tried out as pilot projects at the Indian Institute of Technology, Bombay, and Delhi University. Here, the university issuing the certificate stores the certificate on the public blockchain and then issues a digital certificate to the student. The student can use the personal credentials to re-issue the same certificate multiple times from the blockchain through some authentication method. Given the additional encryption, the blockchain-based system can be slow, resource-intensive, and often inadequate for large-scale transactions. The data resides in distributed public databases, and there is no guarantee of the privacy of the underlying data which is a matter of concern. The Indian government has come up with a blockchain strategy paper that shows the intent to promote the use of this technology. Still, there is a lack of clear policy directions for combating the issues around citizen privacy and trust.

The policy discussions happening today at the intersection of public policy and technology focus primarily on aspects like internet access and digitisation of platforms, which is also evident from most of the chapters in this edition. There is a growing use of emerging digital technologies by governments for the benefit of citizens which gives rise to a plethora of policy issues that require policy research and deliberations to develop effective policies and regulations on those topics.

Note

1 https://www.ideasforindia.in/topics/governance/the-digital-dream-upskilling-india-for-the-future.html#:~:text=Digital%20literacy%20levels%20in%20India&text=Based%20on%20the%20above%20definition,just%2025%25%20in%20rural%20areas

References

Arendt, Ł. (2015). The digital economy, ICT and economic growth in the CEE countries. *Olsztyn Economic Journal*, *10*(3), 247–262.

Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal*, *42*(4), 921–932.

Berger, T., & Frey, C. B. (2015). Bridging the skills gap. In T. Dolphin (Ed.) *Technology, globalisation and the future of work in Europe: Essays on employment in a digitised economy* (pp. 75–79) Institute for Public Policy Research/JP Morgan Chase. Retrieved from https://www.ippr.org/publications/technology-globalisation-and-the-future-of-work-in-europe.

Bojnec, Š., & Fertő, I. (2012). Broadband availability and economic growth. *Industrial Management & Data Systems*, *112*(9), 1292–1306.

Dahlman, C., Mealy, S., & Wermelinger, M. (2016). Harnessing the digital economy for developing countries, *OECD Development Centre Working Papers*, No. 334, OECD Publishing, Paris, https://doi.org/10.1787/4adffb24-en.

Department of Economic Affairs. (2015). *Economic survey*. Ministry of Finance, Government of India. Retrieved from http://indiabudget.nic.in/es2014-15/echapter-vol1.pdf.

Gelb, A., & Decker, C. (2012). Cash at your fingertips: Biometric technology for transfers in developing countries. *Review of Policy Research*, *29*(1), 91–117.

Gelb, A., Mukherjee, A., & Navis, K. (2018). *Digital governance in developing countries: Beneficiary experience and perceptions of system reform in Rajasthan, India* (Center for Global Development Working Paper No. 489).

Haenssgen, M. J. (2018). The struggle for digital inclusion: Phones, healthcare, and marginalisation in rural India. *World Development*, *104*, 358–374.

Hunt, P. (2001). True stories: Telecentres in Latin America & the Caribbean. *The Electronic Journal of Information Systems in Developing Countries*, *4*(1), 1–17.

ITC. (2015). *International E-commerce in Africa: The Way forward* [Technical Paper]. Retrieved from http://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/International%20E-Commerce%20in%20Africa_Low-res.pdf.

Jaeger, P. T., Bertot, J. C., Thompson, K. M., Katz, S. M., & DeCoster, E. J. (2012). The intersection of public policy and public access: Digital divides, digital literacy, digital inclusion, and public libraries. *Public Library Quarterly*, *31*(1), 1–20.

Jaeger, P. T., Subramaniam, M. M., Jones, C. B., & Bertot, J. C. (2011). Diversity and LIS education: Inclusion and the age of information. *Journal of Education for Library and Information Science*, 166–183.

Kanungo, S. (2003). Information village: Bridging the digital divide in rural India. *The Digital Challenge: Information Technology in the Development Context*, *103*, 124.

Khera, R. (2014). Cash vs. in-kind transfers: Indian data meets theory. *Food Policy*, *46*, 116–128.

Masiero, S. (2017). Digital governance and the reconstruction of the Indian anti-poverty system. *Oxford Development Studies*, *45*(4), 393–408.

Mittal, N., Mukherjee, A., & Gelb, A. (2017). Fuel subsidy reform in developing countries: Direct benefit transfer of LPG cooking gas subsidy in India. Center for Global Development. Retrieved from https://www.cgdev.org/sites/default/files/fuel-subsidy-reformdeveloping-countries-india.pdf.

Muralidharan, K., Niehaus, P., & Sukhtankar, S. (2016). Building state capacity: Evidence from biometric smartcards in India. *American Economic Review*, *106*(10), 2895–2929.

Myovella, G., Karacuka, M., & Haucap, J. (2020). Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy*, *44*(2), 101856.

Nedungadi, P. P., Menon, R., Gutjahr, G., Erickson, L., & Raman, R. (2018). Towards an inclusive digital literacy framework for digital India. *Education + Training*, *60*(6), 516–528.

Negroponte, N. (1998). The third shall be first: The net leverages latecomers in the developing world. *Wired Magazine*, *6*(1), 5–12.

Nour, S. (2017). Africa bridging the digital divides. Policy note no 4:2017. Retrieved from http://nai.diva-portal.org/smash/get/diva2:1146536/FULLTEXT01.pdf.

Ramakumar, R. (2010, January). The unique ID project in India: A skeptical note. In *International conference on ethics and policy of biometrics* (pp. 154–168). Berlin, Heidelberg: Springer.

Robinson, J. A. Acemoglu, D. (2012). *Why nations fail: The origins of power, prosperity and poverty* (pp. 45–47). New York: Crown Publishers.

Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six transformations to achieve the sustainable development goals. *Nature sustainability*, *2*(9), 805–814.

Salvador, T., Sherry, J. W., & Urrutia, A. E. (2005). Less cyber, more café: Enhancing existing small businesses across the digital divide with ICTs. *Information Technology for Development*, *11*(1), 77–95.

Steinmueller, W. E. (2001). ICTs and the possibilities for leapfrogging by developing countries. *International Labour Review*, *140*, 193.

Swaminathan, M. (2008). *Programmes to protect the hungry: Lessons from India* Working Paper 22. New York, NY: United Nations, Department of Economics and Social Affairs. DESA Working Paper No. ST/ESA/2008/DWP. Available online - http://fpmu.gov.bd/agridrupal/sites/default/files/2008_Swaminathan_Programmes_to_protect_the_hungry_-__lessons_from_india.pdf Date of Access July 23, 2022.

Thompson, K. M. (2008). The US information infrastructure and libraries: A case study in democracy. *Library Review*, *57*(2), 96–106.

Trauth, E., Howcroft, D., Butler, T., Fitzgerald, B., & DeGross, J. (Eds.). (2006). *Social Inclusion: Societal and Organizational Implications for Information Systems: IFIP TC8 WG 8.2 International Working Conference*, *July 12–15*. Springer-Verlag New York, Inc., Secaucus, NJ, USA.

UNCTAD. (2018). Rapid eTrade readiness assessments of african least developed countries, key statistics, findings and recommendations. United Nations Conference on Trade and Development. Available online at https://unctad.org/system/files/official-document/dtlstict2018_eTrade_overview_en.pdf Date of access July 28, 2022.

2

DIGITAL GOVERNANCE

A Case of COVID Management in India

Aarushi Jain, Ankit Anand, and Isha Mahajan

2.1 Introduction

Amidst the unpredictable pandemic phases, the Government of India's focus on technological interventions as e-Governance, along with the Digital India Mission, has undergone a paradigm shift. The aim is to bridge the digital divide and engage with its citizens, converging various inter-state and inter-governmental functions. The economic, social, and health-related repercussions of a pandemic, especially the COVID-19 outbreak, have been witnessed across the globe, and India faces increased challenges due to its population size. Effective governance mechanisms play an imperative role in countries' response to such a crisis and require governments to explore the existing systems and further innovate to ensure the path to recovery is managed well with minimum adverse impact. Technology came to the rescue of mankind during the global outbreak of the COVID-19 pandemic. Human life has changed unimaginably and saw the emergence of the new normal, centred around technology. The impact has been enormous, affecting lives in multiple ways. Policymakers faced various challenges and used both reactive and proactive approaches, as the pandemic unfolded. From lockdowns to quarantining, from isolation to hospitalisation, and eventually, irreparable loss of life – it has been a devastating journey. With the spread of the pandemic, the world saw travel restrictions, the formulation of social distancing norms, and hygiene protocols being established and communicated. The situation in India was no different and the spread of the virus was quick, and the government resorted to a complete lockdown as per the need of the hour. The government was required to use effective digital governance measures for managing the pandemic. There were all sorts of challenges,

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such as the lack of adequate digital infrastructure, regional disparities, and digital divide, issues around misinformation and fake news, data privacy, cybersecurity-related concerns, and so on. To tackle these, there was a need for a comprehensive approach and planning, apart from tackling the issues around the availability of health infrastructure coupled with the economic slowdown.

The concept of digital governance has been well established in India since the beginning of the 21st century, but of late, there has been an increasing focus on digital transformation in the government. India's economic agenda is mainly focused on economic revival and inclusive growth. It aims to carry these out by financially empowering citizens, focusing on industrial development, and reducing subsidies through the use of digital technologies. Poverty elimination, containing food inflation, agricultural reforms, cooperation between the centre and states, transparent and time-bound delivery of government services, e-governance and governance enabled through mobile devices, ease of doing business, job creation, and develop ment of infrastructure are the action points of the agenda. These could be enabled by digital technologies (Deloitte, 2015).

The following section discusses how this transformative approach helped in managing the pandemic-related governance challenge through the use of specialised digital applications. Section 2.2 gives a brief overview of the worldwide situation at the start of the pandemic. Section 2.3 describes the digital preparedness in India due to the focus of the government on the Digital India Mission and the cross-sectoral groundwork laid before the pandemic hit India. The next section details the use of specific applications in the management of COVID-19 and the continuity of delivery of citizen-centric services through the use of specialised digital applications. The last section brings out the challenges which society faces while adopting these digital solutions, thereby limiting their adoption and effectiveness.

2.2 The Scenario

The COVID-19 pandemic is an unprecedented global health crisis in the history of mankind, given its nature, intensity, and magnitude. It is an ongoing global pandemic of coronavirus disease-2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was first identified in December 2019 in Wuhan, China. The World Health Organization declared a Public Health Emergency of International Concern regarding COVID-19 on January 30, 2020, and later declared a pandemic on March 11, 2020. As of May 28, 2022, there are 528,431,653 confirmed cases and 6,286,540 deaths in almost 200 countries/territories that are attributed to COVID-19, making it one of the deadliest pandemics in history ('COVID-19 pandemic', 2022). The pandemic is not just limited to a health crisis, it also presents itself as an immeasurable socio-economic crisis

impacting every country it spans and has the potential to create catastrophic social, economic, and political effects that leave behind grave and long-standing scars (United Nations Development Programme (UNDP), 2022). In a joint statement issued by ILO, FAO, and IFAD, the COVID-19 pandemic has led to a tragic loss of human lives worldwide and poses an unprecedented challenge to public health, food systems, and the world of work (UN News, 2020). The economic and social disruption caused by the pandemic has devastated tens of millions of people, who are at risk of falling into extreme poverty. Given the enormity of the crisis, effective public interventions and innovative response measures prove themselves indispensable in mitigating the adverse consequences on mankind.

The governments implemented several measures as early response focused on preventive communication and disease management, such as social distancing, movement restrictions, public health measures, social and economic, and lockdown measures (Assessment Capacities Project (ACAPS), 2020) to contain the virus outbreak and support the economy. Various public health measures, such as a ban on mass gatherings, cancellation of sporting and large events, international and domestic travel restrictions, domestic lockdowns, curfew, restaurants and bar closures, mandates to wear masks, public testing, enhanced surveillance, state of emergency (Porcher, 2020; ACAPS, 2020), postponement of, and closure of schools, were implemented, whereas economic interventions included wage support, cash transfer, credit schemes, tax cuts and delays, support to importers and exporters, and policy rate cuts (IMF, 2021).

Talking specifically of the government's digital interventions, these were aimed at responding to the challenges brought in by the pandemic. The efforts included communication and information dissemination to diverse population groups; citizen engagement and consultation through digital platforms; agile development and enhancement of new-age service delivery applications for citizen facilitation; contract tracing through the digital application; focus on a data-centric approach for effective governance; vaccination registration through various platforms; and vaccination certificate storage through paperless governance initiatives.

2.3 Digital Preparedness in India

The Indian Government started focusing on e-Governance with the release of the 11th report of the Second Administrative Reforms Commission, titled Promoting e-Governance – The Smart Way Forward (2008), which paved the way for establishing a National e-Governance Plan (NeGP). This was followed through with the Information Technology Policy, 2012, also bringing forth 'Enabling Service Delivery through e-Governance' as one of its core strategies. The NeGP had a three-tier structure focusing on both the Union level and the states. It encompassed 31 Mission Mode projects

enabling better service delivery to the citizens across a host of government services. To operationalise NeGP, the government instituted the National eGovernance Division within the Ministry of Electronics and Information Technology (MEITY), which became the core of all future activities.

The 'Digital India Mission', launched by PM Modi in July 2015, reinvigorated the NeGP and brought the focus from e-Governance to digital governance with its key motto of 'Transforming e-Governance for Transforming Governance'. Digital India programme had the following three core vision areas (Digital India, 2021):

- Digital infrastructure as a core utility to every citizen–for ensuring availability of high-speed internet and providing unique digital identity and access to Common Service Centres (CSCs).
- Governance and services on demand–to provide seamlessly integrated services across departments/jurisdictions and ensure the availability of services in real time. The vision is to organise information, automate, and streamline processes and transform institutions.
- Digital empowerment of citizens–for providing universally accessible digital resources, literacy, and platforms for participative governance.

The renewed focus led to the strengthening of the existing projects and the creation of some important digital platforms and applications across various ministries and departments. These included the renewed focus on CSC, development of the JAM trinity, accelerating the Bharatnet project, building India Stack, and most importantly, the Unified Payment Interface (UPI).

2.3.1 Rural Outreach through CSCs

Common Service Centres (or CSCs) have been one of the fundamental pillars of the e-Governance Plan in its original avatar and under the Digital India Mission. CSCs were envisaged as one-stop shops in rural areas wherein the citizens could avail themselves of the traditional G2C (government to citizen) services in a digital way. Over time, the business model has evolved to include a lot more, including service offerings by private players in areas such as banking, education, health, FMCG, etc.

To oversee the implementation of the CSC plan, a special purpose vehicle was set up by MEITY by the name of CSC E-Governance Services India Limited (or CSC SPV). As per the operational model, CSC SPV invites applications from willing village-level entrepreneurs (or VLEs) to set up shops in rural areas. The company vets the application and then allows the vetted entrepreneur to set up a shop as per the required physical and digital infrastructure norms. The CSC SPV provides these VLEs with a suite of services through its Digital Sewa Portal and in return takes a pre-defined

commission out of the service charge levied by them, when anyone uses the CSC services. This ensures that VLEs get the required digital support from the CSC SPV and in turn continue to provide services as per the rate card set up by the company. As per the latest Annual Report of CSC SPV (CSC, 2020), 3,60,873 CSCs are operating in the country. This report also documents that CSC SPV recorded a total income of INR110,548.70 lakhs and a net profit (after tax) of INR 8235.80 lakhs.

As of date, CSCs have become the institution of choice for the central government to deliver any and every scheme – be it Ayushman Bharat Yojana (*Ayushman Bharat (2021)*, Pradhan Mantri Shram Yogi Mandhan Pension Yojana (PM-SYM), Pradhan Mantri Kisan Samman Nidhi Yojana, or Pradhan Mantri Fasal Bima Yojana. Keeping with the times, CSC SPV has also launched a rural eCommerce Network. As of June 30, 2021, this network has operationalised more than 1.5 lakh e-stores and has witnessed transactions worth more than INR 272 crore (Prasad, 2021)

2.3.2 IndiaStack–For Financial Inclusion

IndiaStack is one of the most fundamental pillars of the Digital India Mission when it comes to innovation on a billion-plus scale. Simply put, the stack is a set of APIs and technological layers that enable various service providers to roll out their services leveraging the authentication mechanisms of Aadhar, and the connectivity provided by mobile phones. With the addition of bank accounts, IndiaStack has revolutionised the FinTech ecosystem in India. IndiaStack has been the reason for the emergence of other innovative products, such as Bharat Bill Pay System (BBPS) and Aadhar-enabled Payment System (AePS), and now also powers the interoperability with NHAI's FasTag. The overall volume of transactions through these products, as mentioned in Figure 2.1, clearly brings out the impact they had on society as well as businesses.

2.3.3 PMGDISHA–For Digital Literacy in Rural Areas

While the governance space was being reformed through rapid digitalisation, the Union Government was also working to reduce the digital divide in the country, especially in rural areas. The scheme aims to empower the citizens in rural India by training them to operate digital access devices, access government services online, and make digital payments. To this effect, the Union Government launched the Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA) in 2017, which aimed to train at least one person in about 40% of rural households with basic digital skills thereby training almost six crore people (Bhardwaj, 2019). The scheme was built on a model wherein a training institute will have to enrol pre-marked citizens and train them through a pre-defined course module.

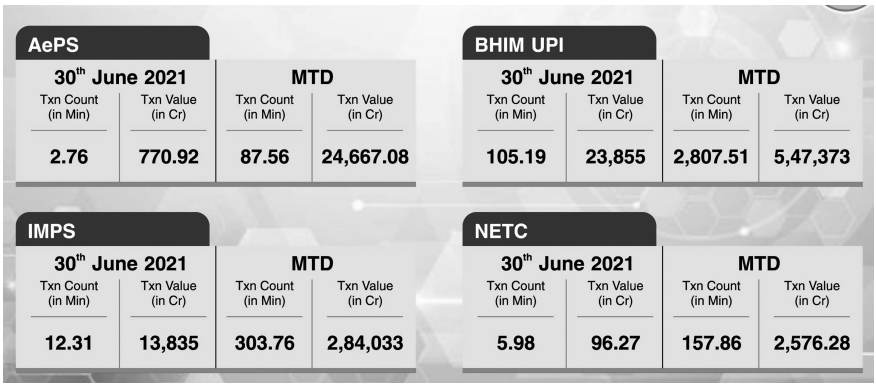

FIGURE 2.1 Payment System Statistics for June 2021

Source: NPCI, 2021 (Image Recreated)

There was an aptitude test at the end of the 20-hour training module and the training institute would be compensated based on the number of certified course takers after the aptitude examination. The entire scheme was to be managed by CSC SPV, with help from local government institutions and NGOs.

Although the target was to achieve the objective by May 2022, the programme is still running, and as per the latest figures, around 5.1 crore people have been trained, while 3.78 crore people have been certified as per the dashboard available on https://www.pmgdisha.in/.

2.3.4 India Enterprise Architecture (IndEA) Framework – For Standardisation in Technical Architectures

As the various applications and platforms were being built, the government identified the need to introduce a standardised approach and architectural framework that can not only bring uniformity in development and reduce the time for deployment by reusing existing modules but also enable interoperability and bring the power of the whole of government approach to such platforms. With this vision, the India Enterprise Structure or IndEA was formulated and launched by MEITY, as another important milestone and a stepping stone for furthering the aims of the Digital India Mission. The architecture has been envisaged to promote sharing and reusability of data by being technology agnostic. It also includes performance measurement systems and associated metrics that are aligned to Sustainable Development Goals prioritised by the government and chooses to adopt the 'Cloud first'

principle for the deployment of services. Figure 2.2 depicts a high-level model for the IndEA vision.

Apart from these comprehensive horizontal schemes, the Union Government also launched a variety of sector-specific interventions; a few important ones are mentioned below.

- **eNAM (for agriculture)** – e-National Agriculture Market (eNAM) is a pan-India electronic trading portal that networks the existing APMC mandis to create a unified national market for agricultural commodities. It was launched with a vision to provide a single unified market to the farmers at their fingertips. The platform was started with 21 mandis from eight states on April 14, 2016 ('PM Modi launches e-platform', 2016) and has increased its reach to cover 1000 mandis in 21 states/UTs with a plan to integrate 1000 more by the end of FY 2021–22. The platform is managed by the Small Farmers Agribusiness Consortium under the aegis of the Ministry of Agriculture and Farmers' Welfare. As per their dashboard, more than 1.7 crore farmers, 1.72 lakh traders, and about 1 lakh commission agents are linked with the eNAM platform (SFAC, n.d.). Expanding this value chain, the Ministry also introduced logistics services under the same platform with the name Kisan Rath. Figure 2.3 brings out the distribution of these linked mandis throughout the country.
- **DIKSHA (for education)** – Digital Infrastructure for Knowledge Sharing (or DIKSHA) is an open-source national platform for school education developed by the National Council for Education Research and Training (NCERT), Ministry of Education, as a PPP initiative along with contributions from the private sector. It was launched by the Vice President of India on September 5, 2017, a day celebrated as Teachers' Day in India. The platform offers school-based educational content in diverse forms and offers QR code-based interactive functionality. The platform has been designed to accommodate the needs of both the students and the teachers. Currently, it hosts content in more than 30 languages and is being used by more than 40 state and national institutes/boards. As per the statistics available at NCERT (2021), more than 337 crore learning

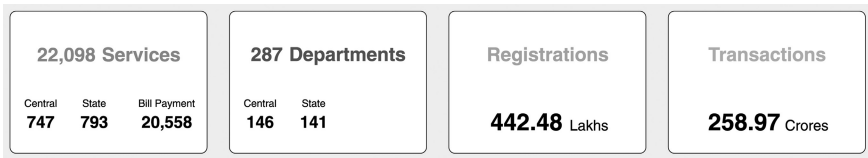

FIGURE 2.2 High-Level Representation of IndEA Framework

Source: MEITY, 2018 (Image Recreated)

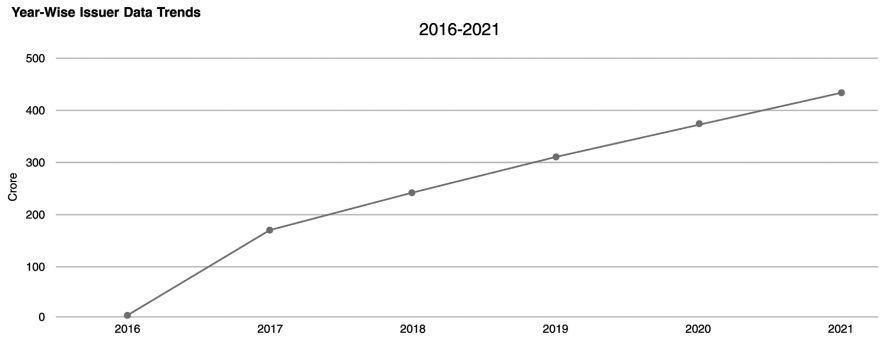

FIGURE 2.3 Spatial Distribution of eNAM-Linked Mandis in India

Source: SFAC, n.d. (Image Recreated)

TABLE 2.1 Top Five States in Terms of DIKHSA Usage

State	*Total Learning Sessions*
Bihar	25 million
Uttar Pradesh	23 million
Gujarat	16 million
Madhya Pradesh	14 million
Maharashtra	11 million

Source: NCERT, 2021

sessions have been delivered through this platform with a cumulative usage of more than 41 billion minutes. Table 2.1 lists the top five states basis the cumulative usage of the platform.

- **Ayushman Bharat PMJAY (for Health)** – The programme was envisaged to provide comprehensive healthcare benefits to a large section of the society akin to universal healthcare programmes in some other countries and was launched by the Prime Minister on September 23, 2018 (MoHFW, 2018). The programme has two components, the first of which was to establish nearly 1.5 lakhs Health and Wellness Centres (HWCs) across the length and breadth of the country (*Ayushman Bharat (2021)*. These centres would provide maternal and child health services along with diagnostic services for non-communicable diseases, including free essential drugs. Currently, there are 76,557 HWCs that have been made functional under this scheme (NHP, n.d.).

The second important component of the programme was to provide free healthcare insurance of up to INR 5 lakh per family to a pre-identified group

of more than 10.74 crore marginalised and vulnerable families, approximating about 50 crore citizens. These families were identified based on Socio-Economic Caste Census (SECC) data for both rural and urban areas as well as from the earlier beneficiaries of Rashtriya Swasthya Bima Yojana. As of August 18, 2021, more than 16.20 crore cards have been printed and handed over to the eligible beneficiaries and the programme has witnessed more than 2 crore hospitalisations. Figure 2.4 provides the detail of the performance of the programme with some key statistics. One of the biggest contributors to the implementational success of this programme has been the specialised and well-designed IT platform that hosts the core components and allows interoperability among various stakeholders. This system has been giving the NHA the capacity to verify about 28 beneficiaries and make at least 20 pre-authorisations per minute.

With the learnings of these ongoing mission-mode programmes, the Government of India is now embarking on the 3rd phase of e-governance by aiming to bring all sector-specific solutions under a single ecosystem platform – being termed as National Open Digital Ecosystem (Ganguly, 2020). The National Digital Health Mission is one of the first Open Data Ecosystems (ODEs) to evolve while the Union Ministry for Agriculture and Farmers Welfare has put out a consultation paper on the India Digital Ecosystem for Agriculture framework. These ODEs would allow the conventional service providers to interact and interoperate with the upcoming start-ups and futuristic technology providers, thereby enabling a comprehensive ecosystem that works for all. These are being designed on principles enshrined in IndEA and would enable various service providers, enablers, and citizens to interact with each other seemingly, and with privacy. In addition, the government had also prepared a Personal Data Privacy Bill, 2019, which is undergoing legislative scrutiny. In the meantime, NITI Aayog had started

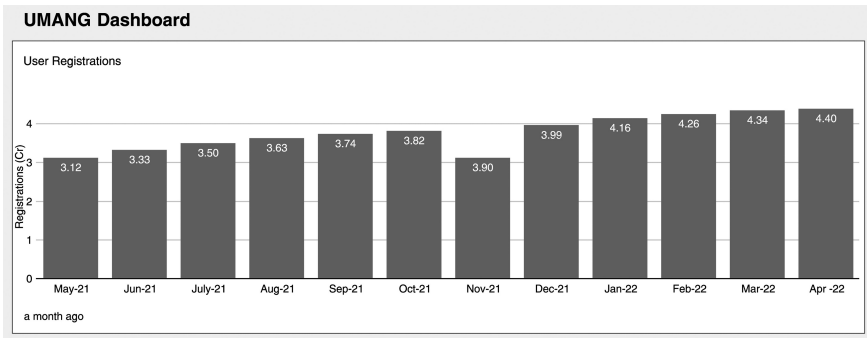

FIGURE 2.4 AB PM-JAY Progress Report as of August 17, 2021

Source: AyushmanNHA, 2021, (Image Recreated)

work on a consent framework termed Data Empowerment and Protection Architecture (NITI, 2020). This mechanism, to be operated through entities known as Consent Managers, would allow the individual and systemic data to flow from one entity to another in a structured way, further easing the ways of doing business.

2.4 Digital Initiatives to Combat COVID-19

Since the spread of the pandemic became quite evident in India around March 2020, the Government of India came up with a bouquet of digital interventions to manage it. This chapter would be studying the digital responses around the following major challenges:

- Preventive communication.
- Disease management.
- Delivery of governance services.

Each of these challenges were handled using specialised applications and was built to serve at scale considering India's huge population. Another important characteristic is that the government used a mix of traditional and non-traditional ways to speed up the development of these applications, which symbolises both the urgency and the versatility of the approach adopted for managing the situation. In another way, these applications also signify the strength of the Indian IT industry, which came forward to support the government through a multitude of initiatives on its own.

2.4.1 Preventive Communication

The world came to know of the pandemic and its spread around December 2019. Since the nature and origins were unclear, governments were also found exploring and experimenting. The new year 2020 came with most governments stopping international air travel and instituting some degree of lockdown in their countries. Global governments and multilateral agencies had started studying the virus, but there was no drug readily available to treat it completely, nor any vaccine to prevent the spread. Simultaneously, WHO came up with guidelines that mandated social distancing and quarantine as the most effective ways of dealing with the pandemic, at the time.

The Government of India also started propagating their guidelines in line with the WHO recommendations. This communication was mostly done through the traditional IEC methods known by the government institutions that included advertisements in mass media such as TV, radio, newspapers, and government advisories on various websites.

The big challenge here was to (a) get the communication right and (b) make it effective by continuous reinforcement. However, the concept of 'social distancing' was never present in Indian culture. Quite the contrary, Indians meet and greet frequently, and out of habit. Moreover, due to the size of our population and pressure on the resources, the local transport and common resources were always overburdened, thus denying anyone the understanding of 'social distancing', in a way. Adding to this complex milieu was the fact that 'quarantine' was not a part of the local language and dialect. Thus, it had to be broken down to a simple concept of isolation, again in the context of an Indian family, that considers the urban-rural conditions, as well as the linguistic complexity, and the illiteracy levels prevalent in Indian society.

Along with these, there was a surge in government orders – both by the Union and the state governments, wherein various containment strategies were being promulgated and certain regular compliances were being deferred for industries and citizens at large. Amongst this, the Union Government declared a full lockdown starting March 25, 2020 (MHA, 2020). The lockdown made it more complex and, though the MyGov platform was being used by the government to broadcast all important messages to the citizens not only through its website, but also through various social media channels, the government was thinking of something simpler, but more effective.

The other important need of the hour was to arrest the spread of misinformation concerning COVID-19. As the situation was evolving, so was the infodemic, and it was reaching a level of mass hysteria leading to cases of stigmatisation and victimisation of both patients and doctors. Therefore, it was becoming increasingly necessary to provide the citizenry with accurate, science-based, and authentic information as fast and as easily as possible.

It was during these discussions that the idea to use a WhatsApp Chatbot emerged. This solution would be simpler, tailored to on-demand needs, and could be made available to the citizens, literally, at their fingertips with all the relevant information in a single place. People would not need to download any extra applications nor would have to be trained in using them. The NeGD (MEITY), along with JioHaptik and WhatsApp Corp, developed this chatbot which was rechristened as 'MyGov Corona Helpdesk' and was launched on March 20, 2021 ('My Gov Corona Helpdesk', 2020). The chatbot was made in less than five days, making it the fastest development and deployment anywhere on the globe (JioHaptik, 2020).

The next important step was to make people aware of this chatbot so that it could be used effectively. The government used all modes to disseminate this information, including mentions by the Hon'ble PM in his various speeches. These efforts bore fruit as the chatbot received an enormous response from the citizens. As per the latest statistics, 'MyGov Corona Helpdesk' has

received more than 76 million messages and processed over 41 million conversations. It continues to help over 28 million Indians stay informed while providing a platform to get the latest information on COVID-19 and curb rumours and misinformation (MEITY, 2020c).

The government also ensured that the data and information are being updated in real time on all its digital properties, including government websites, and even on the Aarogya Setu mobile application. Recently, the chatbot's scope was increased to help citizens get their COVID-19 vaccination certificates by sending a simple WhatsApp message ('Now, get Covid vaccine certificate on WhatsApp', 2021).

2.4.2 Disease Management

This challenge was addressed by the Union Government mainly through the development and deployment of a couple of IT-based applications – Aarogya Setu and CoWIN.

- **The emergence of Aarogya Setu:** The government needed to find a way to predict the nature and occurrence of the pandemic. In many other countries, authorities were trying to track and trace the infected people to help predict the zone of infections. This tracking and tracing were being done based on various mobile-based applications. Singapore was one of the first countries to try a digital mechanism that used Bluetooth beacons to test and trace. The application was named 'Trace Together', and over time, the authorities rolled out special devices for this purpose, rather than using a mobile phone application.

Indian authorities were also trying several approaches, but the two most prevalent were the triangulation method based on call records and Bluetooth beacons similar to the one used by Singapore in Trace Together. Ultimately, NITI Aayog and MEITY decided to move on the Bluetooth approach and built an application called Aarogya Setu, through public-private partnerships. A team of individuals from the private sector volunteered their skills and jointly built the app grounds up with the officials from government departments. The application was launched on April 2, 2020 (MEITY, 2020a).

The app was designed to store the collected data in the mobile phone, which was uploaded to the government's central server only when the user was detected to be infected. Aarogya Setu was launched in 12 languages to cater to the linguistic diversity in India. To be able to maximise its utility, it was necessary to socialise Aarogya Setu with a large section of the society, but also to do it quickly as the contamination was spreading like wildfire. The government started promoting the application heavily, even using celebrities from different walks of life and from various parts of the country to

achieve maximum downloads. Even the Prime Minister endorsed Aarogya Setu regularly.

As a result, the app witnessed more than one crore (10 million) downloads within the first 10 days ('Arogya Setu mobile app', 2020) and crossed the 15 crore (150 million) mark in a record time of four months ('Arogya Setu, India's first contact tracing app', 2020). When compared globally, Aarogya Setu has been downloaded more times than the cumulative of all other similar track and trace applications. As on May 28, 2022, at 21:00 hours, the dashboard on the official website https://www.aarogyasetu.gov.in/ reports the count of users at 21.55 crore.

Over time, there have been many questions raised on the app. These concerned the procurement of services from the private sector, the data being collected by the app, sharing of data by the authorities with other departments, and even breach of privacy allegations. To build on the trust and ensure transparency, the government notified the 'Aarogya Setu Data Access and Knowledge Sharing Protocol, 2020' on May 11, 2020. Going a step further, the government released the source code of the app in the public domain on May 26, 2020 (MEITY, 2020b). It even announced a bug-bounty programme for the enthusiasts, a programme that would enable any cyber enthusiast to win cash rewards if they were able to find a bug in the source code. This challenge was open for one month, though it is not evident that anyone was rewarded through this programme.

- **The emergence of CoWIN:** With the development and authorisation of emergency usage of vaccines, the government had another big challenge at hand. The plan to vaccinate the entire population of India was no mean feat and was to be the world's biggest vaccination drive, by all estimates. However, the complexity increased many fold because of the large number of variables involved in this drive, and that too was changing in real time. The Government of India had held successful vaccination programmes in the past. The Pulse Polio Oral Vaccination campaign had been a success and a shining example for the world. In addition, the Union Government's Mission Indra Dhanush, the umbrella programme for newborn and infant vaccinations, was another major campaign. Therefore, it could be assumed that the government had developed capacity – both in infrastructure and human resources when it comes to vaccination drives. But the COVID-19 vaccination programme was still a challenge because of the multiple complexities – logistical arrangements, vaccine brands, number of vaccines to be administered, numerous vaccination centres, and crores of people to be vaccinated, that too twice, in a limited period.

Over the years, the Union Government had implemented the eVIN (electronic Vaccine Intelligence Network) software for monitoring the vaccination

programmes in the country. This software was developed in association with UNDP and GAVI alliance and was successfully running in various states and districts. The Union Government decided to use this as a stepping stone and worked to develop additional utilities over the CoWIN platform to make an 'end-to-end solution' for the COVID vaccination programme. The software was aptly named CoWIN and first emerged in the Operational Guidelines released by MoHFW on December 28, 2020 (MoHFW, 2020). This was followed by a meeting of the Union Health Minister with his state counterparts on January 10, 2021 (MoHFW, 2021a) and was further cemented when the PM announced it in his address to the nation on January 16, 2021 (PMO, 2021a). The CoWin platform has been built indigenously, though with UNDP's assistance, and witnessed the involvement of the eGov Foundation which developed the DIVOC module (Narayan & Narang, 2021). The CoWIN platform is a modular programme and has a hierarchical approach that runs down to the district and sub-district levels. The various components of the application are detailed in Figure 2.5.

For a common citizen, the application had the following steps:

1. Self-registration.
2. On-site authentication.
3. Vaccine delivery and certification.

The digital application not only helps in keeping a tab on the overall progress but can be integrated with multiple other applications/platforms that could be of use. The application can also be used to validate/authenticate any certificate and the QR code functionality adds to the ease of the process. The government has also introduced a feature wherein citizens can modify their details and add their passport numbers. With the 'vaccine passport'

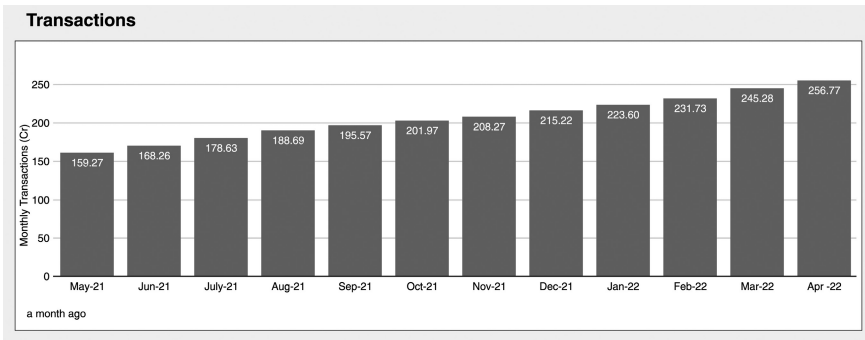

FIGURE 2.5 Modules of the CoWIN Platform

Source: MoHFW, 2020 (Image Recreated)

becoming a reality, these features of CoWin can prove to be a great resource going forward.

The digital infrastructure is also best suited to manage the variability in policy execution. As is known, the entire vaccine delivery programme was planned in a stratified way with select groups of the population being allowed permission to get vaccinated at regular intervals. The platform has therefore been designed to upscale and increase the scope in the minimum possible time. Additionally, to increase the reach and overcome the digital divide within the country, the application allowed the registration of four members on a single mobile number. In due course, CSCs were allowed to register people eager for vaccination (Bano, 2021), and finally, the government also allowed private entities to access select APIs of CoWin through a structured registration programme. Figure 2.6 and Figure 2.7 display the progress of vaccination as reported by the CoWin dashboard.

As with any digital application, CoWin has also seen its fair share of appreciations and downfalls. In the initial days, there were widespread complaints that the OTPs were not getting generated, and people were facing issues with registration. Even when registered, vaccination centres were having problems with authentication and data entry.

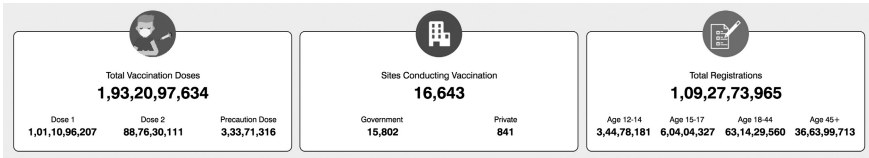

FIGURE 2.6 Progress of Vaccination as of May 28, 2022, 21:15 hrs

Source: CoWIN, 2022 (Image Recreated)

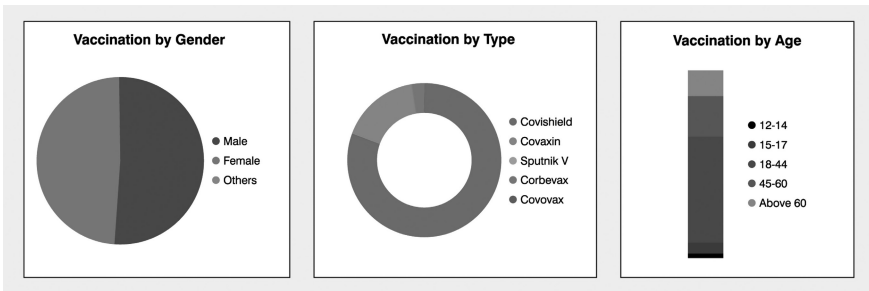

FIGURE 2.7 Vaccination Trends in India

Source: CoWIN, 2022 (Image Recreated)

While these issues were being sorted, the Union Government further advanced the vaccination policy by allowing adults in the 18+ years age group for the vaccination drive. This announcement also meant that CoWin would now have to be scaled up for far more users than it was already handling. The registrations for this phase of vaccination were to start on April 28 for vaccination starting May 1, 2021. With the opening of registrations for younger citizens on April 28, 2021, the platform saw massive hits and with that, the social media sites were filled with complaints alleging that CoWin had crashed ('CoWin crashed', 2021). So much so that the government had to release an official statement dispelling the doubt and claiming that the application performed well, even when it was taking close to 2.7 million hits per minute. The first three hours of registration on April 28, saw 80 lakh (8 million) registrations and this was the beginning of a new milestone for the application (MoHFW, 2021b).

The next few weeks witnessed complaints about the lack of slots for booking vaccination. Though this issue had its genesis in the limited manufacturing capacity and unavailability of raw materials, this also resulted in a lot of questions being raised against the CoWin application.

As mentioned earlier, in the later phase, the government decided to allow various third parties to integrate with CoWin (Singh, 2021). Within a few days of this development, it was reported that the IT-savvy part of the population had started developing scripts and bots that kept hitting the CoWIN servers regularly, thereby denying opportunities to the less-skilled common man. These reports suggested that because of the automated nature of such tools, the slots are getting booked far quicker than usual and allegedly not in the correct way. Although such media reports were denied by the officials, who challenged the publishers to prove it ('Sharma Condemns Media Reports', 2021), the CoWin team went ahead and deployed captcha (Moorthy, 2021) and another suitable mechanism to check the usage of such automated tools. As of today, the system blocks access of the user if 20 or more searches are performed in 15 minutes or if any user id is performing more than 1000 searches, or generating more than 50 OTPs in a 24-hour window. The users would be blocked only for 24 hours ('CoWin to block users', 2021). Among other things, various social media handles also alleged that the application has been hacked, and the data being collected by CoWin has been leaked on certain websites. The government came forward to officially deny any such occurrence (MoHFW, 2021c).

As with any software application, certain contingencies could be predicted and managed, but a few others must be handled in real time. Similar was the case with both Aarogya Setu and CoWIN, and because of the nature of the pandemic and the associated chaos and complexity, both these applications were being optimised in near real time. In Mr Abhishek Singh's own words, 'This was like changing the tyres of a bus, while it is running in full speed' (A. Singh, personal communication, June 10, 2021). Following the footsteps of #VaccineMaitri and buoyed by the confidence in the application, the

Government of India decided to open-source the CoWIN application and make it available to other nations free of cost (PMO, 2021b).

2.4.3 Delivery of Governance Services

India is a huge country, with a federal structure of governance wherein services and departmental jurisdictions are divided between the Union and the State governments, and in many areas drawn down to the last administrative unit. The Indian Government embarked on the Digital India programme in 2014, intending to digitalise and simplify many of these services for the ease of the citizens. The pandemic-induced lockdown brought a special kind of attention to these apps making it a perfect use case.

This case would deep dive into two of the most versatile and critical apps that came out of the Digital India Mission – UMANG and DigiLocker. **UMANG** stands for Unified Mobile Application for the New-age Governance. As the name suggests, UMANG is an aggregator application of the Government of India, which comprises individual applications and services of not only the Union and state governments, but also PSUs and autonomous public agencies. UMANG was designed and developed by the National eGovernance Division of the Ministry of Electronics and Information Technology (MEITY) and has been a key component of Prime Minister Modi's vision of the Digital India programme.

Figure 2.8 presents a high-level representation of the UMANG framework. From 163 services of 33 departments at the time of its launch (MEITY,

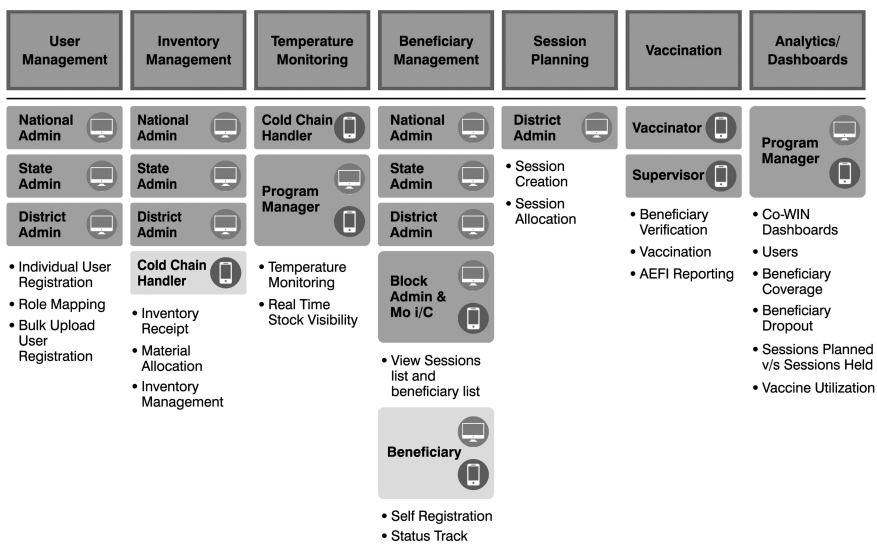

FIGURE 2.8 High-Level Representation of UMANG

Source: NEGD, n.d. (Image Recreated)

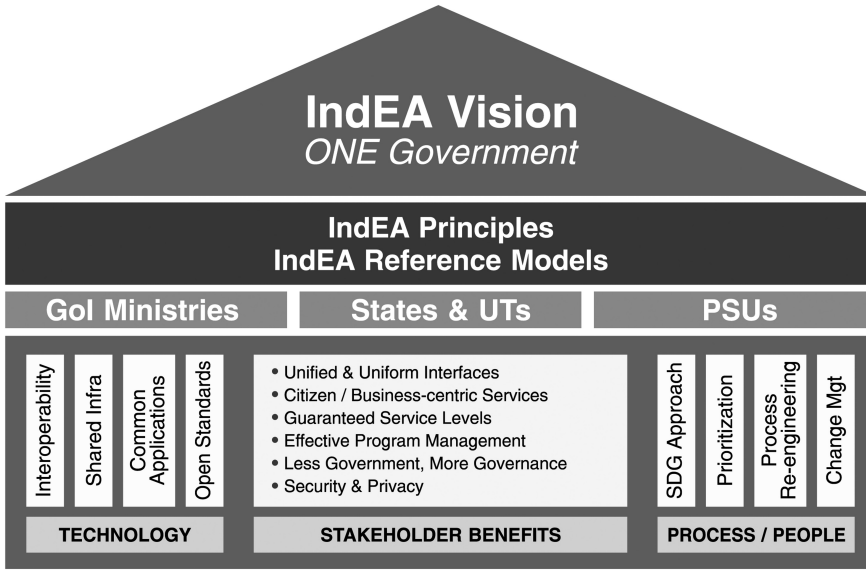

FIGURE 2.9 UMANG Dashboard

Source: UMANG, n.d. (Image Recreated)

2017), UMANG today comprises more than 21,559 services from 131 central government departments and 128 state government departments. More than 44 million users have registered for its services (UMANG, n.d.), as highlighted in Figure 2.9. The app has also been integrated with other major and critical components, such as Aadhar, DigiLocker, and Bill Payment Systems, thereby making it a one-stop shop for the citizen.

The pandemic was resulting in frequent lockdowns, thereby affecting the delivery of routine government services and it was during this time that UMANG emerged as a saviour to the citizens of India. During the pandemic, the app saw a major jump in usages across the broad spectrum of services, as can be seen from Figure 2.10. From enabling checking of EPFO balances to submitting Jeevan Pramaan Patras (for the pensioners), UMANG proved to be a game-changer.

The user registrations during the pandemic saw a 50% jump, and currently, the app has more than 3.50 crore (35 million) registrations. Concurrently, the transactions on the UMANG app increased by almost 61%, and it had witnessed more than 178 crores (1.78 billion) transactions to date, as can be seen from Figure 2.11. During this time, the services also increased many fold.

The UMANG team at NeGD is continuously working on improving the app on two major fronts:

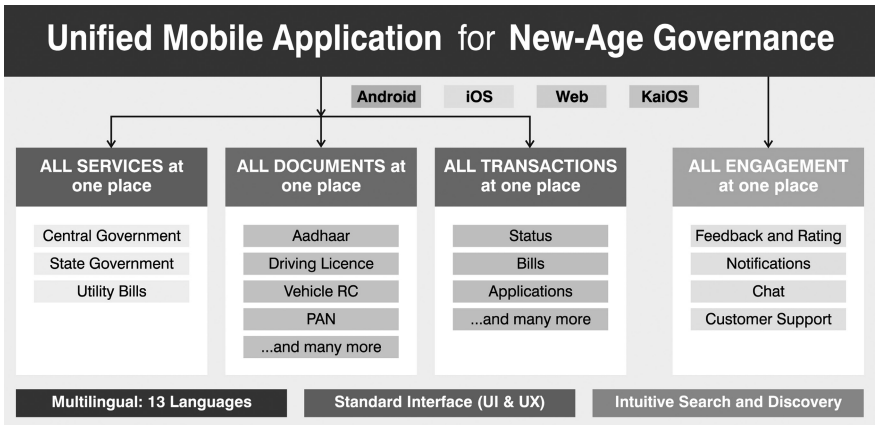

FIGURE 2.10 Increase in UMANG Services Bouquet during the Pandemic
Source: UMANG, 2020 (Image Recreated)

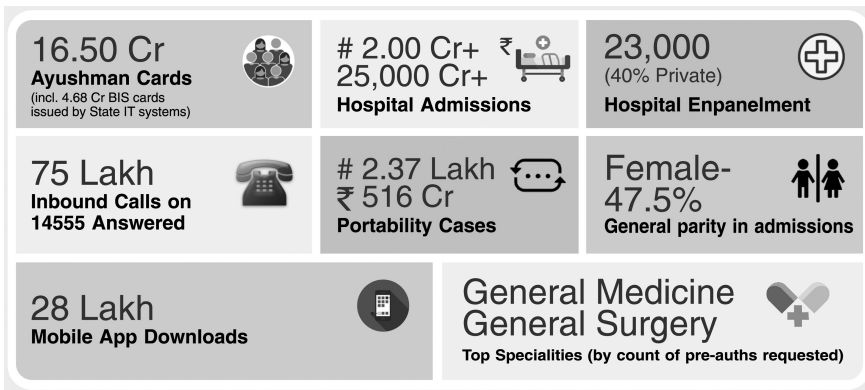

FIGURE 2.11 A. UMANG User Registrations. B. UMANG Transaction Trends
Source: UMANG, 2022 (Image Recreated)

1. Working with state government agencies to increase the number of services being offered.
2. Adapting best features in UMANG keeping the user at the centre.

To give users a better experience, the government is also working on introducing an AI-based Voice Assistant that would make it easier to use. The app is already available in 13 Indian languages, and the team is planning to add more regional languages to the interface. The app has been developed

for both Android and iOS and has also been adapted for JioPhones, which run on KaiOS. Additionally, the app is being run on the assisted mode in CSCs, which are one-stop centres for all B2G services. The MEITY plans to come out with a policy to offer interested third parties in offering UMANG services on assisted mode on a non-exclusive basis (NeGD, 2021).

The DigiLocker project was initiated by MEITY as one of the key pillars of the Digital India programme. As the name suggests, DigiLocker provides registered users a dedicated digital storage space, analogous to a physical locker, to preserve the copies of important government-issued documents. Such digital copies could be then made available by the citizens on demand for availing any government service, without the fear of losing the same. Another added advantage was that DigiLocker-issued copies would not have to be checked and validated for forgery, unlike the physical ones. Over the years, the Union and state governments have amended various laws to provide legal backing to the documents produced in DigiLocker and grant them the same status as the physical copies for all purposes. Additionally, to spur innovation, the government allowed private organisations to enrol as Digital Locker Service Providers (DLSP) by registering themselves with the Digital Locker Authority through the DLSP framework.

DigiLocker now offers access to more than 530 different types of digital documents (DigiLocker, n.d.). It's akin to 'government's dropbox' with an added utility of authentication to cut out on time and expenses required for validation. The application has more than 63 million registered users, 1227 issuers, and 171 requesters and has been used to issue 4.32 billion documents (DigiLocker, n.d.). Figure 2.12 shows the usage statistics of the DigiLocker application and Table 2.2 shows the top five documents accessed through the DigiLocker platform.

In the recent past, the government authorised DigiLocker to act as the National Academic Repository, which means that all educational institutions will have to integrate with DigiLocker and mark sheets and related documents would be provided to students digitally and directly through the DigiLocker route. This use case was initially adopted by CBSE, and they have been distributing the student mark sheets for Class X and XII through DigiLocker since 2018. DigiLocker has also been authorised as the default Health Record Locker under the National Digital Health Mission. Additionally, the Department of Administrative Reforms and Public Grievances (Government of India) issued an office memorandum on December 28, 2020, directing all ministries/departments and their subordinate offices for mandatory integration of their services with DigiLocker starting January 1, 2021. The letter called for fast-tracking the process and ensuring the availability of documents in DigiLocker 'in a mission-mode approach in a time-bound manner' (DARPG, 2020).

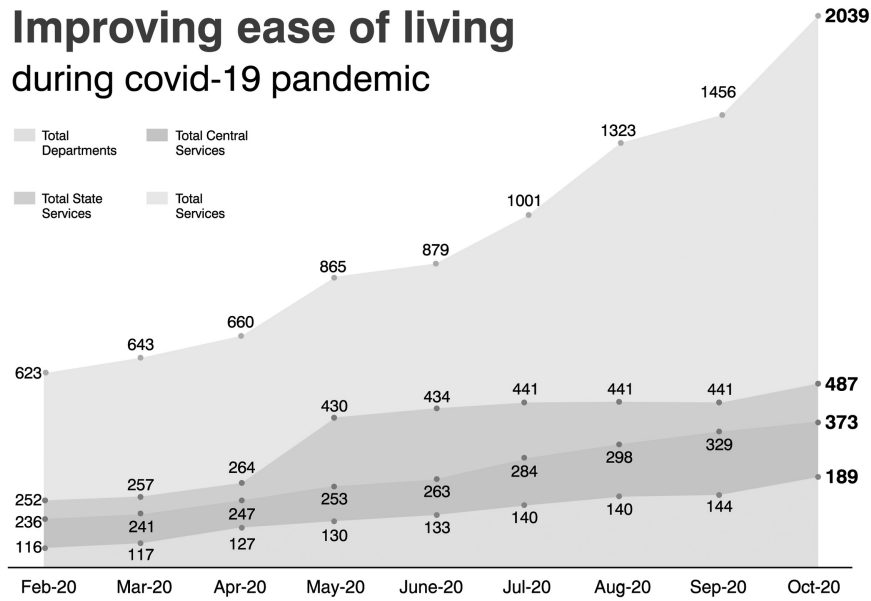

FIGURE 2.12 DigiLocker Usage Trends

Source: DigiLocker, n.d. (Image Recreated)

TABLE 2.2 DigiLocker – Top Five Document Types

Name of Document	*Available*
Aadhar Card	1,22,91,92,140
Policy Document	37,57,89,689
PAN Verification Record	36,54,00,000
Insurance Policy – Two Wheeler	31,11,69,855
Registration of Vehicles	21,42,44,958

Source: DigiLocker, n.d.

As mentioned earlier, DigiLocker has been a key component of the entire vaccination programme. The vaccination certificates being generated by the CoWIN application are getting stored in citizens' DigiLocker and can be produced instantly on demand. Not only this, DigiLocker is being used by various government institutes in delivering their services. One of the most important documents is the Registration Certificates (RC) of vehicles. The MoRTH has mandated this process and integrated the application with Vahan Database. This ensures the RC is available on the DigiLocker way before the citizen receives a physical one. Additionally, it has also enabled touchless authentication for entry at airports.

2.5 Persisting Challenges with Digital Solutions

The pandemic was an unprecedented crisis that demanded unprecedented solutions to minimise the consequences. As such, digital solutions emerged as the most feasible public policy tools to manage the pandemic; however, these came up with their own set of limitations. The broad challenges limiting the adoption and effectiveness of these digital applications in the management of the COVID-19 pandemic are elaborated on below.

2.5.1 Privacy Issues and Use of Personal Data

In 2017, a historic judgement was passed by the nine-judge Bench of the Supreme Court in Justice KS Puttaswamy v. Union of India, in which the Court upheld privacy as a fundamental right, intrinsic to life and liberty that henceforth comes under Article 21 of the Indian constitution. The Judgement also concluded that the state must restrain from committing an intrusion upon the life and personal liberty of a citizen and is obliged to take all necessary measures to protect the privacy of the individual. Further, the justices emphasised the need for a strong data protection regime without which any right to privacy will be left conceptually unsound.

However, the use of digital applications stirred up privacy concerns, and the absence of any national legislation governing privacy and data protection furthered the ambiguity around sharing, accessibility, storage, and usage of personal data. For instance, mandating the use of Aarogya Setu at workplaces as per the initial directive of the government (without any legislation passed by the Parliament authorising the government to do so) raised contradiction to the above judgement since the application captures personal information, location, and health data of the citizens. Moreover, the application's privacy policy was for a long time muted on security measures incorporated to protect the personal data of the citizens. Another crucial COVID-19 management application, CoWIN projected similar challenges, more so that the application initially did not even have its privacy policy for elucidating how it collects, stores, processes, and shares data about individuals. Contrary to this, the hyperlink to the privacy policy redirected to the Health Data Management Policy 2020, which was an umbrella policy acting as a guidance document across the National Digital Health Ecosystem.

Of late, the CoWIN platform has put in place its privacy policy which sets out the details of the personal information collected, how it is collected, by whom, as well as the purposes for which it is used. Nevertheless, the privacy policy mentions 'the personal information collected from you at the time of registration will be stored securely' (MoHFW, 2020), but exactly how it will be done is still missing. Furthermore, the privacy policy as quoted under the head 'data security' says 'CoWIN platform has reasonable security measures and safeguards in place' (MoHFW, 2020), but falls short of

mentioning precisely these measures that are being undertaken. This leaves a lot of obscurity around privacy policy and data security.

2.5.2 Digital Divide and Exclusion

Because of the need for mass-scale impact in the shortest possible time, there was a heavy reliance upon digital solutions to fight back against COVID-19, initially for contact tracing and later for running the largest inoculation drive in India. In a country where inequalities and the digital divide are prevalent, the strategy was questionable for many. The Telecom Regulatory Authority of India (TRAI) report pointed out that the wireless teledensity in rural areas is 57.13% as compared to 155.49% in urban areas as on March 31, 2019 (*The Hindu*, 2021). Besides, a report released by the Internet and Mobile Association of India (IAMAI) and consulting firm Kantar revealed that only 43% of the Indian population are active internet users, out of which 67% belong to urban India and 32% are from rural India. Therefore, there was a risk of exclusion by design because of the gaps in digital infrastructure and issues around accessibility of the same. This might have also resulted in inequitable data for different regions of the county and may have resulted in biased decision-making whenever such data would have been used.

The Supreme Court of India also pointed out that persons with visual disabilities suffered from accessibility barriers in the CoWIN platform, such as the unavailability of an audio captcha, selection across seven filters, and keyboard assistance for scrolling the website (*The Hindu*, 2021). Nevertheless, the digital baby should not be thrown out with the bathwater. It has been contended that physically run mass inoculation drives such as in the case of polio and smallpox reached the rural poor the last owing to paucity of data visibility. This drawback was removed in the technology-backed COVID-19 vaccination drive as it provided real-time data to strategise India's response to the pandemic.

In hindsight, the focus must be on accurate and authentic information dissemination so that even people at the last mile are aware of such applications, along with providing other non-digital modes of accessing such public health services for those with physical or literacy challenges.

2.5.3 Perceived Lack of Transparency

Given the massive push for the adoption of digital applications and the concerns around citizens' data, the entire process of application design and procurement of services from the private sector should have been more transparent, and with proper accountability frameworks. However, the initial questions around the procurement of such services and open sourcing of

the code were met with indirect responses from the government, which were not very encouraging. Petitions were filed seeking information on the origin of the application, but unfortunately, no details were received in this regard.

In some other nations, such applications were open-sourced quite early which allowed experts to scrutinise them for information security and other related research that helped in improving the application. Although there were disclosures at different stages, these were more reactive than being proactive. Also, the source codes were open-sourced later in the day, but some clear responses from the government in earlier days could have gone a long way in increasing the credibility of the application, and the trust of the citizens without creating unnecessary controversies.

2.5.4 Accountability and Grievance Handling Mechanism

As with any digital application, the nationwide rollout of digital platforms was bound to have some glitches. The need of the time was to ensure avenues for feedback and systematic handling of grievances that could have helped in building citizens' trust. However, this area was left underemphasised. For instance, there was no tab to report any error or file a complaint in the case of the Aarogya Setu application. Besides, the government did not hold any responsibility in the event of any inaccurate information provided by the application. This suggests that people cannot hold the government accountable or seek judicial remedy to verify the sanctity of the government's processes in line with the right to privacy. In the case of the CoWIN platform, an email id support@cowin.gov.in was provided for grievances and feedback, but the process of redressal, available remedies, timeline of the resolution, and the details of grievance handling officer/personnel were either not available or not effective.

2.6 Conclusion

The focus of the Government in India is maximum governance with minimum government. The future is much flatter and agile and has tech-enabled governance mechanisms with a high degree of convergence and a citizen-centric approach. This chapter aimed to discuss the Government of India's approach to using digital applications in managing the chaos caused by the COVID-19 pandemic. The groundwork for this approach was laid in the earlier days due to the government's continuous focus on creating digital infrastructure and increasing the use of digital means for delivering citizen-centric governance services. These efforts helped the government in managing the various aspects of the crisis by using some existing applications and developing a few specialised ones for preventive communication, disease management, and delivery of governance services. The innovative use of the MyGov platform and MyGov Corona chatbot helped in spreading authentic information to the citizens in the

early days of the pandemic. The next step was to track and trace the spread of infection which was done using the Aarogya Setu application designed specifically for this purpose. It was followed by the development of another important application, named CoWIN, that formed the bedrock of vaccination in India. Alongside, applications such as UMANG and DigiLocker helped citizens in getting governance services through their mobile phones in the safety of their homes, thereby protecting them from the vagaries of the infection. As with any other digital application, these too came with their own set of challenges ranging from privacy issues to perceived lack of transparency and challenges around grievance handling. Overall, the chapter would serve as an important starting point for the rest of this edited volume highlighting both the positive aspects and the challenges accompanying the use of technology in solving societal challenges.

References

1,000 more mandis to be integrated with e-NAM in 2021–22: Govt. (2021, February 4). *The Times of India*. Retrieved from https://timesofindia.indiatimes.com/business/india-business/1000-more-mandis-to-be-integrated-with-e-nam-in-2021-22-govt/articleshow/80694357.cms.

Aarogya Setu. (2020, August 11). *India's first contact tracing app crosses 15 crore users within four months of launch*. Times Now. Retrieved from https://www.timesnownews.com/technology-science/article/aarogya-setu-indias-first-contact-tracing-app-crosses-15-crore-users-within-four-months-of-launch/635231.

Arogya Setu mobile app crosses over one crore downloads. (2020, April 11). DD News. Retrieved August 19, 2021, from https://ddnews.gov.in/national/arogya-setu-mobile-app-crosses-over-one-crore-downloads.

Assessment Capacities Project. (2020). *Covid-19, a global joint response*. Retrieved from https://www.acaps.org/projects/covid-19.

Ayushman Bharat (2021): Over 0.7 mn Covid treatments authorised from April 20–July 21. (2021, August 18). Retrieved from https://www.business-standard.com/article/current-affairs/ayushman-bharat-over-725-000-covid-related-treatments-authorised-121081801414_1.html.

Bano, N. (2021, May 11). *Persons without digital access can take help of friends, families, NGO's, common service centres for COWIN registration: Centre tells SC*. Lawstreet.Co. Retrieved from https://lawstreet.co/executive/common-service-centres-cowin-registration-centre-sc/.

Bhardwaj, T. (2019, July 3). Budget 2019: PMGDISHA needs more support to achieve digital literacy targets. *The Financial Express*. Retrieved from https://www.financialexpress.com/budget/budget-2019-pmgdisha-needs-more-support-to-achieve-digital-literacy-targets/1627549/.

COVID-19 pandemic by country and territory. (2022, May 28). *Wikipedia*. Retrieved May 28, 2022, from https://en.wikipedia.org/wiki/COVID-19_pandemic_by_country_and_territory.

CoWIN. (2021, August 18). *CoWIN dashboard*. cowin.gov.in. Retrieved August 19, 2021, from https://dashboard.cowin.gov.in/.

CoWIN crashed (2021): Twitter flooded with complaints as registration opens for 18+. (2021, April 28). NDTV.Com. Retrieved from https://www.ndtv.com/india-news/cowin-crashed-twitter-flooded-with-complaints-as-registration-opens-for-18-2423719.

CoWIN to block users who search for COVID vaccine slots 1,000 times in a day: 50 OTP requests allowed. (2021, June 10). News18. Retrieved from https://www.news18.com/news/tech/co-win-to-block-users-who-search-for-covid-vaccine-slots-1000-times-in-a-day-50-otp-requests-allowed-3830390.html.

CSC. (2020). *CSC eGovernance Services India Ltd Annual Report 2019–20*. Ministry of Electronics and Information Technology. Retrieved from https://csc.gov.in/assets/events-report/Annual-Report-2019-20.pdf.

DARPG. (2020, December 28). *Office memorandum: Adoption of DigiLocker to promote citizen centric service delivery – Regarding*. Retrieved from https://dbtdare.icar.gov.in/files/o.m.%2015.02.2021.pdf.

Deloitte. (2015). *E-governance and digital India empowering Indian citizens through technology*. Retrieved August 19, 2021, from www.deloitte.com/in.

DigiLocker. (n.d.). *DigiLocker: Statistics*. Retrieved August 19, 2021, from https://www.digilocker.gov.in/statistics.

Digital India. (2021, August 18). *Vision and vision areas*. Retrieved August 19, 2021, from https://www.digitalindia.gov.in/content/vision-and-vision-areas.

Employees provident fund organisation services most accessed on the UMANG app. (2020, September 30). ETGovernment.Com. Retrieved from https://government.economictimes.indiatimes.com/news/digital-india/employees-provident-fund-organisation-services-most-accessed-on-umang-app/78382651.

Ganguly, P. (2020, February 24). *MeitY invites stakeholder comments on NODE consultation*. Techcircle. Retrieved from https://www.techcircle.in/2020/02/24/meity-invites-stakeholder-comments-on-node-consultation.

https://lawstreet.co/executive/common-service-centres-cowin-registration-centre-sc/.

https://gadgets.ndtv.com/apps/news/mygov-corona-helpdesk-launched-on-whatsapp-to-provide-coronavirus-information-2198146

IMF. (2021). *Policy responses to Covid-19*. Retrieved from https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#I

JioHaptik. (2020, July 4). *Haptik builds world's largest Whatsapp Chatbot in collaboration with the Govt. of India*. YouTube. Retrieved from https://www.youtube.com/watch?v=EH_EEA-ihBI&feature=youtu.be.

MEITY. (2017, November 23). *Prime Minister Shri Narendra Modi inaugurates the 5th global conference on cyberspace, 2017* [Press release]. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1510639.

MEITY. (2018, October). *India enterprise architecture framework version 1.0*. Retrieved from http://egovstandards.gov.in/sites/default/files/IndEA%20Framework%201.0.pdf.

MEITY. (2020a, April 2). *AarogyaSetu: A multi-dimensional bridge* [Press release]. Retrieved from https://pib.gov.in/PressReleseDetailm.aspx?PRID=1610301.

MEITY. (2020b, May 26). *Aarogya Setu is now open source* [Press release]. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1626979.

MEITY. (2020c, June 30). *India's AI enabled MyGov corona helpdesk bagged two awards at the global leadership summit and festival of AI & emerging technology, CogX 2020* [Press release]. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1635403.

MHA. (2020, March 24). *The government of India issues orders prescribing lockdown for containment of the COVID-19 epidemic in the country* [Press release]. Retrieved from https://pib.gov.in/PressReleseDetail.aspx?PRID=1607997.

MoHFW. (2018, September 22). *Ayushman Bharat –Pradhan Mantri Jan AarogyaYojana (AB-PMJAY) to be launched by Prime Minister Shri Narendra Modi in Ranchi, Jharkhand on September 23, 2018* [Press release]. Retrieved from https://pib.gov.in/Pressreleaseshare.aspx?PRID=1546948.

MoHFW. (2020, December). *Covid-19 vaccines operational guidelines (updated on 28 December 2020)*. Ministry of Health & Family Welfare. Retrieved from https://www.mohfw.gov.in/pdf/COVID19VaccineOG111Chapter16.pdf.

MoHFW. (2021a, January 10). *COVID-19 vaccine rollout* [Press release]. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1687421.

MoHFW. (2021b, April 28). *COVID-19 vaccination update* [Press release]. Retrieved from https://www.pib.gov.in/PressReleasePage.aspx?PRID=1714732.

MoHFW. (2021c, June 12). *COVID-19 vaccination update* [Press release]. Retrieved from https://pib.gov.in/PressReleseDetail.aspx?PRID=1726474.

Moorthy, S. (2021, May 7). *You now have to enter a captcha while booking your vaccination*. Moneycontrol. Retrieved from https://www.moneycontrol.com/news/business/you-now-have-to-enter-a-captcha-while-booking-your-vaccination-6866551.html.

Now, get Covid vaccine certificate on WhatsApp in 3 easy steps. (2021, August 8). *The Times of India*. Retrieved from https://timesofindia.indiatimes.com/india/now-get-covid-vaccine-certificate-on-whatsapp-in-3-easy-steps/articleshow/85150381.cms.

Narayan, A., & Narang, L. (2021, June 16). *The actors and operations of a digital delivery platform: CoWIN*. Dvara Research Blog. Retrieved from https://www.dvara.com/blog/2021/06/16/the-actors-and-operations-of-a-digital-delivery-platform-cowin/.

NCERT. (2021, August 16). *Diksha – dashboard*. Retrieved August 19, 2021, from https://diksha.gov.in/data/?type=usage.

NEGD. (n.d.). *UMANG | Welcome to NeGD | National eGovernance Division (NeGD)*. Retrieved August 18, 2021, from https://negd.gov.in/node/88.

NeGD. (2021, April). *Expression of interest (EOI) for agent-assisted service delivery of UMANG services on a non-exclusive basis*. Retrieved from https://www.meity.gov.in/tenders/expression-interest-eoi-agent-assisted-service-delivery-umang-services-non-exclusive-basis.

NHA [@AyushmanNHA]. (2021, August 19). *AB-PM JAY progress report* [Tweet]. Twitter. Retrieved from https://twitter.com/AyushmanNHA/status/1427927411128107018?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Etweet.

NHP. (n.d.). *Official website Ayushman Bharat*. HWC. Retrieved August 19, 2021, from https://ab-hwc.nhp.gov.in/#about.

NITI. (2020, August). *Data empowerment and protection architecture – Draft for discussion*. NITI Aayog. Retrieved from http://www.niti.gov.in/niti/sites/default/files/2020-09/DEPA-Book.pdf.

NPCI [@NPCI_NPCI]. (2021, July 1). *30th June 2021: Daily digital payment statistics #AePS #BHIMUPI #IMPS #NETCFASTag* [Tweet]. Twitter. Retrieved from https://twitter.com/NPCI_NPCI/status/1410584002973474817.

Original source in the annexure to the letter on this URL. Retrieved August 19, 2021.

PMO. (2021a, January 16). *English rendering of PM's address at the launch of Pan-India rollout of COVID-19 vaccination drive* [Press release]. Retrieved from https://pib.gov.in/PressReleseDetail.aspx?PRID=1689026.

PMO. (2021b, July 5). *PM addresses CoWin global conclave as India offers the CoWIN platform as a digital public good to the world to combat COVID-19* [Press release]. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1732812.

PM Modi launches e-platform for farmers to sell produce. (2016, April 14). *The Indian Express*. Retrieved from https://indianexpress.com/article/india/india-news-india/pm-narendra-modi-launches-electronic-trading-platform-for-farmers-e-nam-ambedkar-jayanthi-birth-anniversary-2753922/.

Porcher, S. (2020). Response2covid19, a dataset of governments' responses to COVID-19 all around the world. *Sci Data*, 7, 423. https://doi.org/10.1038/s41597-020-00757-y.

Prasad, R. S. [/RaviShankarPrasadOfficial]. (2021, June 10). *CSC eGrameen store performance* [Facebook]. Facebook. Retrieved August 19, 2021, from https://m.facebook.com/68315058328/photos/a.10152001997393329/10159123106818329/?type=3&source=48&locale2=en_GB&__tn__=EHH-R.

Second Administrative Reforms Commission. (2008). Eleventh report, promoting e-governance, the SMART way forward. Retrieved from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://darpg.gov.in/sites/default/files/promoting_egov11.pdf.

SFAC. (n.d.). *eNAM | Stakeholder Data*. enam.gov.in. Retrieved August 18, 2021, from https://enam.gov.in/web/dashboard/stakeholder-data.

Sharma condemns media reports stating the CoWIN platform can be hacked. (2021, May 29). *The Hindu BusinessLine*. Retrieved from https://www.thehindubusinessline.com/news/sharma-condemns-media-reports-stating-cowin-platform-can-be-hacked/article34678484.ece.

Singh, J. (2021, May 26). *CoWIN guidelines for API usage to allow booking of COVID-19 vaccine slots via third-party apps*. NDTV Gadgets 360. Retrieved from https://gadgets.ndtv.com/apps/news/cowin-app-update-third-party-registration-booking-scheduling-apis-guidelines-2449739.

Supreme court verdict on right to privacy (2017, August 16).

UMANG. (n.d.). *UMANG – One app, many government services*. umang.gov.in. Retrieved May 28, 2022, from https://web.umang.gov.in/landing/.

UMANG. (2020, November 23). *eBook on 3 years of UMANG*. Retrieved from https://web.umang.gov.in/landing/flipbook/index.html.

UMANG. (2022). *UMANG dashboard*. Retrieved May 28, 2022, from https://web.umang.gov.in/landing/dashboard.

United Nations Development Programme. (2022, May 28). *Covid-19 pandemic*. Retrieved from https://www.undp.org/asia-pacific/covid-19-pandemic.

UN News. (2020, October 13). *'Time for global solidarity' to overcome COVID's health, social and economic challenges*. Retrieved from https://news.un.org/en/story/2020/10/1075322.

3

DIGITAL CENSUS AND APPLICATION OF ADVANCED TECHNOLOGIES IN CENSUS

Perspectives from the Forthcoming Census of India

Abhishek Jain and Varinder Kaur

3.1 Census – *Sine qua non* for Achieving Sustainable Development Goals (SDGs) and Effective Governance

> Census collects data of humans for human welfare. Census is for public good.
> Authors

All nations require timely, high-quality, accurate, reliable, and disaggregated geo-referenced census data to inform, implement, and evaluate Sustainable Development Goals and public policies for the larger public good (Jain et al., 2021, p. ii; United Nations Population Fund [UNFPA], 2019; United Nations Statistical Division [UNSD], 2020a). For scientists and researchers in demography, economics, public policy, public administration, geography, anthropology, sociology, statistics, history, and many other fields, the census offers the most authentic, comprehensive, and diverse source of data. The population and housing census is probably the only source of primary data in a country, which is available for every state/union territory, district, sub-district, town, village, and ward. New technologies enable better censuses with more complete, timely, and qualitative data (UN DESA, 2017). The expected outcomes of the first-ever digital census, with a scientific approach in the world's most populous country (India) having 17.7% of the global population, hold great significance for all countries. India surpassed China to become the most populous country on 24 April, 2023 with 142.86 crore population against China's 142.57 crore as per UN's World Population Dashboard (UN DESA, 2023; UNFPA, n.d.). Digital constraints in India

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and the global COVID-19 pandemic pose challenges for successful census taking.

> A population census is the total process of planning, collecting, compiling, evaluating, disseminating and analysing demographic, economic and social data at the smallest geographic level pertaining at a specified time, to all persons in a country or a well-delimited part of a country
> *(UN DESA, 2017: 2).*

Census covers all the geographical units of a country from the national to the village levels (UNFPA, 2019) and hence census is a 'full count' (UNSD, 2020b, p. 1). The population and housing census is one of the largest and most difficult exercises in a nation. The 2020 census round (2015–2024) is the first census round since the adoption of the 2030 Agenda for sustainable development which makes data very critical for effective decision-making and measurement of progress in sustainable development (UN DESA, 2020; Jhamba et al., 2020, p. 43). SDG indicator 17.19.2 specifically highlights the significance of census implementation, tracking the 'proportion of countries that have conducted at least one population and housing census in the last 10 years' (United Nations General Assembly [UNGA], 2015). Data is power and is perhaps the most valuable asset in this modern age (World Bank, 2021). Data is critical for evidence-based policies at the national and sub-national levels, market analysis, and election purposes (Corcos, 2017). Census is a public good (Jain & Kaur, 2021). Rapid progress in handheld computing devices, like smart mobile phones with tremendous features, tablets, laptops, and Personal Digital Assistants (PDAs), and technologies like cloud computing, Geographic Information Systems (GIS), and Geographic Positioning Systems (GPS) unleash new opportunities for accelerating the pace and quality of census than paper-based census (UN DESA, 2019a). 'The use of advanced technologies has become an integral part of many census processes critical for improving the cost, quality (coverage, accuracy, timeliness) and efficiency of the census' (John, 2020).

Sardar Vallabhbhai Patel – India's first Home Minister – while introducing the Census Act in Parliament on August 18, 1948, stated (as quoted in Jain et al., 2021, p. 1):

> As the world is progressing and as a scientific appreciation of an important operation of this nature, we think it is necessary to have a proper census prepared.

The Indian census is one of the largest and most credible sources of statistical information of various kinds, widely used by public and private organisations, besides other stakeholders. There is hardly any ministry or

department from the national to the state or district level which does not use the census data at one point or the other for its policies, programmes, or schemes. Census is a multi-disciplinary field (Figure 3.1) and is extremely useful to academicians and researchers. This trusted and proven exercise provides invaluable statistics every ten years. An unbroken chain of censuses since 1872 gives the Indian census a unique historical legacy (Sinha, 2011). The next census in India will be the 16th in the series. From 1881 to 2011, the census was conducted in the first year of every decade. The next census was originally scheduled for the year 2021 (to be completed in the year 2020 for the first phase and in the year 2021 for the second phase). However, due to the spread of the COVID-19 pandemic, the field data enumeration work has been postponed, and the date for freezing of boundaries of the administrative units for the ensuing census will now be frozen with effect from January 1, 2024 (ORGI, 2023; The Indian Express, 2023). Presently, back-end preparations and pre-census activities are underway.

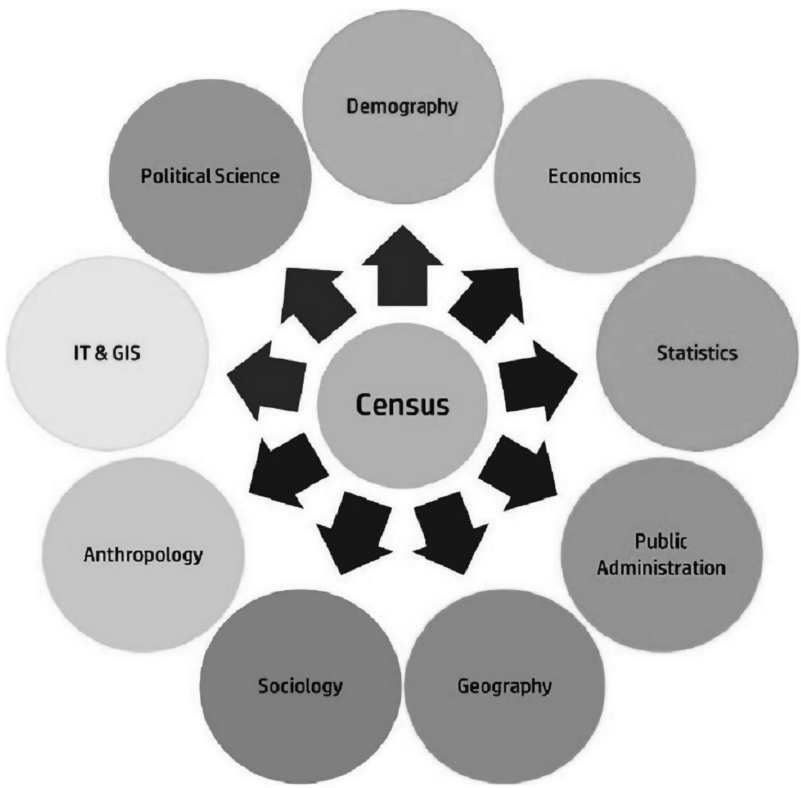

FIGURE 3.1 Census as a Multi-disciplinary Field

Source: Authors

The Census Act, 1948 and The Census Rules, 1990 form the legal basis for the conduct of census in India, which is executed through Union and State governments. Indian census involves the enumeration of data through canvassing of schedules from each and every individual in every village and town of the country. Hence, it is 100% primary data in the Indian census. This is different from other data sources which may be using secondary data or primary data with limited coverage or sample size like Labour Bureau Survey, National Sample Survey (NSSO), National Family Health Survey (NFHS), etc.

Figure 3.2 depicts the Census of India at a glance detailing the chronological methodology of conducting the census in India. Census is done in two phases – Phase I: Houselisting and Housing Census (HHC); Phase II: Population Enumeration (PE). The first phase (HHC) is conducted over a period of 30 days between April and September as per the choice of the state government concerned and collects data at the household level pertaining to assets and amenities owned by households. 'To incorporate the changes due to birth, death and migration, the National Population Register (NPR) would be updated along with Houselisting and Housing operations of the forthcoming census' (ORGI, n.d.). Phase II (PE) is conducted in the next year following the Phase I year in a duration of 21 days fixed from February 9 to 28, with a revisional round from March 1 to 5. Thus, whenever we say the population of India is say 1.21 billion as per Census 2011, it is the population as on 00:00 hours of March 1, 2011. The census data enumeration is thus, time-bound – to be completed in 30 days for the first phase and in 21 days for the second phase – without exception. One can imagine how difficult it is to cover the entire population of a country of India's size twice, physically by an enumerator in such short spans of time. All the above (Phase I and II) involve various steps in a chronological order. The entire census operation covering both phases take more than a year, starting from pre-census activities to census and post-census activities.

The Census in India is conducted by the Union Government through the Census Commissioner and Registrar General, India, with the active support and implementation from State/Union Territory governments. A census involves various functionaries from national to state, district, sub-district, and village levels, who are given different designations/nomenclatures. The hierarchy of various census functionaries in India is given in Figure 3.3. The field enumerators who do enumeration work (digital or manual) would be mainly primary school teachers of government schools. Around three million enumerators are expected to be deployed in the forthcoming census in India (ORGI, 2021c).

Since the actual year of the next census in India after the last census 2011 has not been finalised, the term used for the next census is 'forthcoming

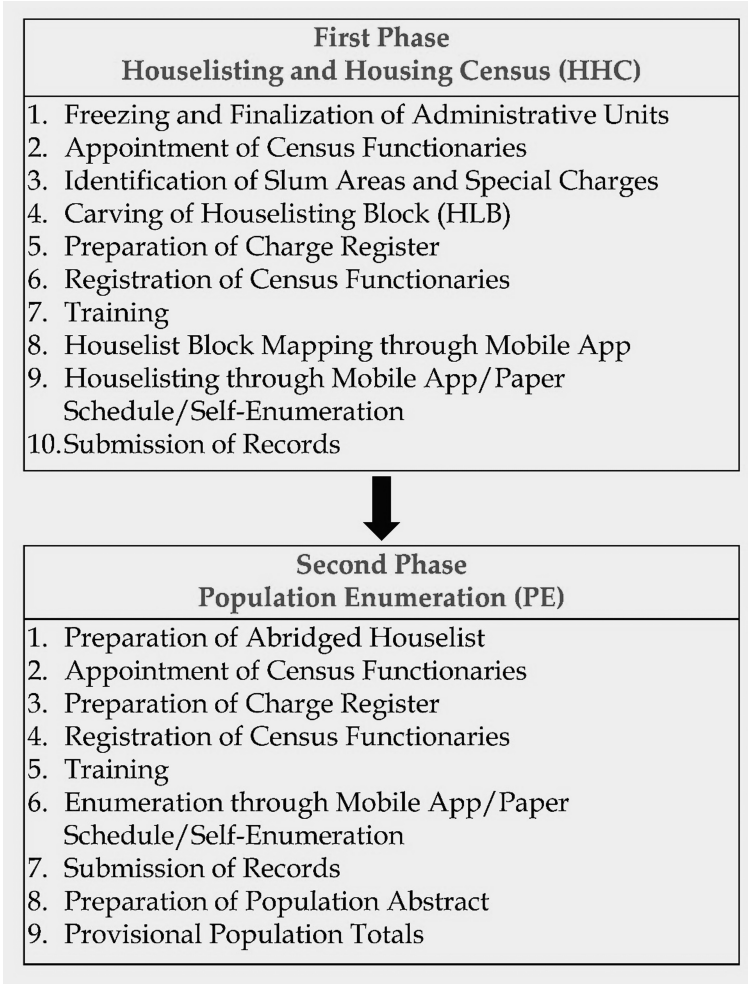

FIGURE 3.2 Census in India at a Glance

Source: Jain et al., 2021, p. 4

census' as per the Office of Registrar General of India (ORGI, n.d.). This is the term we will use in this chapter to denote the next census in India.

In this chapter, the status of the forthcoming census in India in terms of the digital census has been studied along with an assessment of the application of advanced technologies in census and census mapping in India. It begins by defining the problem and problem statement in Section 3.2, a review of literature in Section 3.3, and methodology in Section 3.4. The census technologies are mentioned in Section 3.5, census mapping and the

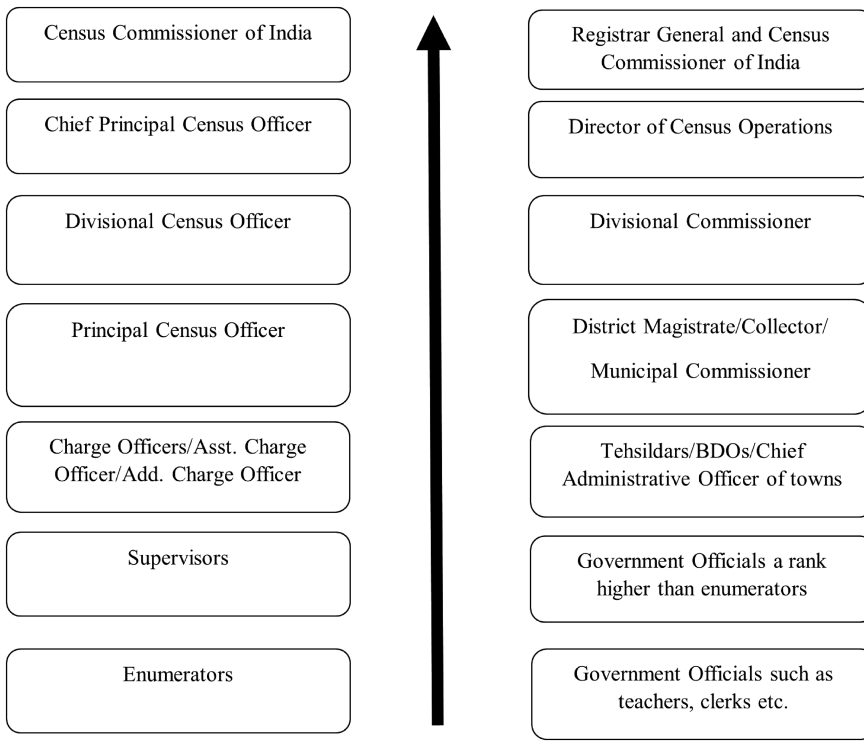

FIGURE 3.3 Administrative Hierarchy of Various Census Functionaries in India

Source: Census Gallery and Information Kiosk, Directorate of Census Operations, Punjab and Chandigarh

role of GIS as essential tools for the forthcoming digital census in Section 3.6. Section 3.7 presents the perspectives on digital census and the application of advanced technologies in the forthcoming census in India. It also discusses the application of advanced technologies in census mapping in the forthcoming census of India. Section 3.8 presents the issues and challenges in conducting digital census in India. Section 3.9 concludes this chapter.

3.2 Problem and Problem Statement

Every country desires a robust, advanced, and efficient census of its population after periodic intervals. The Census 2020 round of the United Nations covers the period 2015–2024. As many as 59 countries are scheduled to conduct a census during the remaining period of the 2020 round from 2015 to 2024, i.e. years 2022–2024 (UNSD, 2020b) (Figure 3.4). The robust and technologically advanced census is essential not only for formulating

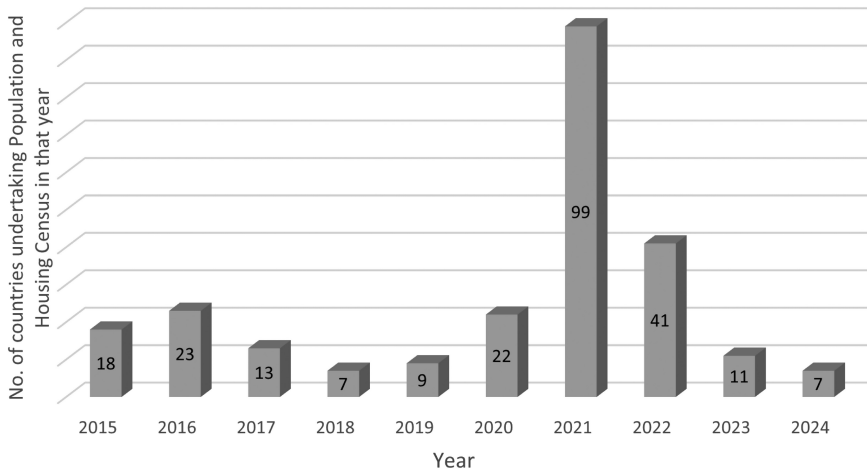

FIGURE 3.4 Census in Number of Countries or Areas under 2020 World Population and Housing Census Programme

Source: Authors, based on UNSD, 2020b

data-driven policies and programmes at the national and sub-national levels but is also a *sine qua non* for achieving Sustainable Development Goals. Also, census mapping is an important tool for understanding man–land relationships and holds the utmost significance in a successful census. An outdated population census conducted in a country can jeopardise the very foundations of public policies and governance and will have a devastating impact on the economic, political, social, and business interests of millions of citizens.

Many countries in the world have adopted digital census with advanced technologies for different components of the census, especially in data collection and mapping. The global COVID-19 pandemic, which also affected India adversely, posed challenges to the census data collection physically through enumerators even with mobile devices as it involved face-to-face interaction between millions of enumerators and over a billion respondent citizens.

India, constituting 17.7% of the world's population (UN DESA, 2019b) is now the most populous country in the world. It had 1.21 billion population as per Census 2011 (ORGI, n.d.). As per the United Nations' World Population Dashboard, the population of India on 23 April, 2023 rose to 1,428 million surpassing that of China at 1,425 million (UN DESA, 2023; UNFPA, n.d.). Universality and simultaneity are the two key features of the census. The forthcoming census of India is a gigantic exercise for which roughly three million enumerators and supervisors are to enumerate more than 1.4 billion people at a cost of INR12,695 crores or approximately US

$1.7 billion[1] (Office of the Registrar General of India [ORGI], 2019a; Press Information Bureau [PIB], 2019). India's census has a significant impact on the global community (Ram & Ram, 2021) – being a major developing and democratic country with huge sub-national diversities.

As per the 2020 UN E-Government Survey (UN DESA, 2020), despite some advantages (like 0.85 Online Service Index and 86.9 mobile cellular telephone subscriptions per 100 inhabitants), India ranks 100 out of 193 countries in the E-Governance Development Index with 0.59 index value. It faces some problems of telecom infrastructure (index value 0.35), mid-level human capital (index value 0.58), inadequate digital penetration (34.4% individuals using the internet), certain digital divide across regions and people, etc. Conducting digital census in India involves many challenges as well. These challenges are on human, technological, capacity, and implementation fronts.

Seen in the above context, perspectives from India in the conduct of digital census, particularly on the application of advanced technologies in census and census mapping, hold great relevance for the rest of the world. This is equally relevant in technology and policy. In this context, we undertake the study with the problem statement –

> in the context of digital census, what is the status of forthcoming census of India, and how does India fare in the application of advanced technologies in census and census mapping, in order to improve the timeliness, quality and utility of census activities.

3.3 Review of Literature – International Evidence

Census is conducted in different ways across the world. Most countries conduct censuses traditionally through the enumeration of data from individuals and households through field enumeration. Increasingly, other methodologies are being used for the census which include register-based census with or without field enumeration, use of administrative data, and continuous survey methodology for producing detailed statistics of small areas (UNSD, 2020a).

The UNFPA (2019, pp. 9–11) notes that the application of new technologies for census processes got a jump from the 2010 round of census. A lot of countries have implemented the latest technologies, viz. mobile devices, internet, and GIS, for different phases of a census (UN DESA, 2015). 17 of 49 responding countries used the internet for data collection in the 2010 round, and 33 plan to use it in the 2020 round. More than 30 nations have adopted internet-based self-enumeration (UN DESA, 2019a). As per the Office of Registrar General of India (ORGI) (2021a), the world is marching towards the digital mode of data collection. Advanced countries either have

a register-based census or are going for the digital mode. Many developing countries are switching over to digital mode for census enumeration. A combination of data collection modes is being used in many countries. These include online self-enumeration (SE), SE through paper questionnaires, a personal visit by an enumerator through electronic devices, and Computer-assisted telephonic interviewing (CATI).

As per the Office for National Statistics of the United Kingdom (2021), Census 2021 was the 'first digital-first census in England and Wales, and 88.9 per cent of households responded online' (Office for National Statistics of the United Kingdom, 2022; Rose, 2020). China conducted its 2020 census digitally, deploying seven million enumerators (Xuemin & Yang, 2020). The US Census 2020, for the first time, invited households to respond to the census through the internet, phone, or mail. Self-response rate in the United States was 67% who responded online, by mail, or by phone (US Census, 2020). Similarly, the digital census has been conducted in Brazil, Australia, Northern Ireland, and many other countries. As per ORGI (2021a), Singapore has a register-based census supplemented with 20% sample enumeration; and the enumeration is multi-mode (internet, CATI, face-to-face interview with ultra-mobile PC). Japan had self-enumeration through paper schedules in the past but now it is online self-enumeration since 2015, and its success rate is 39.5% (Statistics Bureau of Japan, 2005). Australia has self-enumeration primarily through online mode since 2016 when the paper form was sent on request or was web-based.

Regarding the application of advanced technologies in census mapping 'different countries may follow different approaches according to existing geographic information, budgets, technical capabilities, time constraints and so on' (Wang et al., 2012, p. 358). In the last three decades, developed countries as well as some developing countries have been critical in GIS applications in census mapping. These include the United States, United Kingdom, Japan, Australia, Canada, China, South Africa, Uganda, Israel, India, and Nepal (Desnoyers & Norris, 2001). In the United States, Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing system (TIGER) Accuracy Improvement Project was started in the year 2000 (Wang et al., 2012). However, the application of GIS in census mapping is in its initial stages in many under-developed countries (Mokhele, 2011).

In Asia, many countries are adopting the latest GIS technologies for census mapping. Some countries like Japan and Singapore are in an advanced stage while the rest are in the initial stage of developing programmes and software solutions. In Singapore, the Urban Redevelopment Authority uses geospatial tools for land use purposes and the conservation of history (University of Southern California, 2019). In the 2020 census round, the UNFPA has identified key transformative technologies for modernising the census. These include the use of handheld devices, integrating GIS into

census and digital mapping, and generating modelled population estimates (Jhamba et al., 2020, p. 45).

In India, the use of technologies has been done for data scanning, compilation, transmission, analysis, and dissemination in the past censuses. The data collection in the last Census 2011 was done manually by the 'pen-and-paper' approach. There are studies on previous censuses in India. But literature is scarce on the forthcoming census of India and on the application of digital census and advanced technologies in census in India. This study fills that gap.

3.4 Methodology

This study has been conducted with two core objectives. First, to find out the status of the forthcoming census in India in terms of 'digital census'. Second, to assess the application of advanced technologies in census and census mapping in India. The scope of the study includes conducting the census during the 2020 round in different countries with empirical evidence focused on India. It covers digital census in general, and the application of advanced technologies in census and census mapping. The time frame is the forthcoming Census of India. The assessment of technological applications in census mapping in the previous censuses in India has also been done. The hypothesis of this study is that India is conducting a digital census in the forthcoming census, and is applying advanced technologies in census and census mapping.

The research design is that it is an exploratory research study. It assesses the forthcoming census in India in terms of 'digital census'. It explores the level of application of advanced technologies in census and census mapping in India for a faster, more accurate, and more efficient census. The study uses secondary data from the Office of Registrar General of India and Census Commissioner, the United Nations Department of Social and Economic Affairs, and other sources. It also uses qualitative data. It is a descriptive research study. It uses theoretical methods with the practitioners' perspective of the authors – incorporating the field-level experience of the first author of over a decade in the conduct and management of census and five years of experience as Director Census Operations cum Principal Census Officer for different states/union territories in India, and 14 years of experience of the second author in census and census mapping operations in various Directorates of Census Operations in India. The study is applied research in the sense that it can be applied to different census organisations, governments, practitioners, data users, academicians and researchers on the census, data, technology, and policy issues.

3.5 Census Technologies – The Enablers

Emerging census technology solutions offer huge avenues for accelerating the quality and timeliness, and reducing the expenses of census operations even in environments with limited institutional capacity and digital infrastructure. These technologies are benchmarks for census operations. The main factors for these innovations include the demand for quality data received in time, improving efficiency, reducing cost and burden of the respondents, access to improved and low-cost technology, stakeholder and user expectations, etc. (UN DESA, 2019a). Benefits of digital data collection include validation checks, automated routing and coding, customised questions, reduced data entry errors, time and cost reduction, improved field management, GPS and digital mapping, ease of handling, and better response of respondents. To benefit from these technology solutions, national statistical organisations should make strategic and timely decisions with solutions relevant to the context.

Enumeration Area and census house mapping techniques have come a long way from unmanageable paper lists to integrative methods using GIS, GPS, and digitised maps. The geographic information process in census comprises three stages: data acquisition, data processing, and data dissemination. Geospatial technologies cover all these three stages. Data processing has advanced analysis techniques and visualisation software and interactive e-tools, which help in the dissemination and analysis of census data (UN DESA, 2019a). To optimise the use and integration of these innovative practices, flexibility and initiative are needed to accept changes (De et al., 2020, pp. 9–10).

3.6 Census Mapping and Geographic Information System (GIS) – Essential Tools for Forthcoming Digital Census

3.6.1 Census Mapping

Maps are the backbone of census. Census without mapping is like a body without blood. Census mapping is an essential tool for understanding man–land (territorial distribution) relationships. Maps have proved to be indispensable products in conducting population censuses by ensuring completeness of coverage throughout the country and eliminating the possibility of double coverage of the population. Maps aid in data collection and monitoring of census activities. They help delineate the country into small manageable counting units or Census Enumeration Blocks. Census mapping is beneficial in all the census phases as shown in Figure 3.5. Mapping facilitates adequate supervision. Census maps are issued to census supervisors for assistance in planning and monitoring. Census mapping makes it easy to display, analyse,

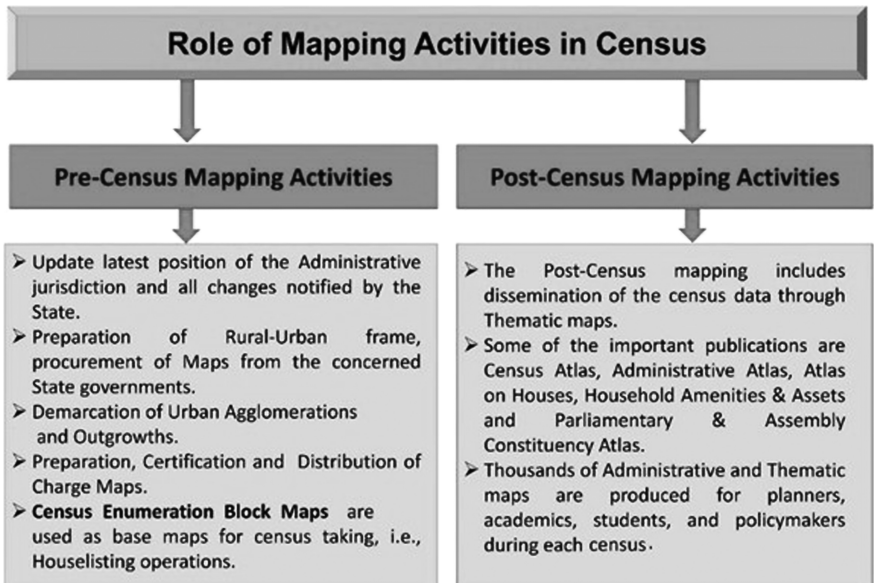

FIGURE 3.5 Role of Census Mapping in Different Activities

Source: Kaur, 2021, p. 51

and publish the results. Mapping the census data is a significant tool for data visualisation (UN DESA, 2017). Census mapping allows for the effective identification of national, state, and local trends of crucial demographic and socio-economic indicators.

Census mapping enables an accurate geographic frame for providing the uniqueness of different enumeration units. The jurisdictional boundaries are frozen before census taking. The different levels of territorial units for conducting the census are clearly delineated, along with the preparation of maps. Various administrative maps help in covering the entire nation without any omission or duplication. The organisation prepares various maps at all levels of administration – state/union territory, district, sub-district (tehsil/block), town, ward, village, and enumeration block.

The Census Organisation (Registrar General and Census Commissioner of India) produces one of the largest varieties of maps in the country and has been disseminating census data and publishing various maps for the last 130 years. It prepares two kinds of maps: pre-census maps and post-census maps for data dissemination (ORGI, n.d.)

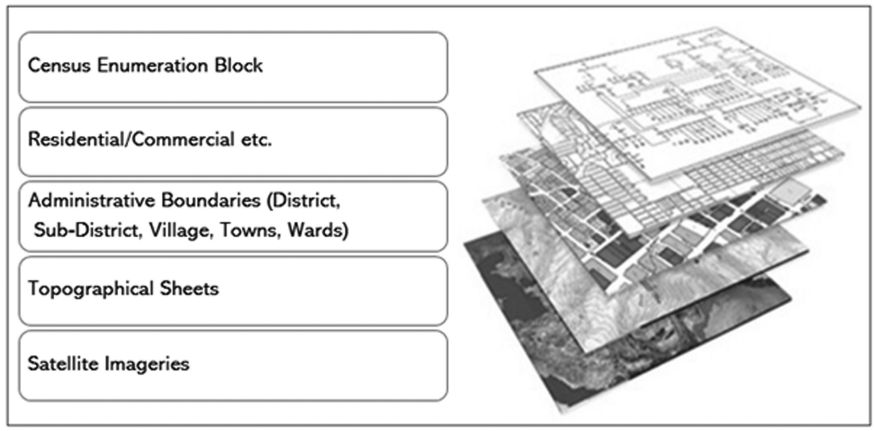

FIGURE 3.6 Data Organisation of Map Layers in Census

Source: Jain & Kaur, 2021, p. 548

3.6.2 GIS and Census Mapping – The Interplay

Traditionally, maps have supported enumeration in census operations. Maps present the final results in cartographic form. Till now, GIS has been used mainly for the preparation of Enumeration Area (EA) maps. With emerging digital technologies, paper maps are being substituted with digital maps on mobiles. These mobile apps enable field enumerators to access the base maps with information on EA boundaries (UN DESA, 2019a, p. 78). GIS has proven to be a useful tool for data integration, analysis, visualisation, and dissemination.

Based on the data organisation of various layers (Figure 3.6), base maps for the census are prepared which play an important role while conducting the census and displaying the results post-census. Remote sensing and imaging enable live maps and live enumeration tracking. Online payment to field workers through mobiles and geo-positioning can enhance the uniformity of responses (UN DESA, 2017, p. 62). GPS, GIS, and remote sensing techniques have become pervasive in policy formulation for integrated management and have benefitted numerous studies (Yao et al., 2017). Through mobile devices, GPS-based applications, social networks, and cloud technology, census mapping, and spatial data analysis have been facilitated (Lopez, 2019). In the above background, the results and findings of this study are described in Section 3.7.

3.7 Perspectives from the Forthcoming Census of India

3.7.1 'Digital Census' in India

The conventional way of census taking in India up to the 2011 census has been the house-to-house canvasser method through paper schedules. These schedules were filled by the enumerators after seeking a verbal response from the respondent households or individuals. Subsequently, paper schedules were scanned, and the recognition of characters was done using ICR (intelligent character recognition) technology followed by editing, tabulation, scrutiny, and ultimately finalisation and dissemination of census data.

The forthcoming census is going to be the 16th in the series in India. The forthcoming census in India moves away from a 'pen and paper census' to a 'Digital Census' (ORGI, 2019a) (Figure 3.7). First time since 1872 when the census started in India, there will be a digital census, and advanced technologies will be deployed in the forthcoming census (PIB, 2019). Digital census in India involves digital data collection, digital self-enumeration, digital mapping, digital census monitoring and management, digital payments, and digital data dissemination.

FIGURE 3.7 Forthcoming Census of India – Digital Census and Mascot
Source: Jain et al., 2021, p. 3 based on ORGI, 2019a

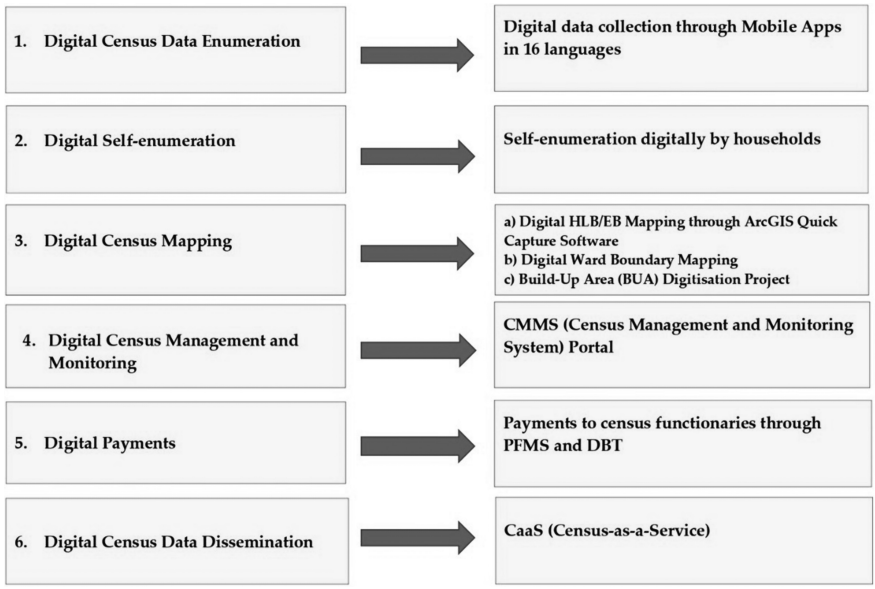

FIGURE 3.8 Dimensions of Digital Census in India

Source: Abhishek Jain

Figure 3.8 shows the dimensions of the forthcoming digital census in India. Digital data collection will be through indigenously built mobile apps. Digital self-enumeration has been enabled by the recent Census (Amendment) Rules, 2022 which enable data collection in electronic form and self-enumeration digitally by respondents (Government of India [GOI], 2022). Digital mapping will be in the shape of digital Houselisting Block Mapping and digital ward boundaries through ArcGIS Quick Capture Mobile Application. Digital management and monitoring of census operations will be through Census Management and Monitoring System (CMMS) Portal. Digital payments will be through Public Finance and Monitoring System (PFMS) and Direct Benefit Transfer (DBT) to more than three million enumerators. Digital data dissemination will be through Census-as-a-Service (CaaS).

This is a quantum leap in census operations, in tune with modern technologies and the 'Digital India' theme of the national government (Sen, 2019). As per the Prime Minister of India, 'the next Census will be the first and most remarkable digitalised census of the country'. This is where India will set an example for other countries. The forthcoming census will be fully digitised and create a digital system (ANI, 2021). The Government of India approved INR12,695 crores (roughly US $1.7 billion) for census and NPR in 2019 – of

which INR8,754 crore will be for conducting a census and INR3,941 crore for Updating of NPR (PIB, 2019; PIB 2021a). INR3,768 crores were earmarked for 2021–2022 in the budget 2021 of India (GOI, 2021). Considering the large number of regional languages spoken in India, the census mobile apps have been made in 16 languages including English and the national language Hindi. Three million enumerators would be deployed to conduct the census (ORGI, 2019a). Around 30 Indian Administrative Service (IAS) officers (India's top-most civil servants) of the seniority of 9–20 years of service (from Deputy Secretary to Joint Secretary, Government of India levels) are deployed by the Government of India to head the Directorate of Census Operations in every state. This is not a small thing and shows the government's importance to census operations in the country. This is unlike many other data collection organisations like the Directorate of Statistics in state governments, the Labour Bureau, the National Sample Survey of India (NSSO), etc. where departmental officers (and not IAS officers) are posted to collect data.

The methodology for data enumeration in the forthcoming census in India is undergoing a paradigm shift. Various disruptive technologies are being deployed in the forthcoming census in data enumeration, mapping, management, monitoring, and dissemination, which will lead to a complete digital transformation of the census in India. The details of the methodologies for the next census in India are given below.

3.7.1.1 Data Enumeration Methods in the Forthcoming Census in India

- By visiting house-to-house and collecting information on mobile apps. Enumerators will have to use their own mobile devices. They will collect the information after verbally asking the questions in two schedules in two phases of the census. The oral response of the respondents will be entered by the enumerator on the mobile app which can be directly synchronised with the server of the Office of Registrar General of India (ORGI)-cum-Census Commissioner. For using their device, enumerators will be paid an additional honorarium; or
- If any enumerator finds difficulty in using her/his device, she/he would collect data by using the paper schedule and get the data entered on mobile app; or
- Self-enumeration by households. As per the Census (Amendment) Rules, 2022, self-enumeration will be allowed – meaning filling up, completing, and submitting the census schedule by respondents themselves. This also includes self-enumeration digitally (GOI, 2022); or
- By visiting house-to-house and canvassing the schedule on paper. The manual data will be further scanned and coded through ICR (Intelligent

Character Recognition) and finally sent to ORGI Server for tabulation and processing (ORGI, 2019a, 2021a, 2021b).

Out of the above options, all except the last one have been introduced for the first time in India. Data collection through Mobile apps and self-enumeration digitally will be done for the first time in India in the forthcoming census.

3.7.2 Application of Advanced Technologies in Census in India

i. **Mobile Apps:** The census data will be collected digitally in the forthcoming census in India. Mobile apps have been developed indigenously by ORGI. These apps are simple and user-friendly to elicit acceptability by the field functionaries, viz. enumerators and supervisors. The apps can run on all android versions 4.0 and above platform-based mobiles (ORGI, 2021c). These apps in 16 languages (English, Hindi, and 14 regional languages) are given in Table 3.1.

These mobile apps can run on all android mobiles and iPhones (for mobile mapping app). The apps can function in off-line mode with internet data required only twice – one at the time of downloading the apps and second, at the time of uploading the data of the filled-in census schedules onto the servers. This would ward off the problem of lack of internet connectivity in many parts of India as the enumerator can send data after a few days from a nearby place having internet connectivity. Because of mobile apps, the enumerators need not carry cumbersome and heavy schedules for data enumeration. It will help in enabling more flexibility and mobility for the enumerators. There

TABLE 3.1 Mobile Apps to Be Used in Forthcoming Census

Houselisting and Housing Census Mobile App	This will be used during the first phase of the census for the collection of Houselisting and Housing Census (HHC) data
NPR Mobile App	This will be used for the Updation of the National Population Register (NPR)
PE Mobile App	This will be used during the second phase of the census for Population Enumeration (PE)
ArcGIS Quick Capture Mobile App	This will be used for boundary demarcation of Houselisting Block/Enumeration Block (HLB/EB)
Self-Enumeration Portal/App	To enable self-enumeration for Updation of NPR, Houselisting and Housing Operations, and Population Enumeration

Source: Prepared by the authors on the basis of ORGI (2020b,2020c, 2020d, 2020e, 2021c, 2022, n.d.); PIB, 2019; GOI, 2022.

is a facility in the census enumeration apps to retrieve/fetch data from existing records which would be pre-filled in the census schedules in the app. This data can be further edited. There would be no need to prepare Census Abstracts, and information flow would be better and instant without any further intervention like Intelligent Character Recognition (ICR) technology used in the earlier censuses (ORGI, 2021c, p. 5).

Code Directories have been provided for several questions asked in the census schedules. For the questions involving descriptive/non-numeric entries, a separate Code Directory containing possible responses and codes for each such question, has been prepared for use by the enumerators. The census schedules will contain maximum pre-coded responses, and the data collection will be managed through an MIS-based web portal to ensure faster data finalisation. Code Directories will help faster data entry on mobiles by removing the need for typing. It will also improve accuracy in data entry.

ii. **Self-Enumeration Portal:** For the first time in the Indian census, an option of self-enumeration (SE) for respondents through mobile/portal has been provided (PIB, 2019; GOI, 2022). Self-enumeration refers to the filling of survey forms for the National Population Register (NPR), Houselisting and Housing Census (HHC), and Population Enumeration (PE) by the respondents themselves. Earlier, Section 10 of the Census Act of 1949 allowed manual self-enumeration. Now as per Census (Amendment) Rules, 2022, digital self-enumeration would also be allowed. The respondent will be able to check, update, and validate their records subject to certain conditions. Residents having valid Aadhaar and/or mobile numbers (as per the last NPR exercise in the year 2010 or 2015) can update the records of their household. The SE Portal would be available for all usual residents for the stipulated time period before the commencement of fieldwork. SE would yield multiple benefits like no dependency on enumerator to record information, reduction in manual efforts, elimination of transcription errors during data collection, COVID-19 compliance, the respondent can save/submit the data as per convenience, a mobile number can be updated using details of members available in NPR database of 2010/2015, etc. (ORGI, 2021b).

iii. **Digital HLB/EB Mapping and Digital Ward Mapping**: Recognising the importance of maps and mapping in the census, for the first time digital mapping is being implemented through three instruments. First, Digital Houselisting Block/Enumeration Block (HLB/EB) Mapping is being done to prepare digital HLB/EBs. HLB/EB is the lowest geographical unit demarcated for conducting a census which covers, on average, an area containing 150–180 houses and/or 650–800 persons. The enumerator would prepare HLB maps marking terminal boundary points.

Based on these, the supervisor would prepare HLB/EB maps digitally through the mobile app. Second, digital ward boundary maps of wards in urban areas have to be prepared. The mobile app has been developed for geo-tagging of boundary points and landmarks of each EB (Tripathi, 2021). The main aim of this exercise is to help in the identification of overlapped and omitted areas during the time of houselisting operations. All this would enable the preparation of digital geo-referenced maps for all EBs, villages, towns, districts, etc. It would be a big boost to digital census and digital census mapping.

iv. **Census Management and Monitoring System (CMMS) Portal–**A system for real-time monitoring and management mechanism has been implemented in the Indian census, called Census Management and Monitoring System (CMMS). CMMS will provide a transparent platform for the smooth functioning of census activities and to achieve complete coordination between Directorates of Census Operations, the Office of Registrar General of India, and various state governments. From the scheduling of various training batches to the appointment of field functionaries at all levels for monitoring field activities and processing the pay-outs, CMMS will play a crucial role in the forthcoming census. This system caters to the needs of various stakeholders, from the top at the national or state level to the enumerators at the field level. The maps of villages and towns/wards will be uploaded on CMMS for the convenience of the Charge Officers, enumerators, and supervisors (ORGI, 2019b). CMMS would digitalise the extremely voluminous field operations of the census in India.

v. **Digital Payments –** Payment of honorarium to around 30 lac census functionaries including Principal Census Officers, Charge Officers, supervisors, and enumerators will be done digitally using a Public Financial Management System (PFMS) and Direct Benefit Transfer (DBT) covering more than 60% of the total expenditure (PIB, 2019). Timely payments to the various field functionaries are essential for smooth census operations.

vi. **Census-as-a-Service (CaaS) –** Census is incomplete without data dissemination to various stakeholders and data users. Data is the new oil (Jain & Kaur, 2021). First time, 'Census-as-a-Service (CaaS) has been introduced in this census which will deliver on-demand data in a machine-readable, clean and actionable format with facilities like dashboard etc.' (PIB, 2019). Query-based responses on required parameters for policy making would be available. Ministries, states, and other stakeholders are expected to get desired aggregated information in tables and maps through Application Programme Interface (API).

3.7.3 Status of the Forthcoming Census in India

Like the previous censuses, the forthcoming census is to be conducted in two phases – i) Houselisting and Housing Census and ii) Population Enumeration. The Notifications in this regard were issued by the Government of India on March 28, 2019 (PIB, 2021b) and by various state governments in 2019–2020. Training for various census functionaries has been conducted up to the district level in the first few months of 2020. The CMMS Portal is functional. All the mobile apps have been created with continuous updation and have undergone field trials. The pre-test of the census was conducted during the years 2019–2021 across India at different locations in every state/union territory (UT). Instruction manuals for enumerators and other census functionaries have been prepared (PIB, 2019).

The data enumeration work in the field for the first phase of the census was scheduled for different States/Union territories of India within a period of 45 days (30 days for Houselisting and Housing Census and 15 days for Updation of NPR) from April–September 2020. However, due to the unexpected outbreak of COVID-19 and the consequent lockdown, the data collection work and field activities were postponed (PIB, 2021b) in April 2020 since it involved physical interface between enumerators and respondents. The extension of jurisdictional changes, which effectively means postponement of the field enumeration work, was done on several occasions since April 2020 and is currently extended up to January 1, 2024 (ORGI, 2021d; Baruah & Singh, 2021; ORGI, 2023; The Indian Express, 2023). Even globally, the enumeration work in the population and housing censuses has been affected in different ways during the pandemic time (years 2020 and 2021) and has forced countries to emphasise more on the 'statistical population registers as a backbone of the national statistical system' (Mrkic, 2021, p. 493). Notwithstanding, a field trial of mobile apps was conducted in the years 2021 and 2022 in India to assess the readiness of the mobile apps in data collection and to garner feedback from the users. All the background work, research, consultations, etc. are going on in full swing. The revised field trials of mobile apps and the CMMS Portal occurred during February–March 2022 across India. The next announcement on the start of field enumeration work for the forthcoming census is awaited from the Government of India who is the competent authority to issue orders regarding actual dates of commencement of census, especially field data collection.

3.7.4 Application of Advanced Technologies in Census Mapping in India

In the initial censuses conducted in India, census mapping was based on traditional cartographic techniques and methods. In the 1991 census, there

was a paradigm shift from traditional mapping to digital census mapping. Updation of the GIS tools has enhanced the process and quality of maps mainly using ARC info GIS Platform. The journey of technological advancement in census mapping in India can be classified as per evidence from the decadal censuses of 2001 and 2011 and the forthcoming census. In 2001, using GIS technology, 'Census GIS India' enabled users to create interactive thematic maps based on census data (ORGI, n.d.). Census 2011 used 'Census Info India' and 'Census GIS India'.

3.7.4.1 Evidence from 2001 and 2011 Census Mapping

i. **Census GIS India –** Census GIS India reflects population characteristics like economic activity, literacy and education, urbanisation, Scheduled Castes, and Scheduled Tribes. The data content included population, houses, household amenities and assets, literacy, education, religion, age and marital status, and economic status.
ii. **Census Info India –** Using DevInfo database technology, a dashboard was developed to provide a consolidated report of census results, and 'Census Info' software was prepared. It allowed the generation of thematic map-based results free of cost.

3.7.4.2 Mapping Technologies Being Adopted for the Forthcoming Census

Improving upon the past, various new and advanced technologies and methodologies are being utilised for the forthcoming census for seamless and integrated mapping tasks in India (Jain & Kaur, 2021). The prominent technologies applied for the forthcoming census include geo-referencing of administrative units, Standardisation of GIS Spatial Database Design, Standardisation of Computer Assisted Cartographic work, Houselisting Block or Enumeration Block (HLB/EB) Mapping Project using ArcGIS Quick Capture Mobile App, etc. (ORGI, 2020d). In the forthcoming census, 'some path-breaking initiatives have been taken up to generate geospatial data at Enumeration block level to ensure complete geographical coverage of the country' (ORGI, n.d.). The software and mobile apps used in census mapping in the forthcoming census of India are shown in Figure 3.9.

The various components of mapping technologies being adopted for the forthcoming census are mentioned below:

i. **Geo-referencing of Administrative Units –** The work of geo-referencing of the administrative units has been initiated with a view to develop a web-based GIS application. For this, the spatial database pertaining to all states of India has been geo-referenced based on the Survey of

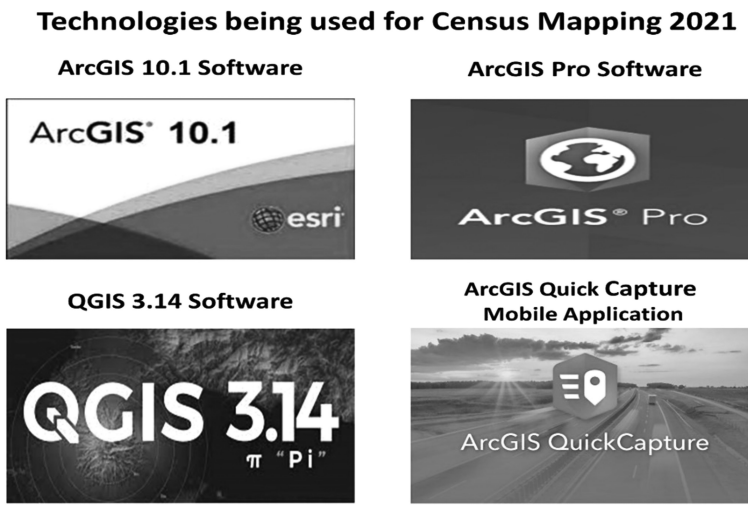

FIGURE 3.9 Technologies for Census Mapping for Forthcoming Census in India
Source: Kaur, 2021, p. 53

India topographical sheets. All the feature layers of polygon, arc, and point have been created in geo-database format at the state, district, sub-district, and village levels. This process removes common geometrical/topographical errors by topology creation which rectifies the gaps and self-intersects (polygon files), point locations (point files), and edge matching (arc files) of various layers. The attribute information has been attached to all the geo-referenced layers. To create a seamless village spatial database at the national level, all the states have been edge-matched with neighbouring states. The latest jurisdictional changes are being updated in this geo-referenced database. The symbology in post-enumeration maps has been standardised and assigned coding to bring uniformity (ORGI, 2018).

Standardisation of GIS Spatial Database Design – Standardisation of spatial database design is essential as the base data of previous censuses was in the form of coverages (ORGI, 2018).

> Coverage is a geo-relational data model that stores vector data, i.e. both the spatial (location) and the attribute (descriptive) data for geographic features. Coverages use a set of feature classes to represent geographic features. Each feature class stores a set of points, lines (arcs), polygons, or annotations (text). As a first necessary step, these coverages have been changed into Shapefiles.
>
> *(Jain & Kaur, 2021: 550)*

The Shapefile format was introduced by the Environmental Systems Research Institute (ESRI) for ArcGIS. 'A Shapefile is a digital vector in storage format for storing geometric location and associated attribute information' (Haining, 2010). It consists of the main file, an index file, and a dBase table. It supports point, area, and line features. Further, in the present time, the Geodatabase[2] files were created following feature datasets and feature classes for various polygon, point, and arc layers like country, states/union territories, districts, sub-districts, towns, and villages.

ii. **Standardisation of Computer-Assisted Cartographic Work –** For the purposes of standardisation of the mapping activities in census organisation, the first step is to standardise Spatial Digital Database. For this, unique identification numbers have been assigned to different features. These features mainly cover administrative boundaries like international, coast lines, states, districts, sub-districts, restricted areas, villages, statutory towns, etc. The unique identification numbers have also been assigned to all administrative polygon features (state, district, sub-district, statutory towns), forest areas, transportation features, water features and recreations, worship places, and service stations (ORGI, 2018).

iii. **Houselisting Block or Enumeration Block (HLB/EB) Mapping Project –** As the census layout maps are notional sketches, it is impractical to put them into any systematic mapping frame. Hence, to make them more usable, Houselisting Block Mapping Project has been implemented by ORGI for the forthcoming census. Houselisting block boundaries are being captured using the ArcGIS Quick Capture Mobile App which can record the location coordinates of a particular place and are then sent to the servers. Besides other benefits, it will help identify the omitted/overlapped areas in houselisting operations (ORGI, 2020a).

On the basis of the data, facts, and evidence given above, our hypothesis that India is conducting a digital census in its forthcoming census, and is effectively applying advanced technologies in census and census mapping, is proved.

3.8 Benefits and Challenges in the Conduct of Digital Census in India

New digital technologies are likely to improve the timeliness, completeness, and quality of census results (UN DESA, 2020). The Indian census is likely to benefit tremendously from digitisation and digital transformation using disruptive technologies. Census is likely to be faster, more accurate, and useful for various stakeholders and data users. However, conducting a digital

census and applying new technologies to the census involves various challenges on human, technological, capacity, and implementation fronts which ought to be handled with advanced and pro-active planning and strategies.

Digital census in India and the use of digital technologies in census are expected to yield many benefits. These include ensuring better and faster data collection, lesser problems of omission and duplication, more accuracy, automatic transitions, and cross-checking. Very fast and real-time data transfer from the enumeration stage to the servers would take place. Earlier it used to take months for scanning at the regional Data Capture Centers where millions of manual schedules were collected, scanned, and transmitted. The maps would be geo-referenced for every EB, village, ward, town, sub-district, district, state, and ultimately at the national level. These geo-referenced maps would be highly useful not only for the current and future census operations but also for many surveys and applications in other organisations. Digital census and technologies will reduce data collection time – more importantly, data tabulation and compilation time. It will ultimately ensure a faster release of census data with improved quality (PIB, 2019). The data collection and the CMMS Portal are expected to release census results early with better quality. CMMS would immensely help in the management and monitoring of census operations which span for over a year, involving 30 lac enumerators and supervisors, thousands of Charge Officers and Principal Census Officers, and 34 Directorate of Census Operations in all states/union territories of India. Census-as-a-Service (CaaS) is expected to bring down the data release time drastically. As per the projections of ORGI (2021a), the provisional population figures are expected within three weeks of the census, first phase (HHC) data within 6 to 8 months, Population Enumeration (PE) data – village-wise primary data within one year and other PE data – within two years of the data collection exercise. The forthcoming census is also expected to generate 24 million person-days employment and technical capacity building in digital data collection and coordination, enhancing future employment prospects of the census personnel (PIB, 2019).

Conducting forthcoming digital census in India involves certain challenges as well. Based on the field evidence and over a decade experience of both the authors in census related operations, we mention these major challenges and also suggest main solution to tackle these challenges. These challenges are on human, technological, capacity, and implementation fronts. First, the digital census is being introduced for the first time in India. It is easier to say that a country of such great diversities facing many challenges in the digital arena as mentioned above, will conduct a digital census and undertake digital transformation by applying disruptive technologies in the enumeration and use of census data. It is a difficult task to implement all these technologies of census mobile apps and to prepare accurate maps of EBs of each and every village and town in the country. This has to be seen in the context of the cognitive abilities of three million enumerators

– mostly elementary school teachers – who are to do this work digitally. Field implementation is much more difficult than it looks when envisaging technology and policy changes. New technologies may unleash unforeseen problems in digital data collection. Online responses have both pros and cons (UN DESA, 2020). It is possible that the option for self-enumeration might be misused or compromised. All these things have to be kept into consideration while implementing a digital census. Second, the security of census data of around 1.4 billion people on around 75 indicators taken in the entire census process could be a big issue in this age of hacking and global data vulnerabilities. Though the census organisation in India is taking much care in this regard through multi-layered data security and robust security architecture, concerted efforts should continue to make the systems and data security fool-proof and robust. Third, conducting a digital census in remote border areas and areas with no mobile connectivity or 'shadow zones' might be challenging. This could be tackled by resorting to advanced mobile network planning or by using paper schedules. Fourth, HLB-EB mapping might be tough with mapping work being completely digitised, something the enumerator-supervisors may find difficult. This could be handled by better training and capacity building of field implementors. Fifth, getting people's cooperation may be an issue especially in rural areas and with fewer literacy levels (both general literacy and digital literacy). This could be addressed with better and more effective publicity and awareness generation campaigns. Sixth, conducting training and preparing field functionaries including Principal Census Officers, Charge Officers, supervisors, and enumerators in properly handling different mobile apps, Self-enumeration Portal, CMMS Portal, digital maps, etc. may not be a smooth sailing given the age profile of these functionaries. Many are middle to old age, less tech-savvy or mobile-savvy or less digitally literate. The moderate level of familiarity or ease in handling such advanced technologies for the first time in the census at such a massive scale across India may constrain the applicability and quality of the census operations. This would require genuinely concerted efforts and micro-level training and capacity-building programmes, otherwise many technological and implementation issues would crop up which the ground-level census functionaries may not be able to handle in the time-constrained scenario of completing the census in 30 days for the first phase of the census and in 21 days for the second phase of census. Seventh, technology glitches may also happen during implementation, which can be better handled with advanced pilot testing, contingency planning, and technology support.

3.9 Concluding Remarks

Census is both a public good and for public good. Census collects data, but this data is not an end in itself, but a means to promote human welfare.

Census is one of the largest and most exhaustive administrative-cum-statistical exercises in a country. The census helps data-centric governance by enabling evidence-based decisions and effective digital governance. Electronic data collection is expected to improve data quality, field management, and time-saving. Maps are the backbone of census and provide foundation to conduct, monitor, and disseminate census activities. Census Mapping provides a solid background for census planning and action.

The 2020 census round of the United Nations covers the period 2015–2024 in which different countries conduct censuses in different years. Census will be conducted in 59 countries in or after the year 2022. Census experience of a digital census in the world's most populous country (India) with 17.7% of the global population is very relevant for the whole world. As per United Nations, India has surpassed China as the most populous country in the world on April 23, 2023. The Indian census is the largest administrative and statistical exercise in the world (PIB, 2019). The forthcoming census in India is indeed a gigantic exercise involving three million personnel to enumerate roughly 1.4 billion people at a cost of INR12,695 crores (US$ 1.7 billion). India faces many challenges in the conduct of digital census reflected in its E-Governance Development ranking of 100 out of 193 countries, constraints in some parts of the country and sections of society in terms of telecom infrastructure, digital penetration and IT literacy, etc. The global pandemic of COVID-19 severely constrains census processes especially data collection by enumerators which involves physical interaction with the respondent households, even with mobile devices. However, despite these constraints, the forthcoming census of India is poised to be a milestone and paradigm in digital census across the world, and in the 150 years' history of census in India.

Evidence from India shows that the forthcoming census is the first 'Digital Census' in India – moving away from the traditional 'pen-and-paper' approach. It will lead to complete digital transformation of the census in India. This study finds that disruptive technologies are being adopted in various facets of the census in India. The digital census includes digital data collection, digital self-enumeration, digital mapping, digital management and monitoring of census operations, digital payments, and digital data dissemination. Digital data collection will be through mobile apps. For the first time, the data enumeration from households would be in a mixed-mode approach involving mobile apps, self-enumeration, and paper schedules. Five mobile apps in 16 languages have been created by the Office of the Census Commissioner of India to collect census data in two phases digitally. These apps include Houselisting and Housing Census Mobile App, Population Enumeration App, National Population Register App, ArcGIS Quick Capture Mapping App, and Self-Enumeration Portal/App. An online self-enumeration facility is proposed to be provided to the households through Self-Enumeration Portal. Given the large country size

of India with potential infrastructure issues, this mix-mode of data collection has been envisaged. Digital mapping in the forthcoming census includes Digital Houselisting Block Mapping and Digital Ward Boundary Mapping through ArcGIS Quick Capture app. A Census Management and Monitoring System Portal is being implemented for the complete automation of census processes with access given to all census functionaries from the village level (enumerator) to the national level (Census Commissioner of India) for real-time management, monitoring, and information flow. Digital payments will be through Public Finance Management System (PFMS) and Direct Benefit Tranfser (DBT) modes. Digital data dissemination will be through Census-as-a-Service (CaaS).

Geographic Information System (GIS) has played a prominent role in the Indian census in the last two decades. Presently, Standardisation of Computer Assisted Cartographic work, Geo-Referencing of Administrative Units, and Houselisting Block Boundary Mapping Project have been initiated in Indian census. These would completely digitise and automate the census mapping in India in the forthcoming census.

The conduct of digital census and the application of advanced technologies in census in India is likely to make the Indian census faster, more accurate, and more productive. However, it involves various challenges on technological, human, logistical, managerial, and administrative fronts. Factors for optimising the use of contemporary technology for census operations include suitability, scalability, security, stability, safety, and skill (UN DESA, 2019a, pp. 64–65). Census Mapping can be strengthened by a high-quality, geo-referenced address registry for accurate data collection and mapping; and geo-referenced high-resolution satellite images for covering the gaps in rural boundary maps. The global COVID-19 pandemic has forced governments and organisations to accelerate digitisation by exploring newer digital platforms and investing in new technologies (Artificial Intelligence, blockchains, robots, drones), developing ICT infrastructure and engagement tools (UN DESA, 2020). The experiences and lessons learnt from the forthcoming census in India have significance for national statistical organisations, governments, businesses, practitioners, and researchers worldwide (Jain & Kaur, 2021). Ultimately, the whole census process in India involves lots of challenges, but these challenges can indeed be converted into opportunities to create a win-win situation for all the stakeholders. The sooner it is done, the better it is for one and all.

Disclaimer

The views expressed in this chapter are the personal opinion of the authors and not of the official positions they hold or of the Office of Registrar General of India and Census Commissioner or of the Government of India. They are in the nature of literary and academic work. This chapter does not

necessarily represent, and should not be construed as representing, or as being critical of, the views of the Government of India or any state.

Notes

1 Taking the exchange rate of US $1 = INR75 (www.fbil.org.in).
2 Geodatabase is a collection of geographic datasets of various types held in a common file system folder. The geodatabase is the native data structure for ArcGIS and is the primary data format used for editing and data management (Jain & Kaur, 2021, p. 556).

References

ANI. (2021). PM Modi asserted next census will be most remarkable digitalised census of the country: NITI Aayog. Retrieved March 26, 2022, from https://www.aninews.in/news/national/general-news/pm-modi-asserted-next-census-will-be-most-remarkable-digitalised-census-of-the-country-niti-aayog20210221015052/.

Baruah, A., & Vijaita, S. (2021, May 11). Government likely to postpone census to 2022. *The Hindu*. Retrieved April 3, 2022, from https://www.thehindu.com/news/national/government-likely-to-postpone-census-to-2022/article33710753.ece.

Corcos, N. (2017). Excavations in 2014 at Wade Street, Bristol – A documentary and archaeological analysis. *Internet Archaeology*, 45. Retrieved December 3, 2021, from 10.11141/ia.45.3.

De La Rua, L., Bright, P. L., & Juran, S. (2020). *Qgis for digital cartography in censuses and surveys*. United Nations Population Fund; Pacific Community. Retrieved July 5, 2020, from https://www.unfpa.org/sites/default/files/resource-pdf/GLOBAL_QGIS_for_Census_2020_web.pdf.

Desnoyers, M., & Norris, D. (2001, August 7–10). *Strategies for involving stakeholders in census activities: The Canadian experience*. Symposium on Global Review of 2000 Round of Population and Housing Censuses: Mid-Decade Assessment and Future Prospects, Department of Economic and Social Affairs, UN Secretariat. Retrieved July 28, 2021, from https://unstats.un.org/unsd/demog/docs/symposium_02.htm.

GOI [Government of India]. (2021). *Budget 2021–22*, New Delhi: Ministry of Finance.

GOI [Government of India]. (2022). The Census (Amendment) Rules, 2022. The Gazette of India.

Haining, R. P. (2010). The nature of georeferenced data. In M. Fischer, A. Getis (eds) *Handbook of applied spatial analysis* (pp. 197–217). Berlin, Heidelberg: Springer. Retrieved February 23, 2023 from https://doi.org/10.1007.

Jain, A., & Kaur, V. (2021). Census mapping in India and role of GIS: A look ahead at census 2021. *Indian Journal of Public Administration*, *67*(4), 540–558. https://doi.org/10.1177/00195561211056406

Jain, A., Solanki, P. K., Zagade, R., Ramaswamy, G. P., & Pandey, N. S. (2021). *Census of India 2021: Handbook for Principal/District census officers and*

Charge officers. Office of Registrar General & Census Commissioner, New Delhi.

Jhamba, T., Juran, S., Jones, M., & Snow, R. (2020). UNFPA strategy for the 2020 round of population and housing censuses (2015–2024). *Statistical Journal of the IAOS*, *36*(1), 43–50. https://doi.org/10.3233/SJI-190600.

John Stillwell, H. G. (Ed.). (2020). The Routledge handbook of census resources, methods and applications. *Environment and Planning B: Urban Analytics and City Science*, *47*(2), 354–356. https://doi.org/10.1177/2399808320902310

Kaur, V. (2021). Census mapping. In A. Jain, P. K. Solanki, R. Zagade, G. P. Ramaswamy, & N. S. Pandey (Eds.), *Census of India 2021: Handbook for Principal/District census officers and Charge officers*. Office of Registrar General & Census Commissioner, New Delhi, pp.50–55.

Lopez V., & Marco, A. (2019). The GIS in the era of big data: The impact on society. *5th International Conference on GIS and Remote Sensing*, Rome.

Mokhele, T. (2011). The applications of GIS in census data. Retrieved December 23, 2020, from https://doi.org/10.13140/RG.2.1.3356.6329.

Mrkić, S. (2021). Conducting population and housing censuses during the pandemic: An overview. *Statistical Journal of the IAOS*, *37*, 483–493. Retrieved April 3, 2022, from https://doi.org/10.3233/SJI-210820.

Office for National Statistics United Kingdom. (2022). Designing a digital-first census. Retrieved March 1, 2022, from https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/designingadigitalfirstcensus/2021-10-04.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2018). *Administrative boundaries of geo-referenced data-observations for rectifications* (Document No XII-029/13/2018-Map/51). Office of the Registrar General & Census Commissioner of India, New Delhi.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2019a). *Instruction manual for houselisting and housing census*. Office of the Registrar General & Census Commissioner of India, New Delhi.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2019b). *User's manual for census 2021 management and monitoring system*. Office of the Registrar General & Census Commissioner of India, New Delhi. Retrieved December 28, 2021, from https://cdn.s3waas.gov.in/s302e74f10e0327ad868d138f2b4fdd6f0/uploads/2020/02/2020022056.pdf.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2020a). *Geospatial database for census 2021 & H/W, S/W, other infrastructure issues, overall status of mapping activities and priorities for census 2021*. Office of the Registrar General & Census Commissioner of India, New Delhi.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2020b, January). *Updation of national population register (NPR) 2020. User's manual for NPR mobile app*. Office of the Registrar General & Census Commissioner of India, New Delhi.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2020c, January). *User's manual for census 2021 management and monitoring system*. New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2020d, January). *Supervisor's user manual for HLB mapping 2021 mobile app*. New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2020e, January). *User's manual for household mobile app*. New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2021a, October 21–22). *Digital census* [Conference presentation] Conference of Directors of Census Operations, New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2021b, October 21–22). *Self-enumeration (SE)* [Conference presentation]. Conference of Directors of Census Operations, New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2021c). *Census of India 2021: User's manual for houselisting and housing census mapping app (version 1.61)*. New Delhi: Office of the Registrar General & Census Commissioner of India. Retrieved March 3, 2021, from https://cdn.s3waas.gov.in/s302e74f10e0327ad868d138f2b4fdd6f0/uploads/2020/02/2020022016.pdf.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2021d, December 23). Extension of date of freezing of boundaries of administrative units for ensuing Census. Letter to the Chief Secretaries/Administrators of States/Union Territories.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2022). *National population register (NPR) – Self enumeration portal*. New Delhi: Office of the Registrar General & Census Commissioner of India. Retrieved December 9, 2022, from https://se.npr.gov.in/npr/se-landing.html.

ORGI [Office of the Registrar General & Census Commissioner of India]. (2023, June 30). Extension of date of freezing of boundaries of administrative units for ensuing Census. *Letter of Additional Registrar General to all the Chief Secretaries/Administrators of States/Union Territories*. New Delhi: Office of the Registrar General & Census Commissioner of India.

ORGI [Office of the Registrar General & Census Commissioner of India]. (n.d.). *Census of India website: Office of the registrar general & census commissioner, India*. New Delhi: Office of the Registrar General & Census Commissioner of India. Retrieved November 28, 2022, from http://censusindia.gov.in/2011-common/censusdataonline.html.

PIB [Press Information Bureau]. (2019, December 24). *Cabinet approves conduct of census of India 2021 and updation of national population register*. Government of India. Retrieved March 23, 2022, from https://pib.gov.in/PressReleasePage.aspx?PRID=1597350.

PIB [Press Information Bureau]. (2021a, February 9). *Population enumeration*. Ministry of Home Affairs. Retrieved March 2, 2022, from https://pib.gov.in/PressReleasePage.aspx?PRID=1696570.

PIB [Press Information Bureau]. (2021b, December 1). *Census 2021 with a mixed-mode approach*. Retrieved March 30, 2022, from https://pib.gov.in/PressReleasePage.aspx?PRID=1776817.

Ram, U., & Ram, F. (2021). *Demographic transition in India: Insights into population growth, composition, and its major drivers* [Online]. Mumbai: Indian Institute of Population Studies.

Rose, S. (2020, December 2). The implications of the first digital census, 2021, Raconteur. Retrieved November 2, 2021, from https://www.raconteur.net/public-sector/implications-digital-census/.

Sen, S. R, (2019, September 23). *Census 2021 to go digital, mobile app to be used for decadal headcount*. Hindustan Times. Retrieved December 29, 2021, from https://www.hindustantimes.com/india-news/census-2021-to-go-digital-mobile-app-to-be-used-for-decadal-headcount/story-Zctq9DNo6XctX13gfXkzuK.html.

Sinha, S. (2011). Overview of census 2011: Madhya Pradesh, Bhopal. Directorate of Census Operations.

Statistics Bureau of Japan. (2005, March 7–9). Improvements of the census operation of Japan by using information technology [conference presentation] the 22nd population census conference, Seattle. Retrieved July 9, 2020, from https://unstats.un.org/unsd/censuskb20/Attachments/2005JPN_IT-GUID2ce3a9c8bc654f218cc3d1023a56c64c.pdf.

The Indian Express (2023, July 3). *Census to be delayed again, deadline for freezing administrative boundaries pushed to January 1, 2024*. Retrieved July 9, 2023, from https://indianexpress.com/article/india/census-delayed-deadline-administrative-boundaries-pushed-8697397/.

Tripathi, R. (2021, March 17). Interim census data likely to be available in 2023–24. *The Economic Times*. Retrieved April 3, 2022, from https://economictimes.indiatimes.com/news/politics-and-nation/interim-census-data-likely-to-be-available-in-2023-24/articleshow/81537582.cms.

UN DESA [United Nations Department of Economic and Social Affairs]. (2009). *Handbook on geospatial infrastructure in support of census activities*. New York: Department of Economic and Social Affairs. Retrieved September 17, 2020, from https://unstats.un.org/unsd/demographic/standmeth/handbooks/series_f103en.pdf.

UN DESA [United Nations Department of Economic and Social Affairs]. (2015). *Conference of European statisticians, recommendations for the 2020 census of population and housing*. Geneva: United Nations Commission for Europe.

UN DESA [United Nations Department of Economic and Social Affairs]. (2017). *Principles and recommendations for population and housing census, revision 3*. New York. Retrieved September 12, 2020, from https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Principles_and_Recommendations/Population-and-Housing-Censuses/Series_M67rev3-E.pdf.

UN DESA [United Nations Department of Economic and Social Affairs]. (2019a). *Guidelines on the use of electronic data collection technologies in population and housing censuses*. New York. Retrieved September 2, 2020, from https://unstats.un.org/unsd/demographic/standmeth/handbooks/data-collection-census-201901.pdf.

UN DESA [United Nations Department of Economic and Social Affairs]. (2019b). *World population prospects 2019*. Retrieved March 5, 2022, from https://population.un.org/wpp/Download/Standard/Population/.

UN DESA [United Nations Department of Economic and Social Affairs]. (2020). *E-government survey 2020: Digital governance in the decade of action for sustainable development*. New York: Department of Economic and Social Affairs.

UN DESA [United Nations Department of Economic and Social Affairs]. (2022). *World population prospects 2022*. Population Division. Retrieved December 8, 2022, from https://population.un.org/wpp/.

UN DESA [United Nations Department of Economic and Social Affairs]. (2023, April 24). India overtakes China as the world's most populous country. *UN DESA Policy Brief No. 153*. Retrieved July 7, 2023, from https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-no-153-india-overtakes-china-as-the-worlds-most-populous-country/.

UNSD [United Nations Statistical Division]. (2020a). Handbook on population and housing census editing. Revision 2. Retrieved March 6, 2022, from https://unstats.un.org/unsd/demographic-social/publication/SeriesF_82Rev2en.pdf.

UNSD [United Nations Statistical Division]. (2020b). World housing and population census programme. Census dates for all countries. Last Updated October 1, 2021. Retrieved March 3, 2022, from https://unstats.un.org/unsd/demographic-social/census/censusdates/.

UNGA [United Nations General Assembly]. (2015). Transforming our world: The 2030 agenda for sustainable development (A/RES/70/1). New York.

UNFPA [United Nations Population Fund]. (2019). *Because everyone counts: UNFPA strategy for the 2020 round of population & housing censuses (2015–2024)*, New York. Retrieved July 1, 2020, from https://www.unfpa.org/publications/unfpa-strategy-2020-round-population-housing-censuses-2015-2024.

UNFPA [United Nations Population Fund]. (n.d.). Retrieved July 7, 2023, from https://www.unfpa.org/data/world-population-dashboard.

US Census. (2020). Retrieved December 29, 2021, from https://2020census.gov.

University of Southern California. (2019, July 9). *3 countries using GIS technologies, USC Dornsife special science institute blog*. Retrieved September 23, 2021, from https://gis.usc.edu/blog/3-countries-using-gis-technologies/.

Wang, Y., Li, H., Yu, Z., & Luo, B. (2012). Approaches to census mapping: Chinese solution in 2010 rounded census. *Chinese Geographical Science*, 22(3), 356–366. https://doi.org/10.1007/s11769-012-0540-2.

World Bank. (2021). *World development report 2021: Data for better lives*. Washington, DC: The World Bank.

Xuemin, Y., & Yang,Y. (2020, October 11). *Knock Knock: How will China undertake its huge national population census?* CGTN. Retrieved February 1, 2021, from https://news.cgtn.com/news/2020-10-11/Knock-Knock-How-will-China-undertake-its-huge-national-census--Uv1vy83Ekw/index.html.

Yao, Y., Liu, X., Li, X., Zhang, J., Liang, Z., Mai, K., & Zhang, Y. (2017). Mapping fine-scale population distributions at the building level by integrating multisource geospatial big data. *International Journal of Geographical Information Science*, *31*(6), 1220–1244.

4

ENVISIONING SMART REAL ESTATE DIGITAL INFRASTRUCTURE FOR MADHYA PRADESH

Mausmi Hajela, Girish Sharma, and Sudhir Chaudhary

4.1 Introduction

A fully functioning and well-regulated real estate market can be an important factor in enhancing the economy, as it generates employment and fosters growth owing to its highest employment elasticity. After undergoing unprecedented change in the last two decades, the real estate sector remains at the forefront of the Union Government's agenda. The real estate sector plays a catalytic role in fulfilling the need and demand for housing and infrastructure. Although the sector has grown significantly in recent years, it has been largely unregulated. It is necessary to guarantee the mobility of the labour force and improve adjustment to aid this sector. The lack of standardisation has constrained the healthy and orderly growth of the sector. Analyses of the current scenario and economic crisis have shown that unclear and non-cohesive regulatory frameworks in the real estate sectors were a significant cause of oversupply, resulting in unplanned growth and slump which needs to be addressed. Therefore, the need for regulating the sector has been emphasised on various forums. Digital real estate and emerging technological implementations can create synergy between current e-Governance applications and citizens, professionals, and businesses to achieve the goal of guaranteed service level, less government, and more governance over digital channels (Sharma, 2019).

The Urban Development and Housing Department, Government of Madhya Pradesh (GoMP), brought forth and implemented the Madhya Pradesh Real Estate Policy, 2019, to give an impetus to the real estate sector in the state. Countries around the world have built a digital infrastructure based on artificial intelligence and machine learning (AI/ML),

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Blockchain, and other advanced technologies to transform real estate development. Considering the changes recommended in the policy document, a draft framework for workflow and unhindered progress of an application for achieving a high level of 'ease of doing business' in real estate has been designed under the Smart MP Real Estate Digital Infrastructure (SM-RE@di).

4.2 Existing e-Platform/Provisions for Real Estate by the Government of Madhya Pradesh

Currently, the citizen has to interact with more than one public agency/department to avail of a service or any document related to property or real estate permissions. There are various e-platforms and portals related to the real estate sector which are managed by various government departments. These are:

- Provision for Land details (Form P-II) on M.P. Bhu-Abhilekh.
- Provision for Revenue Case Management System under the Revenue Department.
- Provision for single-window Automatic Building Plan Approval System (ABPAS) as an initiative under the Urban Administration and Development Department (UADD), Government of Madhya Pradesh.
- Provision of single-window Automated Layout Process Approval and Scrutiny Systems (ALPASS) by the Directorate of Town and Country Planning.

Most of the e-Governance systems and databases are established and working in silos as per the specific requirements of the individual department. These public departments have limited coherence, and interactions remain largely uncoordinated. The projects often span the multi-tier administrative architecture, involving the central and state departments, the urban local bodies along with other public agencies. Establishing interoperability among these systems is one of the most urgent and important challenges. With many initiatives and policies already in place, the real estate sector in the state is eyeing a silver lining. Extensive studies have already been carried out in terms of re-engineering the regulatory processes and procedures, yet many issues lie unanswered (Mishra & Suhag, 2017).

4.2.1 Need for a Single Enabling Environment

With digital advances, there is an increase in public expectations for transparency, openness, and communication. For government organisations,

meeting these expectations means exploring new tools and practices that help foster innovation, drive efficiency, and create economic benefits for end customers, constituents, communities, and entrepreneurs alike.

Frameworks are one of the many guiding tools that can be deployed to foster interoperability among products or services within departments, making these services responsive to real citizens' needs, which promotes innovation, fuels market growth, and protects investments. ICT Framework Standards (IFRES) and suggested tools help hardware and software providers develop products and services that work better for users and enhance interoperability among different technologies and processes used by various departments.

Typically for any urban infrastructure development project, several clearances are required. As per the World Bank's 'Doing Business, 2014' report, India is ranked 183 out of 189 countries in terms of dealing with construction permits. On average, there are 37 procedures involved, and 162 days are spent before obtaining permission to undertake construction. Although in the World Bank's latest 'Doing Business, 2019' report, India has recorded a jump of 23 positions from its rank of 100 in 2017 to be placed now at 77th rank among 190 countries assessed. It signifies that the procedure for obtaining clearances is time-consuming and projects often get stalled due to delays in obtaining clearances from various agencies.

These time delays result in an unaccounted loss in terms of 'time value of money' (TVM). TVM is the concept that money available at the present time is worth more than the identical sum in the future due to its potential earning capacity. This core principle of finance holds that provided money can earn interest, any amount of money is worth more the sooner it is received. The statutory approvals cause incessant delays in the conceived projects which are demeaning to all stakeholders in real estate. If the aspiration of a person to own a property is fulfilled after a wait for a decade, the person is bound to lose interest and may even withdraw from his intention of owning a house. Even the realtors who are in the sector to do business shall incur profits only when the conceived project is constructed and sold in the time frame envisaged. Projects often become non-lucrative due to an increased cost for customers as a result of procedural delays faced by developers. This needs simplification and standardisation. The existing process flow of a real estate development vis-à-vis the proposed independent staging of tasks through SM-RE@di is shown in Figure 4.2.

4.2.2 Issues Identified with Existing Systems

With multiple stakeholder consultations, the current challenges and enhancements were identified with the Automated Layout Process Approval and Scrutiny Systems (ALPASS). Some of the observations were:

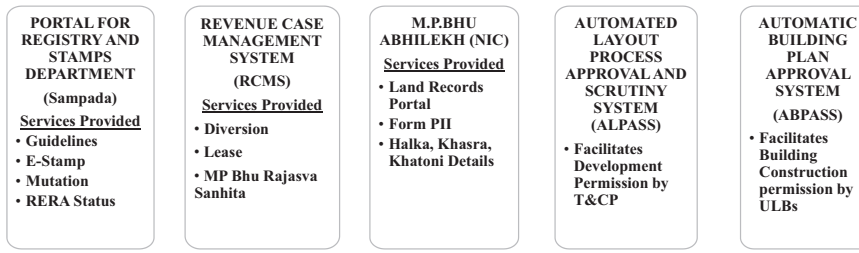

FIGURE 4.1 Mapping of Existing Portals and Single-Window Systems in Various Departments

Source: Authors

1) The ALPASS currently in place has the major challenge of verifying the survey layout digitally with the building bylaws. Verification of survey layout with building bylaws is still a human intellect-intensive exercise as rule engines are inconsistent.
2) The Madhya Pradesh Agency For Promotion of Information Technology (MAP_IT) has created a rule engine with fixed rules taken from the building bylaws rule book and verified and approved by various officials. The agency is also developing a single-window system which has inherent challenges, such as the rules/regulations and procedures related to the real estate sector services being hard-coded. Thus, any addition or amendment to the rules requires a new change to be introduced in the software system, thus resulting in cumbersome software change release procedures and practices.
3) The rule engine will have the capability to run fixed rules governed by the development plan over any particular layout, which needs to be modified as the development plan changes.
4) The integration capabilities of the rule engine, for now, are not being explored as the cross-platform system, thus resulting in all departments working in silos. The linear staging of procedures thus results in system and process delays. Figure 4.3 examines the same.

4.3 SM-RE@di – Smart Real Estate Digital Infrastructure

The SM-RE@di envisions the provision of unhampered government real estate services to citizens through a single portal. This requires ICT initiatives to be implemented across various state government departments and over common digital integration channels, i.e. an Interoperable Framework. Hence, the purpose of an Interoperable Framework is:

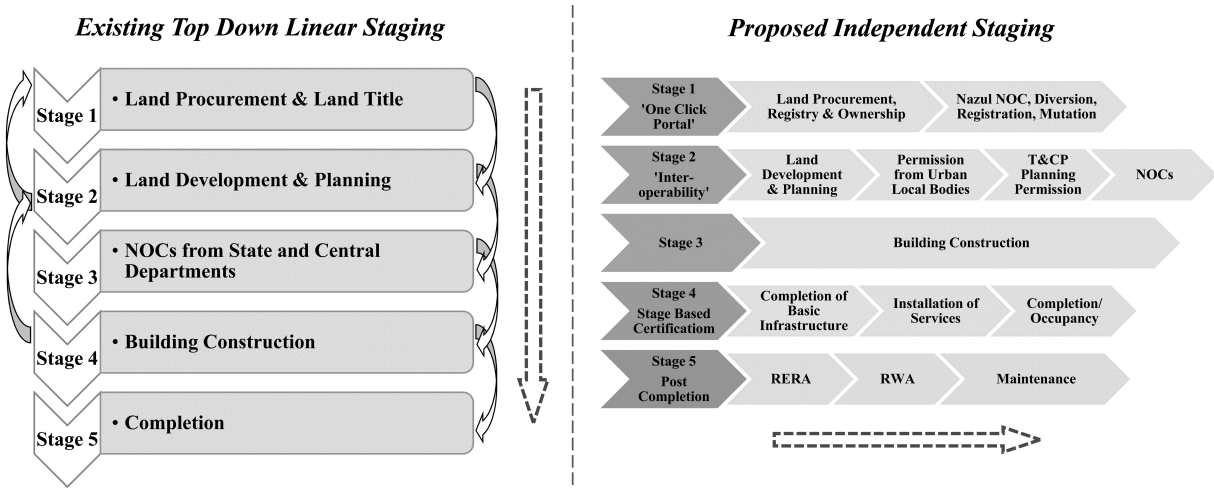

FIGURE 4.2 Status Quo to Be Achieved with SM-RE@di; Envisioned Re-structuring of Existing Linear Staging of Permission Process to Independent Staging

Source: Authors

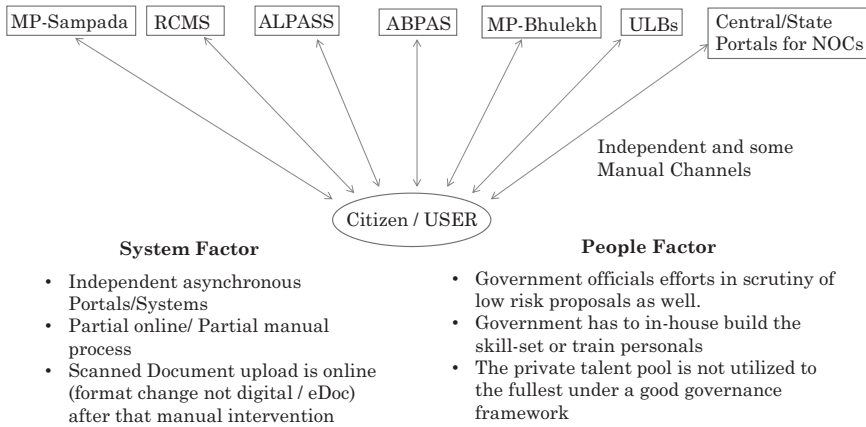

FIGURE 4.3 Current Scenario of Real Estate Services and Citizen/User Interfaces

Source: Authors

- To provide digital infrastructure – establishing interoperability and information sharing among various departments and e-Governance systems which deliver services related to land and property.
- To describe a digital framework and programme/project implementation approach.
- To offer a set of specific recommendations which can be adopted by various stakeholders to proactively address the challenges in interoperability.
- Suggest and describe ICT components and software architecture for implementation.

4.3.1 Creating Single-Window Environment with SM-RE@di

Under the overarching vision of Digital India, the GoMP aims to make all government services related to property and real estate digitally accessible to citizens through multiple channels, such as the internet, mobile, and common service delivery outlets. To meet this objective, there is a need for an interoperable ecosystem of data, applications, and processes which will make the right information available to the right user at the right time. In this context, it is important to ensure interoperability amongst various e-Governance or operational systems to upgrade the quality and effectiveness of services and ensure contactless execution of service delivery.

The GoMP with its Real Estate Policy 2019 (Urban Development and Housing Department, GoMP, 2019) envisioned implementing SM-RE@di, a complete digital infrastructure (Figure 4.4) for enabling a composite single-window portal to cater to all real estate-related needs of all stakeholders, including citizens, investors, developers, business houses, etc., and it will be

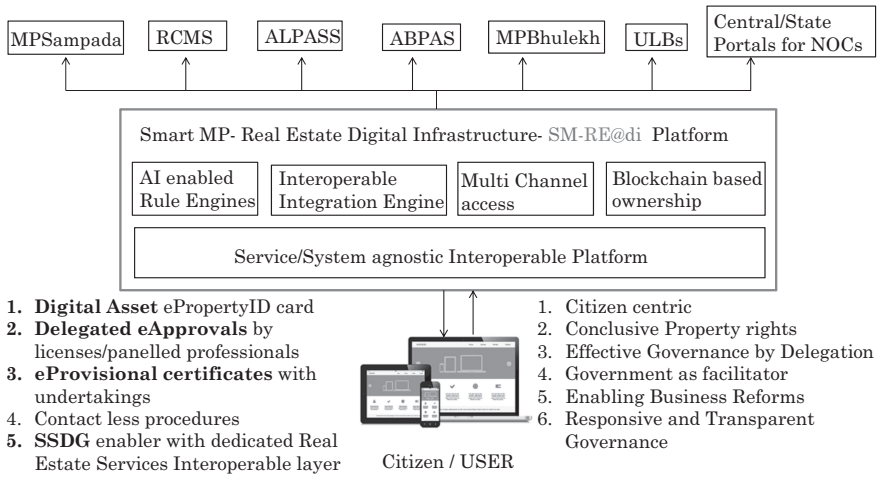

FIGURE 4.4 Status Quo to Be Achieved with SM-RE@di

Source: Authors

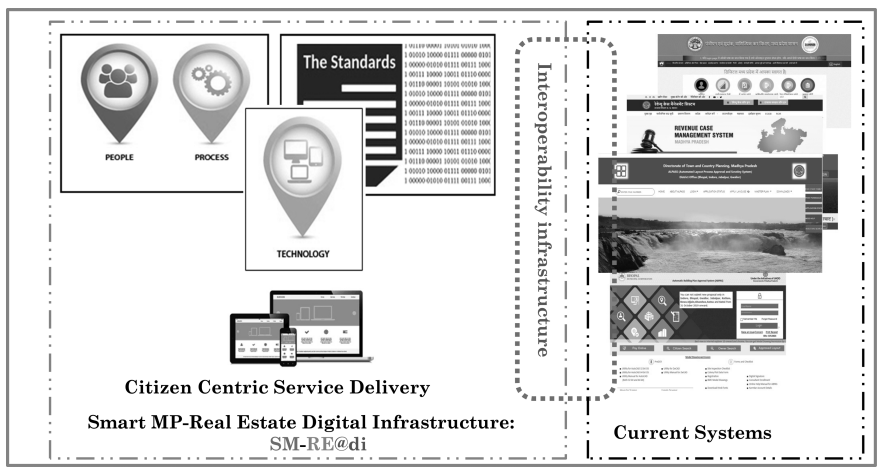

FIGURE 4.5 Citizen-Centric Service Vision

integrated with existing systems/channels to deliver citizen-centric services. The SM-RE@di envisions the objective of 'technologically assisted digital services in real-estate domain, from land ownership to financial digital asset ownership enabling virtualisation of operational processes to deliver Smart Real Estate', ideated over the India Enterprise Architecture E-Governance (IndEA) framework guidelines (Figure 4.5). This infrastructure will enable transformation into digitally empowered real estate services and a transparent information-based economy, giving long-awaited impetus to the real estate sector in Madhya Pradesh.

The core objectives of digital infrastructure for e-Governance are:

1. Citizen-centric services.
2. Conclusive property rights.
3. Effective governance by delegation.
4. Government as facilitator.
5. Enabling business reforms.
6. Responsive and transparent governance.

The digital infrastructure will help in bringing more inclusiveness in governance along with the required regulatory and compliance goals with below tools/concepts:

1. Digital Asset ePropertyID card.
2. Delegated eApprovals by licensed/empanelled professionals.
3. eProvisional certificates with undertakings.
4. Contactless procedures.
5. State e-Governance Service Delivery Gateway (SSDG) enabler with dedicated Real-estate Services Interoperable layer.

Such digital infrastructure will enable transformation for digitally empowered real-estate services and a transparent information-based economy boosting the real estate sector (Figure 4.6).

4.3.2 Citizen-Centric Usability of the Presentation/Interface Layer

Any e-Governance service should be a change agent which supports citizens, businesses, and the innovation ecosystem alike. For example, Dubai Land Department User Interface is a leading case towards this approach, where the portal is not just useful to individual citizens but also to businesses and technology companies which utilise and enhance the platform offerings by building solutions over it. Such e-Governance services have been applied to support the unique activities of the government, including Electronic Data Interchange (EDI), interactive voice response, voice mail, email, web service delivery, virtual reality, and key public infrastructure to enable services, such as Government to Citizen (G2C), Government to Government (G2G), Government to Business (G2B), and Government to Employees (G2E).

The presentation/interface layer mostly consists of websites, APPs, front-end exposed APIs, etc. Any interface should comply with national and international standards (wherever applicable) and guidelines, like those laid out by the Government of India e-Gov websites. The presentation layer should be designed as a seamless workflow and not as a clutter of various functionalities or services offered by various departments. The citizens should be

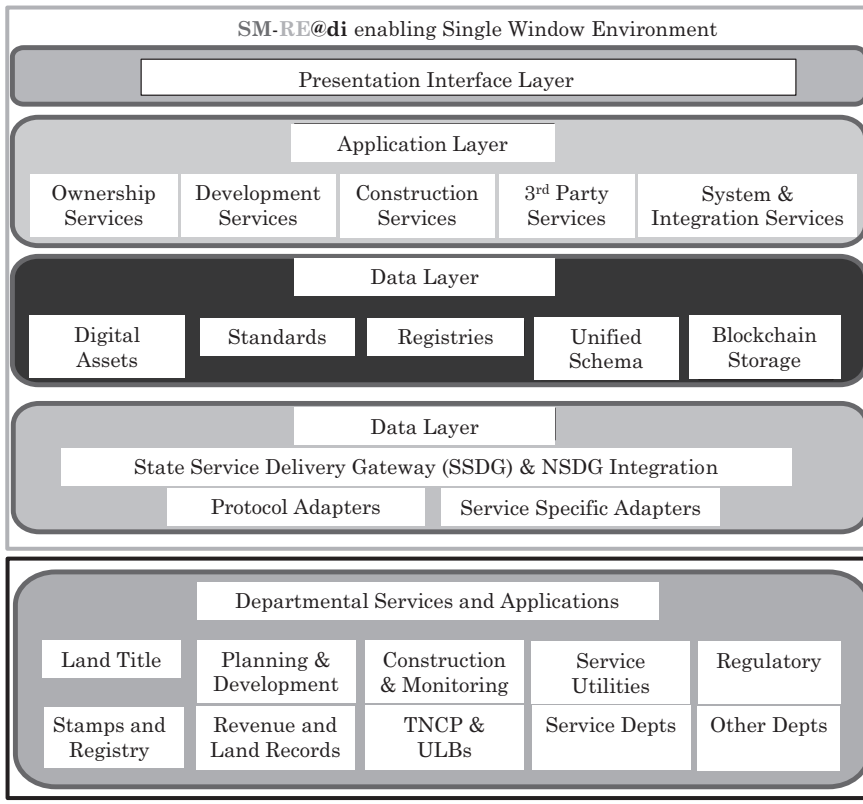

FIGURE 4.6 High-Level Architecture of the Real Estate Digital Infrastructure
Source: Authors

exposed only to the objective of the concerned government service and all inter-departmental approvals, communication should be handled with citizens' consent by the digital system (e.g., availing land title or RoR records). The ultimate objective to meet the citizens' needs can be fulfilled by synchronising and orchestrating the data flow/interpretations between inter-departmental operations and processes. Thus, SM-RE@di enables SOeGOV (Service-Oriented e-Governance) with a dedicated interoperable layer and the shared digital assets, authenticated via Blockchain. Also, to achieve the design objectives of SOeGOV along with interoperability and digital asset authentication, steps need to be followed for real estate-specific services, like property registry, mutation, and development approval provided by various different government departments via separate portals like MPSampada, RCMS, and T&CP or ULB portals. Below framework and guidelines should be adhered to in the system design to achieve the objectives of usability,

addressing the functionality, accessibility, flexibility, and cost-benefit in terms of time value, thereby ensuring the society's current and future needs pertaining to e-Government services as shown in Figure 4.7.

All application components and all business and system functionalities should be designed as independent services with an alignment to IndEA 1.0 and service-oriented architecture. Dividing each business functionality or system requirement into atomic state full services provides the dynamism and adaptability that is expected in citizen-centric and e-Governance delivery. For example, login authorisation should be designed as an independent service so that SSO (Single Sign On) can be extended with various authorisation mechanisms.

The ultimate objective of meeting the citizens' needs can be fulfilled by synchronising and orchestrating the data flow between inter-departmental operations and processes. The SM-RE@di enables a SOeGOV with a dedicated interoperable layer and shared digital assets authenticated via Blockchain. The flowchart in Figure 4.8 describes the steps to be followed for moving towards SOeGOV.

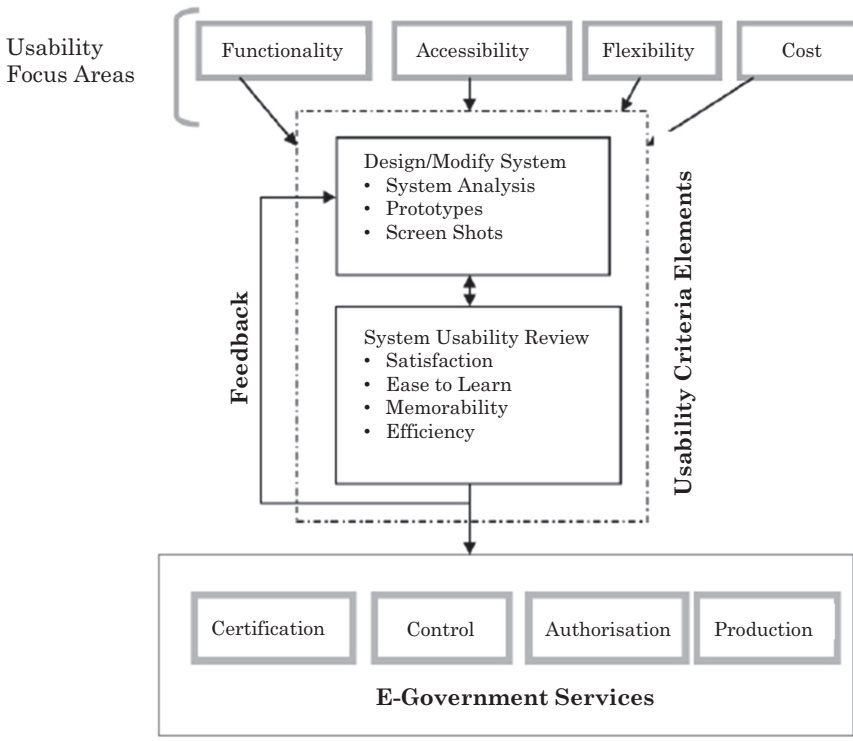

FIGURE 4.7 Usability for Single-Window Environment

Source: Humphrey & Mayoka, 2015

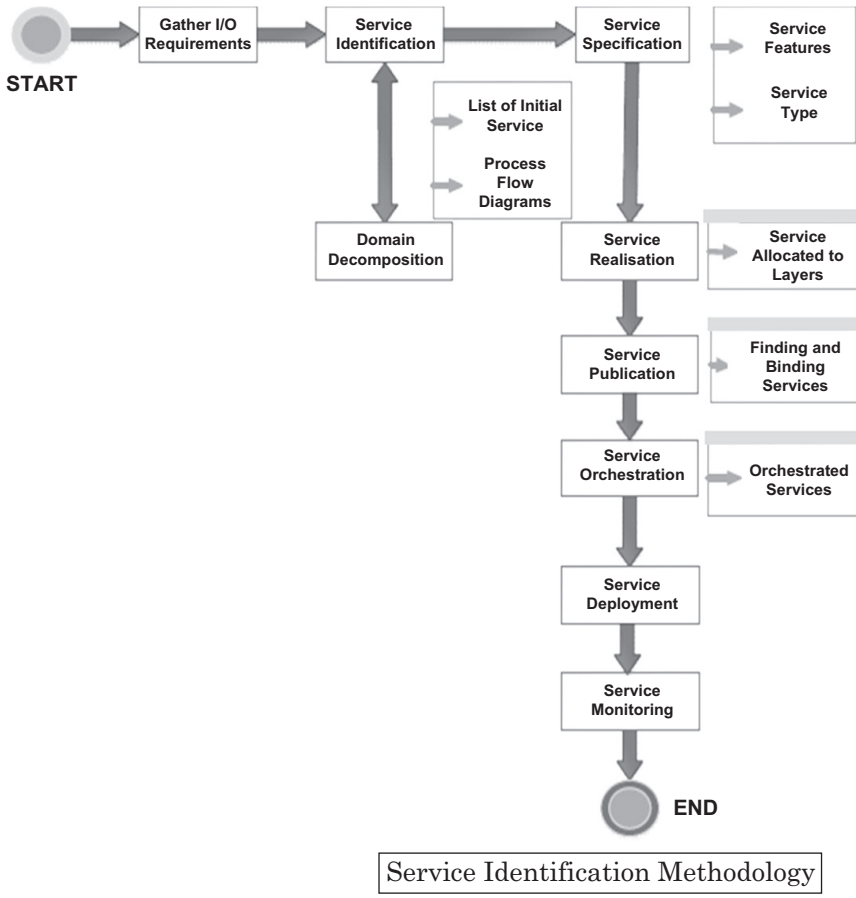

FIGURE 4.8 Process Flow for Achieving SoeGov Service-Oriented e-Governance
Source: Das, Patra, & Patnaik, 2014

4.3.3 Standardisation, Data Sharing with the Digital Connect Layer

Any e-Governance service delivery can be in a true sense interoperable as well as futuristic if the data or storage layer designed to achieve technological interoperability is aligned to the semantic interoperability for that domain. For data definition, the system and service must adhere to global or national standards, such as ISO 19152:2012 LADM, OSCRE, COB, and other applicable standards for particular service, with an overarching adherence to global/national data interchange, and technical and EDI standards, like XML, metadata elements, WSDL, and SOAP. Figure 4.9 as a sample

FIGURE 4.9 Major Data Flows in Land Management and Land Development
Source: Authors

shows the major data flow in land management or real estate domain which should be mapped as per the standards.

The data model and data definition for every element involved in the real estate domain should be correlated and must create a logical relationship (as discussed in the existing process flow in Figure 4.1) with other data elements, as shown in Figure 4.10

4.4 Learnings from the Successful Cases

Citizen-centric service delivery is an intricate process involving various departments, documents, officials, and regulations which result in reciprocating complex service delivery systems/procedures, thus resulting in silo systems, asynchronous procedures, and inefficient processes. The National e-Governance Framework advocates and provides guidelines for State Service Delivery Gateway (SSDG) which can be utilised by various departments within the government as well as the citizen-facing portals to take out various government systems from silo architecture to collaborative architecture. The core technological component used in the composite single-window portal is the interoperable integration layer, X-Road, as shown in Figure 4.11.

The Government of Estonia is achieving the objective of e-Estonia with X-Road as the backbone which enables the country's various e-service information systems in public and private sectors to link up and function in harmony. Estonia's e-solution environment includes a full range of services for the general public, and since each service has its information system, they all use X-Road. To ensure secure transfers, all outgoing data is digitally

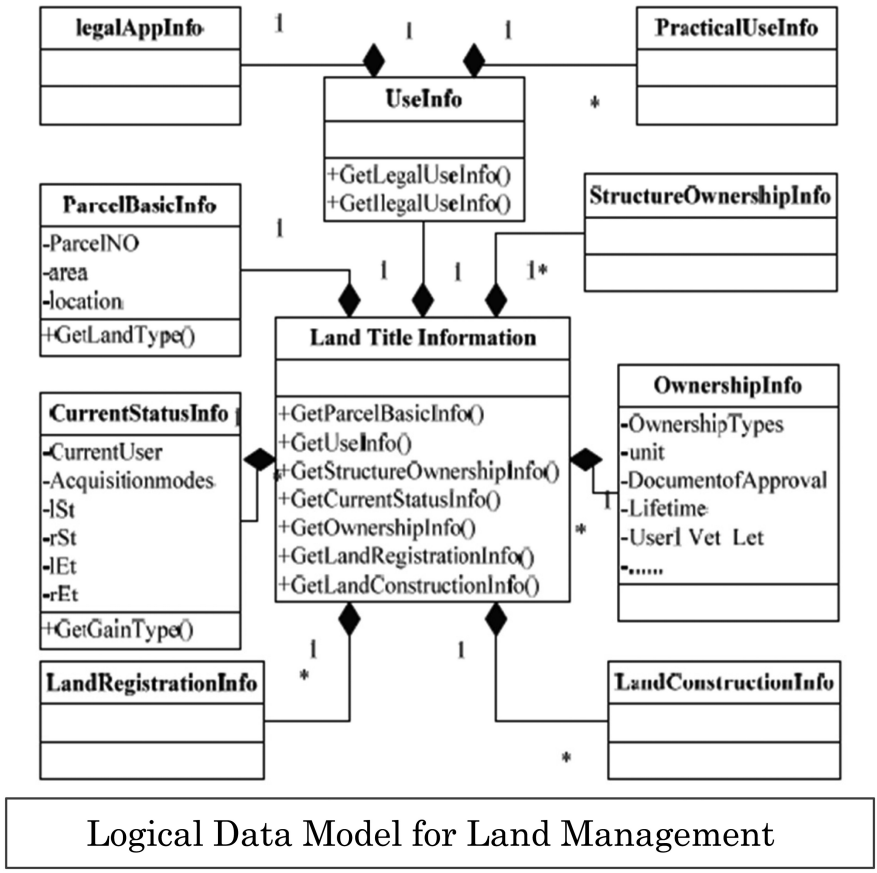

FIGURE 4.10 Logical Data Model for Land Management

Source: Authors

signed and encrypted, and all incoming data is authenticated and logged. It is used as the main communication system for government services and supports writing to multiple databases, transmitting large data sets, and performing searches across several databases. Today, it is implemented in Finland, Kyrgyzstan, the Faroe Islands, Iceland, Japan, and other countries. Any integration platform which is evaluated should have core capabilities for scalability, availability, and inherent security with efficient response time and data reproducibility. X-Road, with its EU government deployments and production performance, delivers these aspects with the below components and roles which should be at the core of any integration platform supporting e-Governance, as depicted in Figure 4.12.

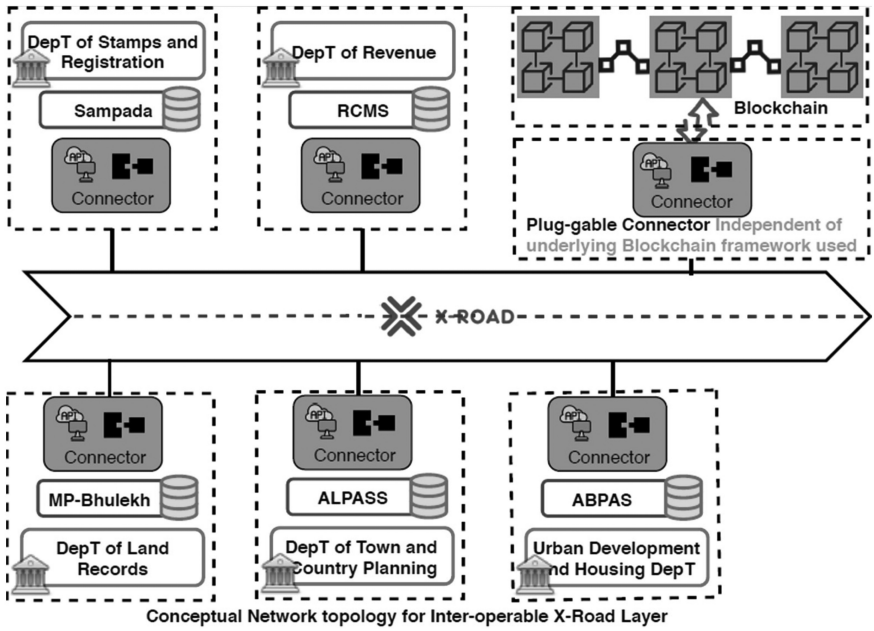

FIGURE 4.11 Integration Platform X-Road

Source: Authors

4.5 Interoperability Framework for Service Delivery in Real Estate Domain

An interoperable framework through SM-RE@di would encompass the approach to be adopted by government departments that wish to work together towards the joint delivery of public services facilitating real estate. The framework involves a common structure which comprises a set of standards and guidelines. The structure can be used by public agencies to specify the preferred way that all stakeholders interact with each other to share information. It is synonymous with speaking a common language.

The Interoperability Framework for Real Estate Services (IFRES) proposes the same information exchange between various departments that achieve or contribute to any activity related to property or real estate registration, approval, or any other. The inter and intra-organisational sharing of information is the basic requirement of e-Services delivery in a federated governance structure. There are three primary goals associated with achieving interoperability in any system (digital or otherwise), i.e. (i) Data exchange through infrastructure and software (technical ability of software/hardware used by different systems to exchange data through common data exchange protocols); (ii) Meaning exchange (ability of different systems/organisations to understand exchanged data in the same way through a

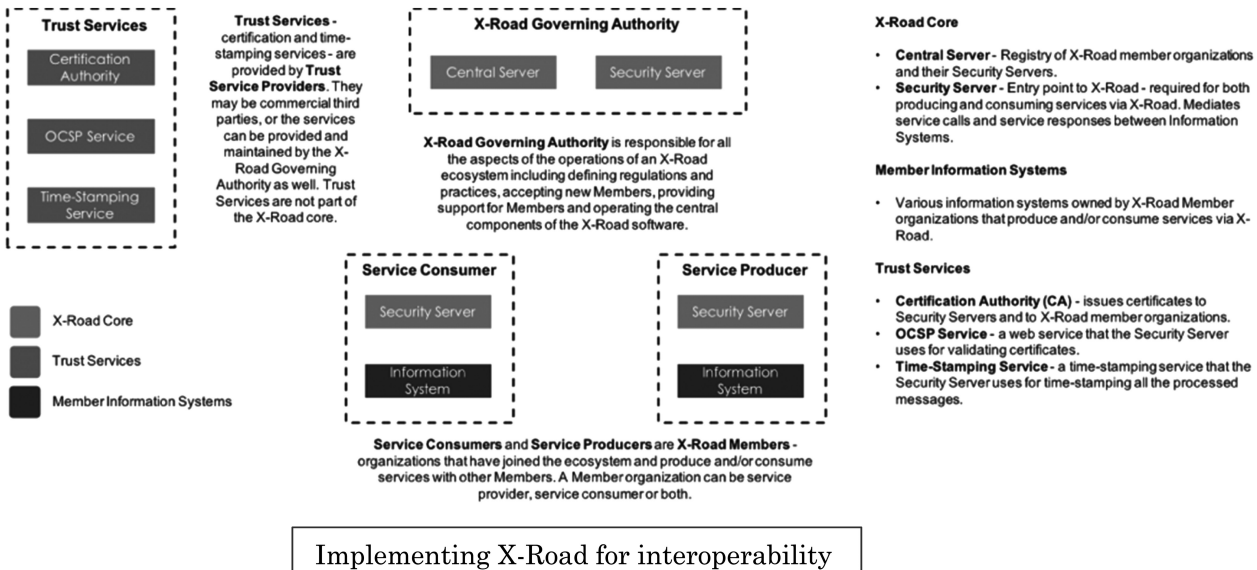

FIGURE 4.12 Reference Integration Platform Components, Roles and Responsibilities

Source: (Nordic Institute for Interoperability Solutions, 2018)

mechanism allowing the presentation of service data and data definitions); (iii) Process agreement (ability of organisations to provide services to other organisations or their clients/citizens, thereby ensuring service agreements and their legalisation).

4.4.1 Levels of Interoperability

To achieve the goal of complete interoperability, each interoperability level must be fulfilled and implemented, resulting in a composite and cohesive service delivery – irrespective of the department or public agency. Achieving complete interoperability requires strategic policy and implementation actions at four levels in the real estate SM-RE@di portal. Interoperability at the policy level is aligned towards the common goal of achieving ease and excellence in service delivery for all real estate-related transactions or workflows to achieve citizen/customer satisfaction along with moving positively towards 'e-Property registration', 'Online Building Permission Approval', and other objectives of ease of doing business, as envisioned by the GoMP.

The IFRES involves a common structure that comprises a set of standards and guidelines and implementation methodology, with a clear and workable government policy or mandate. The interoperability levels related to the sharing of information in IFRES are mainly classified into the following.

4.4.1.1 Organisational Interoperability

Organisational interoperability enables a multilateral mechanism to ensure proper management and implementation of an interoperable framework by identifying and addressing any possible barriers (including legal, political, managerial, and economic). The multilateral mechanism means organisational structures, appropriate processes, adequate resources, facilities, autonomy, and authority. Organisational interoperability also aims to meet the requirements of the user community by making services available, easily identifiable, accessible, and user-focused. This involves steps like process re-engineering, including government orders, process changes/creation, and organisational structures.

4.4.1.2 Semantic Interoperability

Semantic interoperability enables data to be interpreted and processed with the same meaning. This includes designing and implementing e-services, with the following functionalities: (i) Discover information requirements for the delivery of quality e-services; (ii) Explicitly describe the meaning of data

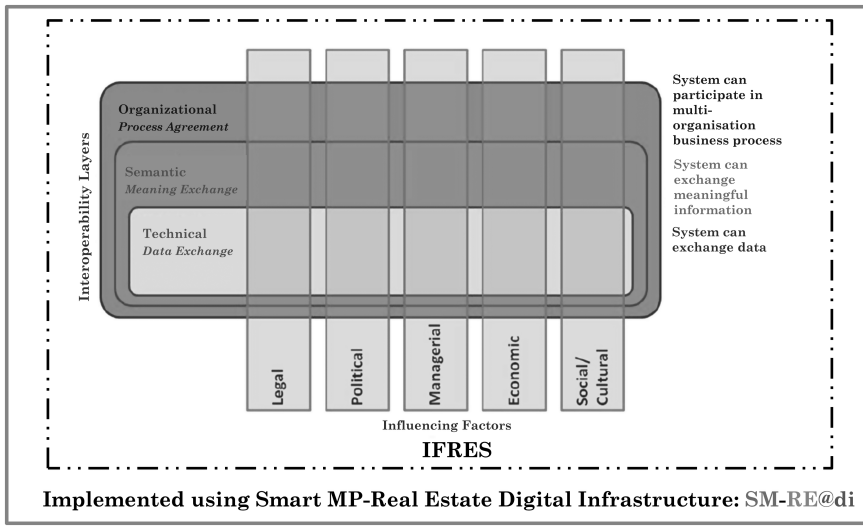

FIGURE 4.13 IFRES Inter-departmental Interoperability Model

Source: Authors

to be shared multilaterally among the stakeholders; (iii) Process the received information in a manner consistent with its intended purpose.

This will involve creating tools like XML schema for metadata, code lists for controlled values, taxonomies for the classification of data, and registration of users/owners of the repository.

4.4.1.3 Technical Interoperability

This covers technical issues in interconnecting ICT systems and services, information storage and archival, protocols for information exchange and networking, security etc. Technical interoperability was considered for classifying the standards into various layers or domains (e.g. presentation domain, network domain, data interchange domain, etc.).

The property ownership details can be securely stored on Blockchain as an e-Property ID card (acting as a digital asset) to be used as a tamper-proof single source of truth in any e-service. These digital assets can be exchanged over a secure integration layer of X-Road (an enterprise service bus or data exchange platform) with the required controls and privileges. Figure 4.13 provides an overall view of the levels of the interoperability system. Technical interoperability forms the basis for the interoperability framework. The government facilitates and enforces the implementation of framework standards and guidelines.

4.4.2 Sub-areas

The multilateral mechanism is influenced by the following key sub-areas:

Political: In the political context, strategy-related issues, support and commitment from an authority, provisioning of policies/guidelines, and strategies over different levels of interoperability are required.

Legal: For issues like IPR/copyright, content regulation, privacy, freedom of information, and electronic identities, they are context-sensitive. Legal factors include legal power assigned to a system for data protection and privacy information of the citizen, governance issues related to information management, executive orders and laws related to e-Governance services, citizen services driven by administrative procedures, enforcement, etc.

Managerial: For issues concerning training, motivation, and reorientation of concerned staff from public agencies.

Economic: For funding/project execution-related issues.

Social/cultural: For social/cultural characteristics of the system, stakeholders' differences in culture, working practices, issues of trust, timings, and social exclusion issues are more influential.

Ease of doing business impact: Any system design should enhance/improve the parameters which support investors and business/entrepreneurs alike.

Encouraging innovative business/employment/investment generation economic models: The business or employment ecosystem is dynamic. Thus, any design should be accommodative and responsive towards innovative economic models, bringing new resources into the real estate domain. The multilateral mechanism should be defined–with transparent, consensual, collaborative open environments; through participation from all stakeholders; and to enhance the ease of doing business and facilitate an investment-friendly approach.

When an e-service initiative involves more than one public agency, there is a need for a commonly agreed project plan before committing a budget for the initiative. All stakeholders' clear-cut roles, responsibilities, and accountabilities should be defined and maintained. Also, adequate organisational resources should be provided, and capabilities for implementing such an interoperable framework should be imparted through capacity building and collaborative initiatives.

4.4.3 Interoperability Governance

Interoperable governance refers to the background layer of the model. This concept guides decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities,

policies, agreements, and other aspects of ensuring and monitoring inter-departmental interoperability (Shi, Nikolov, Sukhobok, Tarasova, & Roman, 2017).

For effective cooperation, all stakeholders must share a vision, agree on objectives and time frames, and align priorities. Interoperability between public administrations at different administrative levels will only be successful if governments give sufficient priority and assign resources to their respective interoperability efforts. Building and grooming necessary in-house skills is a must for implementing interoperability policies. Related departments should include interoperability skills in their strategies, acknowledging that interoperability is a multi-dimensional issue that needs awareness and skills in legal, organisational, semantic, and technical contexts. For example, the Chief Information Officer should have complementary associates in every department for better system/application architecture supporting the higher goal of inter-departmental interoperability.

Interoperability governance is the key to a holistic approach to coordination, communication, and monitoring. As mandated by the Government of India, any technical application architecture should be compliant with IndEA 1.0 Enterprise Architecture and IFRES framework guidelines and rules within the IFRES interoperable framework guidelines.

4.5 Applicability of Interoperability Framework

The existing portals of various concerned departments are disaggregated with no interoperable linkages. To smoothen the process flow from inception to completion of a project, assimilation and streamlining shall be done through a digital platform, popularly known as 'Single Window'.

'Single Window' is an expression for stakeholder-friendly procedures to apply for and obtain permissions and clearances under all rules and regulations necessary for getting on with the business. It can either be at a physical location or on a digital platform. Its efficacy lies in ensuring that the applicant is not required to visit the facility repeatedly to follow up or to remind the authorities to do the needful. Such a facility, if effectively operationalised, can cut costs and transaction time and impart transparency to the operations. On the supply side, it can improve accountability.

Any exercise leading to the successful implementation of the single-window concept will call for back-end simplification of procedures and workflow with direct and indirect efficiency gains. The proposed single-window web portal will, therefore, facilitate streamlining of processes and expedite clearances required by different government departments related to real estate. This interface will build 'a connection' between stakeholders, including beneficiaries, private players/developers, government agencies and departments (T&CP, Housing Board, Development Authorities, etc.), and

town and municipal administrations. Currently, various online application systems are functioning in various departments in isolation. Interoperability of such portals shall be done so that development permits and approvals may be given in a consolidated manner.

4.5.1 Role of Blockchain in Simplification of Processes

Blockchain is a breakthrough technology which could improve planning and scheduling mechanisms in the construction industry and offer new solutions for the entire gamut of data management to improvise process flow related to processes and approvals. In 2017, Sweden began using Blockchain to register property; Brazil has developed a pilot for its national land records; India is working on a pilot that tracks property ownership; and the UK's Land Registry is investigating registration and conveyance improvements through Blockchain.

Blockchain-based platforms for affordable construction projects have been used in some countries to cut down inefficiencies throughout a project's life cycle, saving time and money. It codifies agreements into smart contracts, with automated payments, when project milestones are met, for example, GPS-enabled, internet of things (IoT) devices would help determine when materials have reached a site. The platform would expedite due diligence by enabling investors to see how contractors have performed in the past. Pilot versions of this platform have been tested in Senegal and the UK.

4.5.2 Applications

The IFRES can be applied to all systems and operations that are involved in the real estate management and resource planning of the Madhya Pradesh Government. Applicability shall include all planned e-Governance systems and Disaster Recovery (DR) Management systems as well as operational processes introduced by these departments supporting a real estate service.

4.5.2.1 Compliance Areas

New e-Governance systems/processes.
Up-gradation of existing e-Governance systems/processes.
Release of new versions as per enhancements or new inclusions in the framework.

4.5.2.2 Scope of Compliance

Data aggregation, validation, presentation level, where data from multiple systems need to be aggregated and validated.
Data archival/storage level.

4.5.2.3 Nature of Compliance

Advisory for all public agencies and as directed by the administration.

4.6 Targeted Stakeholders

The IFRES is designed and articulated so that public agencies and the technology community (enterprises/start-ups) can utilise it for designing or modifying their systems and operational processes for real estate-related requirements under GoMP authorities. To bring transparency and ease of functioning in all departments involved in real estate development, a 100% e-office system shall be used. Technology shall be used mandatorily to promote paperless methodology and ease process flow within and between all departments. The approval process will be linked to a real-time system to monitor the status of approvals. A stakeholder analysis was conducted based on categorical mapping and on the approval process, as discussed in Figure 4.14.

4.7 Expected Impact of the Interoperability Framework

Currently, there are various government departments which are involved in the real estate-related approval processes, and since all these approval processes in operational as well as technological silos have not been interacting with each other, operational friction is created in almost every process. With the SM-RE@di framework, there will be X-Road, a globally used and recognised e-governance integration technology to integrate various stakeholders with the digital real estate technological stack offered by the SM-RE@di framework. Figure 4.15 showcases the various technological components and their interaction with the stakeholders at a conceptual level.

The SM-RE@di framework will be used in the digital transformation of real estate services aligned to the e-Governance architecture standards under the IndEA01 (India Enterprise Architecture) framework 1.0 for the software system, for e-Governance along with domain-specific enhancements/additions over IndEA for adapting and accommodating emerging technologies for new global market needs.

The SM-RE@di will align with the philosophy of the IndEA Enterprise Architecture, which recommends a federated architecture whereby the participant entities can design (with regulatory approvals) their solutions adhering to the principles and standards laid down by the Enterprise Architecture to make them interoperable with all other entities within and outside the enterprise/government. The SM-RE@di framework will not amount to a monolithic design. It will be technology-agnostic and therefore, enables heterogeneous technologies to coexist and interoperate. It will facilitate an autonomous evolution of multiple solutions in different domains of the real

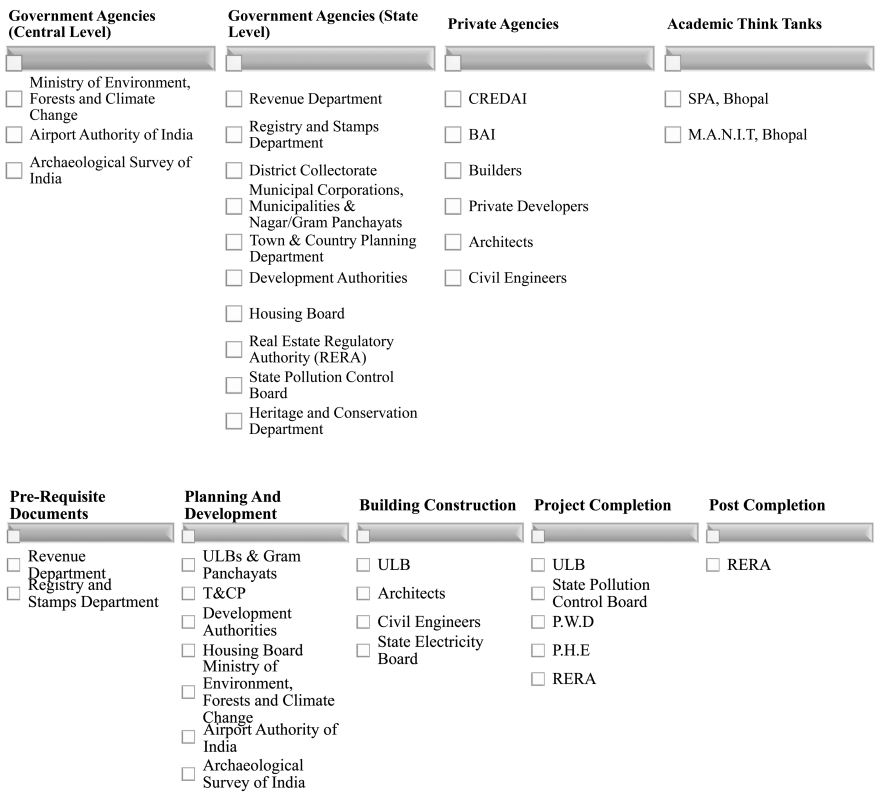

FIGURE 4.14 Mapping of Stakeholders (Categorically)

Source: Authors

estate enterprise, all conforming to a set of principles and standards. The design considerations of SM-RE@di will include citizen-centric, efficiency-focused, and event-driven business and technological patterns and reference models. The SM-RE@di will provide a holistic smart real estate framework and guidelines comprising a set of reusable building blocks, which are aligned to the 'Whole-of-Government Architecture' suggested by the UN and also to the guidelines appropriate for inclusive growth of digital real estate.

4.7.1 Benefits

The major benefits envisaged by the adoption of SM-RE@di framework are:

- Provide a consolidated smart real estate experience to the citizens and businesses by offering integrated services through multiple channels in a contactless, frictionless manner.

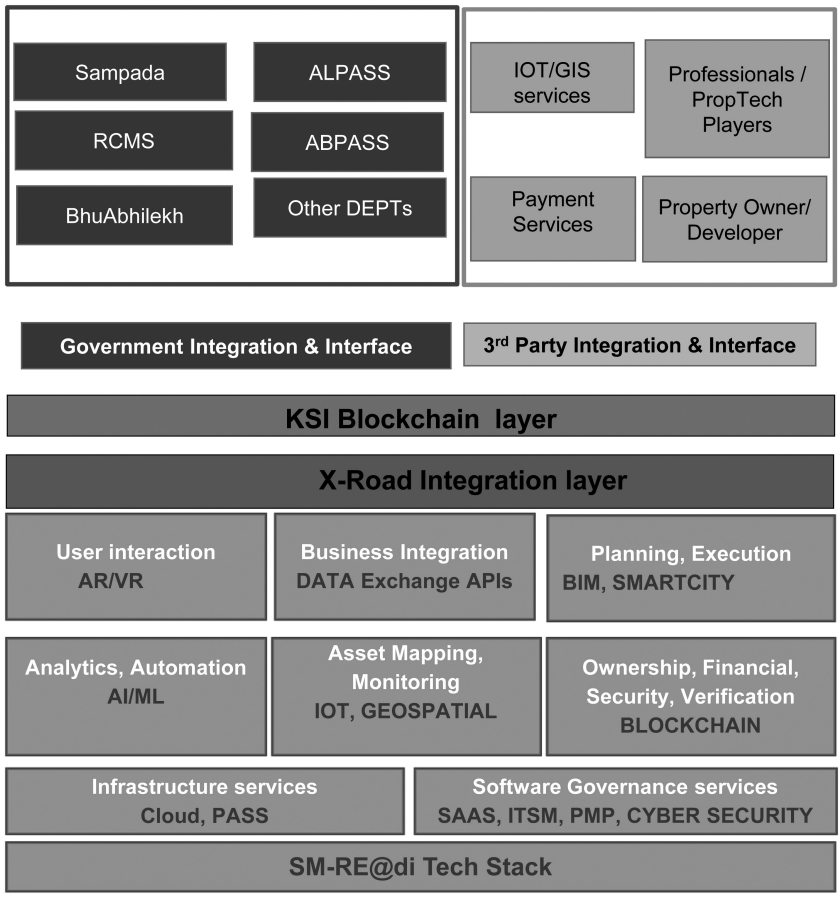

FIGURE 4.15 High-Level Overview of Technological Components of SM-RE@di
Source: Authors

- Enhance the efficiency of the delivery of services by defining and enforcing service levels of a very high order.
- Improve the effectiveness of the implementation of the development and welfare housing/urban planning schemes through holistic performance management.
- Enhance the productivity of employees, agencies, and third-party market players through easy access to information.
- Provide integrated and cross-cutting services through seamless interoperability across the 'Whole-of-Government' channels/departments.
- Bring in flexibility and agility in making changes to the systems to align with the best practices and to leverage the latest technologies.

- Realise the cost-effectiveness through the use of shared infrastructure and services.
- Enable establishing a connected government and market ecosystem that works for inclusive development.
- Maintain the right balance between the security of data and privacy of personal information, but not hinder the access of useful data by other stakeholders for higher efficiencies.

4.7.2 Impacts

The expected impacts of the interoperability framework are:

- Delivering services of various systems like RCMS, ABPASS, ALPASS, etc. via the common integrated single interface for multi-platform services.
- Enable systems to interoperate efficiently and effectively with other systems across various departments/domains of e-Governance.
- Ensuring consistency that information exchanged is interpreted and processed unambiguously and uniformly in all interacting systems continuously.
- Ensuring better sharing of ICT infrastructure and reproducibility and reliability of the data collected or encoded at various sources.
- Compliance with the policy on open standards by adopting the formats, standards, and specifications as per policy for better interoperability.
- Enable autonomous development for systems within the principles of various levels of interoperability.
- Adoption of principles of Service-Oriented Architecture (SOA) to enable integration of dissimilar technologies and checking feasibility of implementation of microservices.
- Offer e-services (including G2C, G2B, G2G, G2E) to the stakeholders concerned through a single composite portal (or one-stop delivery or one-service window/portal), and through multiple delivery channels like PCs, mobiles, and common services centres, open data standards, or open APIs.

4.8 Challenges and Issues in the Current Situation for Adopting Interoperable Framework

- Lack of a single centralised coordinating agency/programme team to manage the implementation of various e-Governance systems deployed by various departments.
- Lack of enforcement policies and guidelines on adopting interoperability standards/guidelines.
- Lack of awareness of the complexity of interoperable frameworks.

- Shared elements and common processes are not identified during the architecture stage and resolving these interoperability issues at a later stage is very difficult.
- The incompatible e-Governance infrastructure (including varying platforms and their frameworks and software, non-standard data formats for archiving and exchange, disparate hardware systems, and unreliable network systems) may pose a great challenge.
- In most cases, coordination among the public departments concerned is very poor due to various reasons, like varying nature of work, lack of proper understanding (say, on quality of service.), and non-adherence to standards and mutual commitments.
- Accessibility of information syntactically and semantically from one e-Governance system to another e-Governance system is not accessible due to the use of varying formats, structures, and meanings. The wide use of different data models, processes and rules, time bases, and user interfaces in the e-Governance systems makes interoperability a difficult task.
- The non-availability of adequate funding for efforts and facilities needed for adopting interoperability is one of the major constraints in public agencies. Thus, an effort has to be made to make use of reusable components (like restful APIs, SOA components) while designing the e-Governance systems so that the cost of software development can be reduced.
- Process changes and staff and user training needed for the adoption of interoperability are rarely considered.
- Addressing contrasting requirements like dissemination of information under legal requirements (like compliance to RTI) and rules related to data protection (like privacy, IPR) is yet another challenge.
- Sensitivity of data, differences in culture, working practices, issues of trust, timings, collaboration, workflows, convincing stakeholders, legal issues, levels of political support, and technical approach among public agencies may also pose problems for implementing interoperability.
- Cultural and linguistic diversity in India introduces additional administrative constraints, like naming conventions, language-dependent format, etc.

4.8.1 Road Map to Achieve Interoperability for Single-Window Environment

Given the challenges and issues discussed above, a comprehensive approach and implementation methodology is required to achieve the goal of Single-Window environment with successful deployment and utilisation of the real estate-specific digital infrastructure, SM-RE@di. Every level of interoperability has to be designed and implemented meticulously by an expert planning (people), execution (process), and support/maintenance team (technology). Each interoperability will be achieved through a

'people-process and technology approach' with the process flow/methodology as discussed to achieve organisational, semantic, and technological interoperability.

4.8.2 Implementing Organisational Interoperability

People: Governing Team/Committee, Digital Transformation Manager, Teams (Project Management, Technology (Products + Technical), Operations).
Process: Project Management Processes, Operational Processes, Governance Processes, Audit Processes, and Domain-Specific Business Processes.
Technology: PMP Tools, BPM Tools, Audit Tools, etc.

4.8.3 Implementing Semantic Interoperability

Figure 4.16(b): Methodology for achieving Semantic interoperability

People: Information Officer, Database Architects, Data Science Team.
Process: Data Exchange and Data Interchange Procedures and Protocols, Data Models, Data Standards, SDLC.
Technology: PMP Tools, Data Models and Standards, Analytical Tools.

4.8.4 Implementing Technological Interoperability

People: Programme Team, Product Team, Technology Team, Database Team, Compliance Team, Operations Team, Digital Infrastructure Team.
Process: SDLC (Waterfall or Agile).

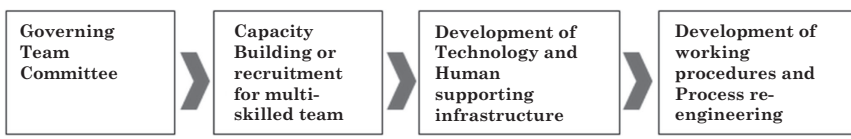

FIGURE 4.16(A) Methodology for Achieving Organisational Interoperability

Source: Authors

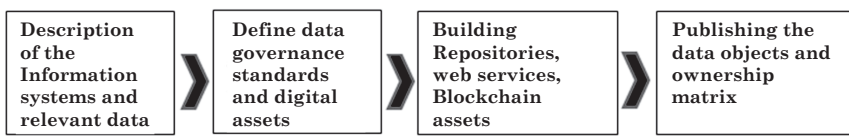

FIGURE 4.16(B) Methodology for Achieving Semantic Interoperability

Source: Authors

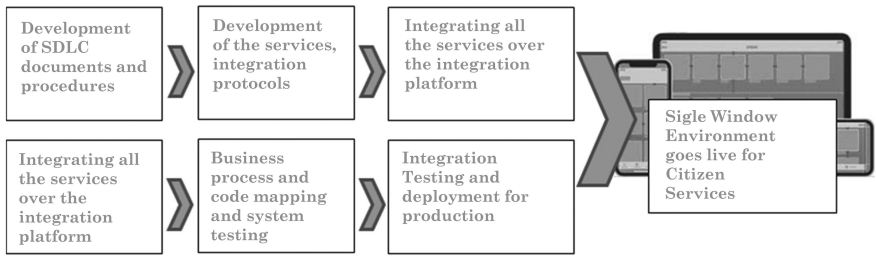

FIGURE 4.17 Methodology for Achieving Technological Interoperability

Source: Authors

Technology: PMP Tools, Code Repository Tools, QA Tools, Deployment Tools, Digital Infrastructure Tools, Software Products and Services (e.g. Blockchain, Interoperable platform), etc.

4.8.5 Process Enhancement through SM-RE@di

4.8.5.1 Current Workflow and Interaction

With respect to statutory approvals, there are various government stakeholders. Project approvals cost 40% of the sale value to the Government of India (Shanke et el, 2010). The cost of the project gets compounded due to delays and time and cost overruns. From anecdotal evidence, approvals can take 90 to 600 days. A few approvals from the Central Government ministries and departments prove as a major bottleneck, leading to time delays and cost overruns (EIA and Forest clearances in particular). Procedures followed by local governments, starting from receiving the application to giving the completion certificate, are ridden with a lack of clarity or structure, complexity of design and operation, inefficiency and uncertainty, and time/resource consumption (National Real Estate Development Council, 2017). The different types of permits required for getting approvals from various government departments are broadly classified into six categories.

From the analysis, it has been identified that some of the permission processes required are overlapping. Such discrepancies will be resolved through SM-RE@di.

Currently, a citizen or developer approaches each department separately to collect the required documents needed for the plan approval of a project/building, using all existing systems/portals, namely Sampada, RCMS, M.P.BHUABHILEKH, ALPASS, and ABPAS. Thus, in the complete workflow from land ownership to the post-completion formalities, there are considerable manual processes involved in the scenario. The current user interaction

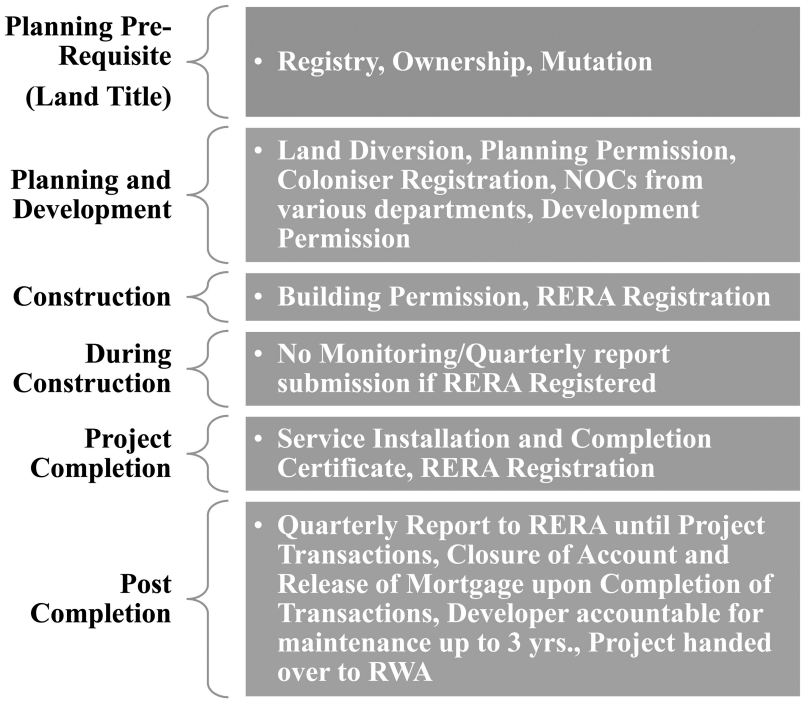

FIGURE 4.18 Six Broad Categories for Permits

Source: Authors

is shown in Figure 4.19 to achieve the workflow shown in Figure 4.20. In the current scenario, the applicant has the responsibility to collect documents from all systems/portals before applying.

Figure 4.21 depicts the generic workflow for building plan approval with current users and the departments' role in various kinds of process outcomes/documents.

4.8.6 Proposed Workflow and Interaction with Composite Single-Window Portal through SM-RE@di

With the proposed composite Single-Window portal, SM-RE@di, all current manual tasks/processes will be digitised and automated. The citizen/developer has to complete the application with a Composite Application Form (CAF) which captures all the required details. The CAF captures complete information needed now or later for all major process objectives to ascertain

FIGURE 4.19 Mapping Process Simplifications

Source: Authors

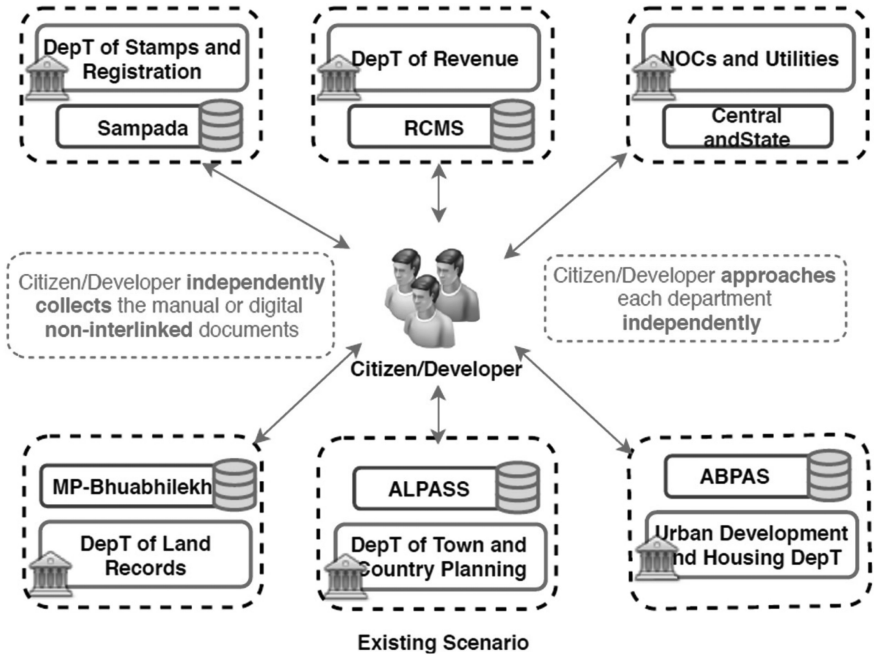

FIGURE 4.20 Manual Efforts and Department/System Interaction with the Current Process

Source: Authors

land ownership, planning and land usage, construction, required utilities certifications/NOCs, and other post-completion and regulatory procedures.

This one-time information-gathering approach at the start of the process helps the applicant by saving manual efforts and thus, reduces the time of execution remarkably, with errors/incorrect information getting removed at the start of the process as shown in Figure 4.22.

The proposed workflow using a composite Single-Window portal is suggested in Figure 4.23. The major difference between the new workflow is the introduction of digital assets. The digital assets and any transactions on them are securely recorded on the Blockchain, and the verification is automatically done for land title verification as well as for layout approval.

4.8.7 Reforms and Their Impact by SM-RE@di Platform-Enabled Workflows

Table 4.1 evaluates major reform parameters impacted after aligning with the recommendations mentioned in the State Business Reform Action Plan (Department of Industrial Policy & Promotion, 2017)

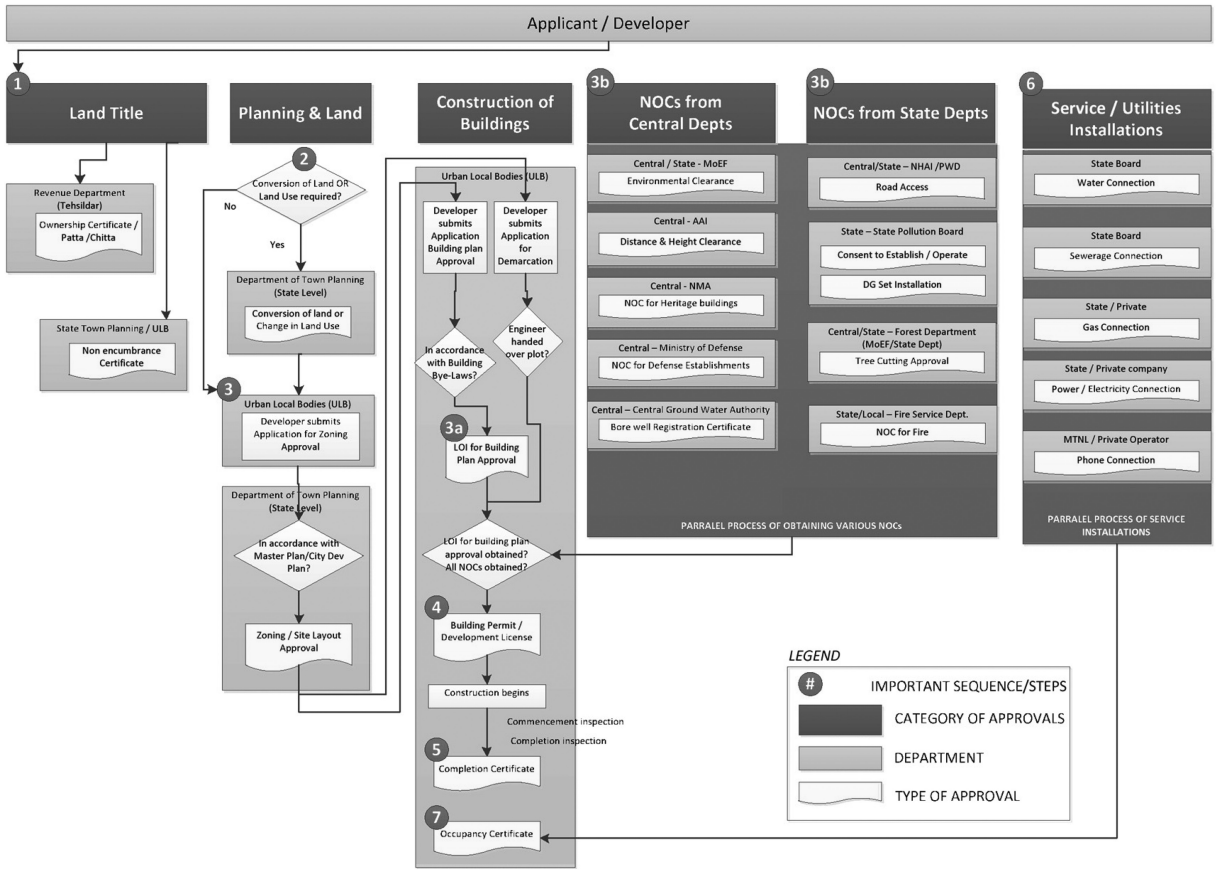

FIGURE 4.21 Current Generic Workflow for Building/Project Plan Approval

Source: RICS Analysis

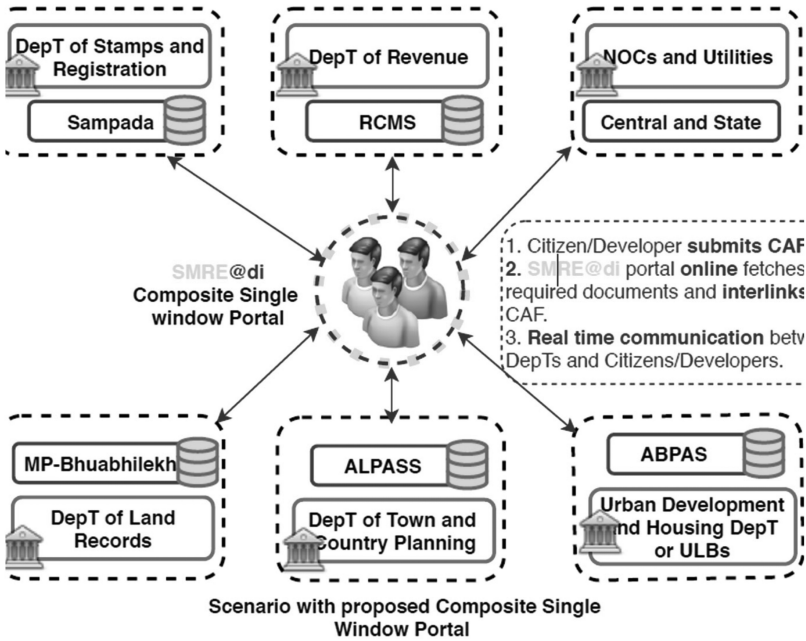

FIGURE 4.22 Modified Scenario with the Proposed System

Source: Authors

4.8.8 Standardisation of the Workflow through SM-RE@di

An overview of the Standard Operational Procedure (SOP) for the new workflow. At a high level, Figure 4.24 depicts the standard operating procedure for the proposed flow.

4.8.9 Data Governance Model of SM-RE@di

There are multiple stakeholders, government departments, and authorities involved in a real estate transaction life cycle. Now, these participants can have their systems using customised data models. To bring uniformity in the digital real estate communication channel, there should be a data exchange standard based on global criteria, and thus, a new Data Governance Maturity Model has to be built, and other participants need to be on board in this journey. The Figure 4.27 shows how an organisation can take up the model for integrating the systems in silos.

To achieve the objectives of such a Data Governance Maturity Model as shown in Figure 4.25 for exchanging data with other systems without friction, the data modelling and entity data relations have to be defined in three stages. (i) Conceptual Data Model, (ii) Logical Data model and Second Logical Data model, and (iii) Physical Data Model as shown in Figure 4.26.

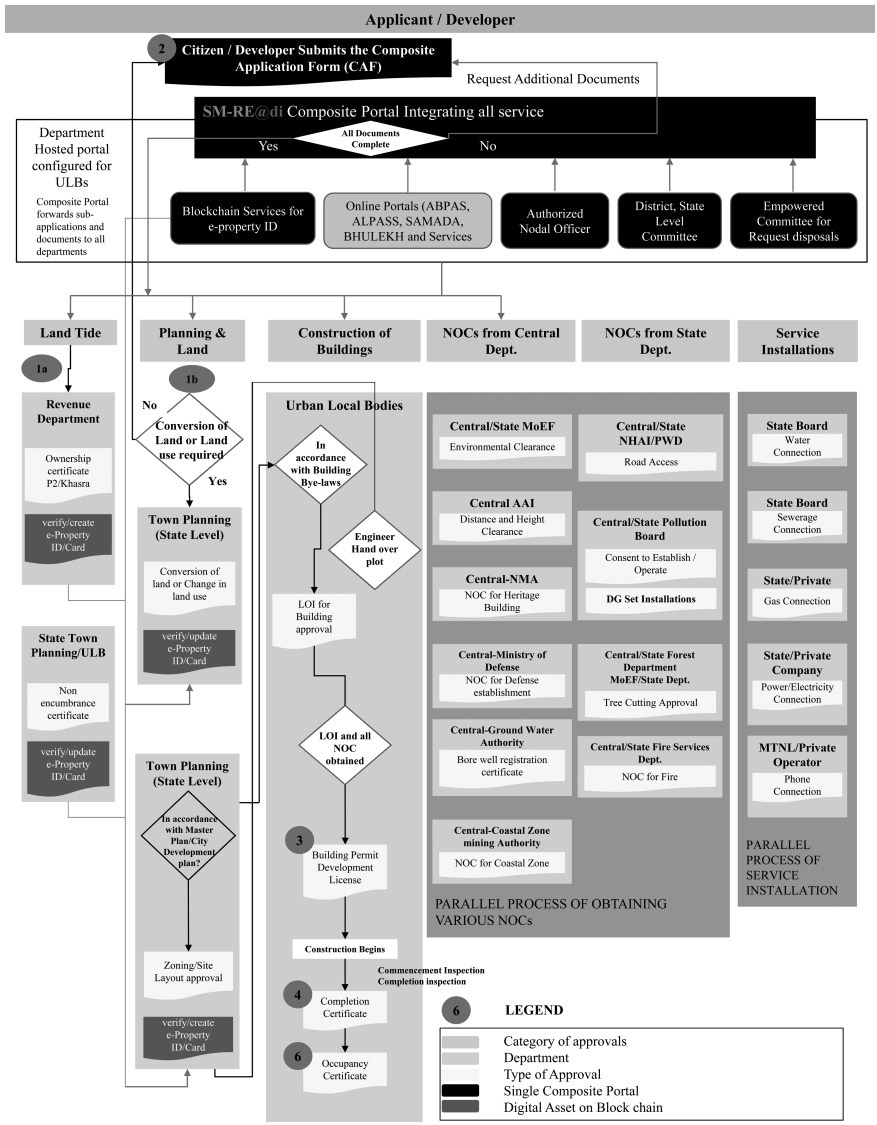

FIGURE 4.23 Workflow Using Composite Single-Window Portal

Source: Authors

TABLE 4.1 Reform Parameters

Sr. No. in the Guide	*Reforms Heading*	*Recommendation (Rec) No.*	*SM-RE@di Workflows/ Feature/Functionality Enabling This*
13.	Paper-Less Courts	Rec. No. 67	Single Window and Blockchain-based transparent digital asset ePropertyID Card having liability details attached to it. Property Ownership workflow enables this.
14.	Property Registrations – Enablers	All, Rec. No. 68 to 77	
15.	Property Registration – Online system	Rec. No. 80	
18.	Inspection by Building Proposal Office/relevant agency as part of obtaining construction permit	Rec. No. 101 to 104.	Single Window and the Task Scheduling, AI +IoT-enabled report processing engines in SM-RE@di. Building plan permission, construction and occupancy approval workflow in SM-RE@ di achieves this. Digital assets like development file, building plan file, completion certificate enabled the transparency and efficiency.
19.	Inspection by Appropriate Authority for felling trees (prior to commencement of construction activities)	Rec. No. 106 to 110	
20.	Inspection by Building Proposal Office/relevant agency as part of obtaining occupancy/ completion certificate	Rec. No. 111 to 115.	
33.	Online Single-Window System	This recommendation is oriented towards more of industry permissions and thus is an Industrial Single Window.	Single window and interoperability (with integration engine) enabled by SM-RE@ di can be the backend of Industrial Single window for all real estate needs. All flows contribute to achieve this.

(*Continued*)

TABLE 4.1 Continued

Sr. No. in the Guide	*Reforms Heading*	*Recommendation (Rec) No.*	*SM-RE@di Workflows/ Feature/Functionality Enabling This*
34.	Availability of Land/ Infrastructure	Rec. No. 213 to 215.	ePropertyID card having GIS, Cadastral data, and dynamism to add further layer of data enables such a dataset. Property development workflow and Property ownership workflow enable this. Innovative approach: pooled land bank.
35.	Land Allotment	This deals with land for setting up industry. Rec no. 221 is for transparency.	ePropertyID and transparent single window (interoperability) between various departments enables this.
36.	Construction Permit Enablers	Rec. No. 222 to 233.	Building plan permission, construction and occupancy approval workflow in SM-RE@ di achieves this. Digital assets like eDevelopment file, eBuilding plan file, eCompletion certificate enabled the transparency and efficiency.
37	Building Plan Approval	Rec. No. 236, 237, 239 and 240.	

Source: Authors

4.9 Conclusion

Currently, every government service department works in a silo as citizens themselves have the responsibility to go to every department for any real estate or property-related work. With SM-RE@di, a digital infrastructure in place, which achieves interoperability between various government departments, the objective of meeting the needs of citizens for every real estate-related service can be achieved via a common and single platform. Property ownership once recorded on Blockchain and then enriched with metadata

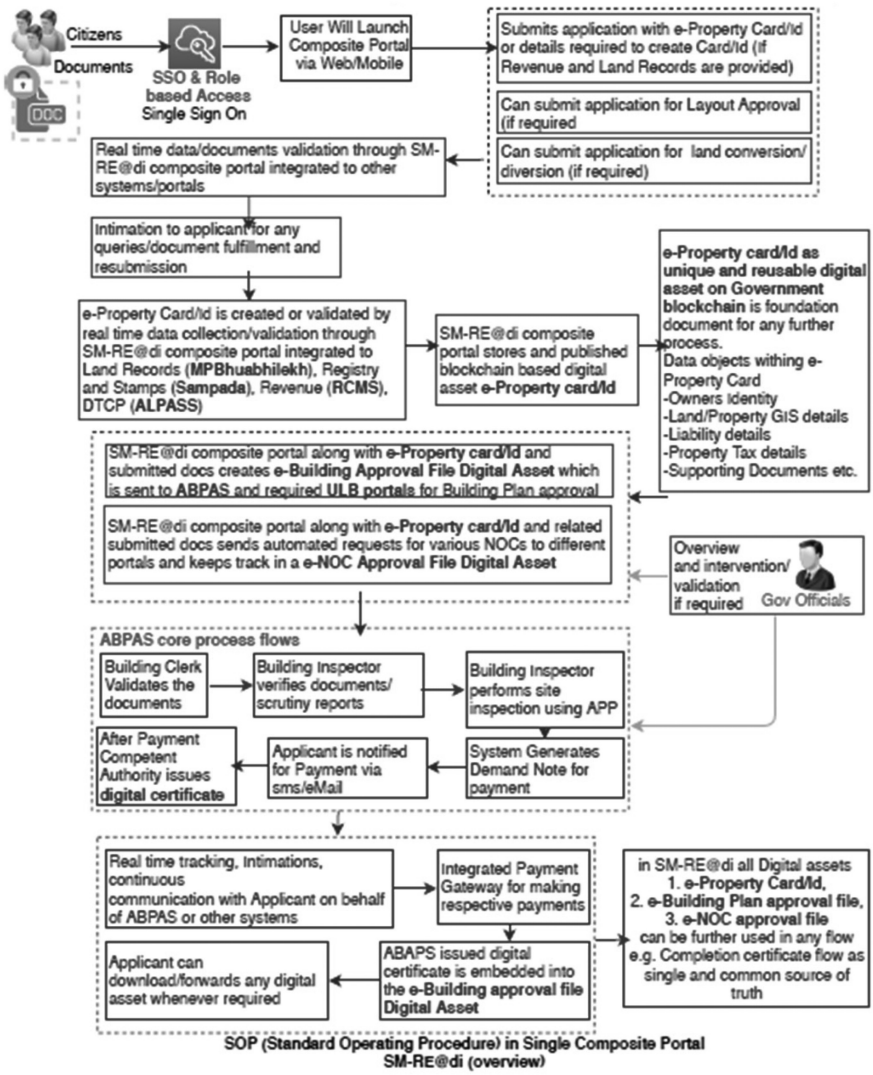

FIGURE 4.24 Procedural Simplifications Using SOP for Proposed Flow

Source: Authors

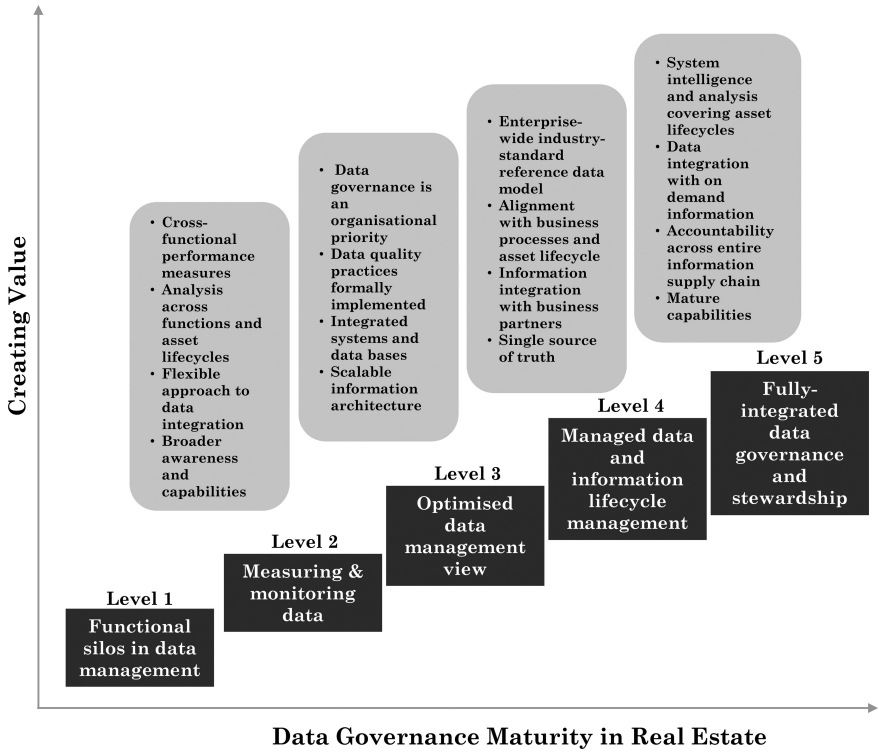

FIGURE 4.25 Data Governance Model

Source: OSCRE, 2019

from other departments, like land use and utility services over the interoperable layer of X-Road technological infrastructure, can deliver the objective of seamless and digital government services in the real estate domain. Thus, SM-RE@di enables the SOeGOV with a dedicated interoperable layer and the shared digital assets authenticated via Blockchain, thereby realising the real estate policy for Madhya Pradesh in letter and spirit. The main design principles of the real estate digital infra which shall be promoted befitting all stakeholders of real estate are:

Accessibility: Citizen-centricity, the system should adhere to intuitive design methodology irrespective of the stakeholders. The ease of use and adherence to business process should be so well merged that the user experience is enhanced, irrespective of the medium of access.

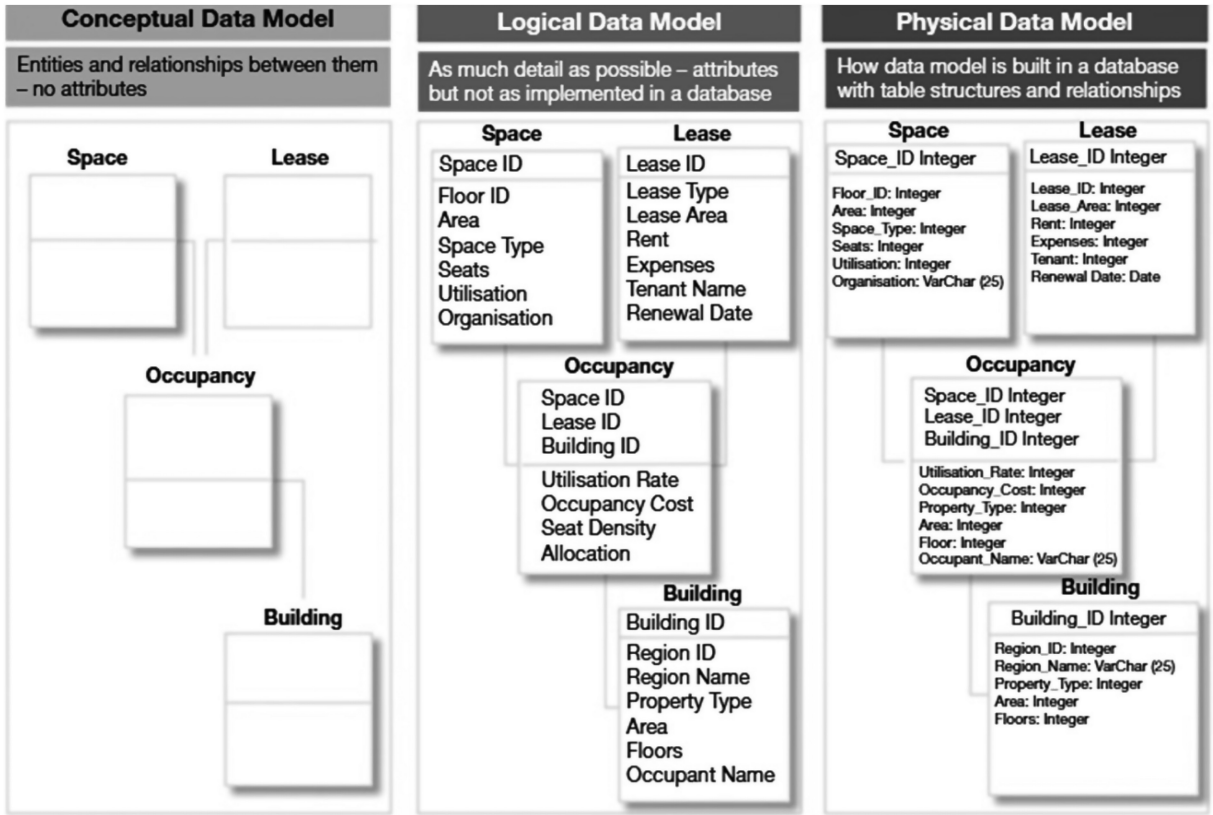

FIGURE 4.26 Data Modelling and Entity Data Relations for Achieving Data Governance

Source: Authors

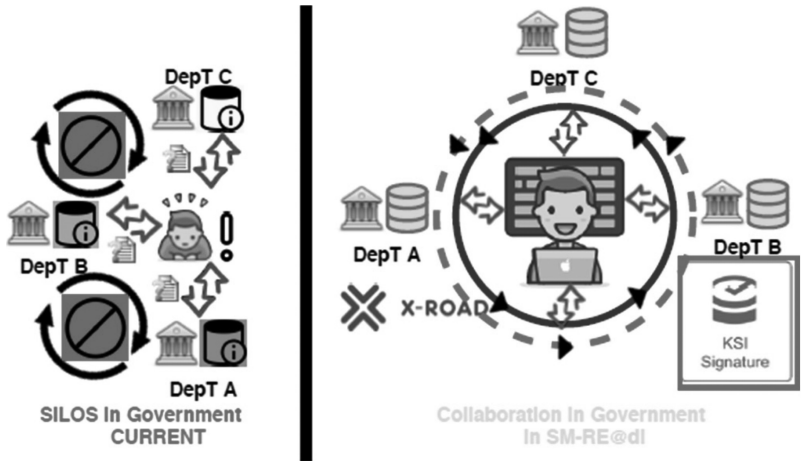

FIGURE 4.27 Current Silos and Collaborations

Source: Authors

Result-driven process and automation: Any operational or technological component should fulfil the result-driven approach to achieve more with minimal or required complexity. Land parcel manual verification/measurement to be assisted using AI/ML, imagery, and drone surveillance technologies.

Security: All regulatory security standards applicable should be inherent in any system supporting real estate procedural simplifications.

Standardisation and Interoperability: Common Data Standard specific to the real estate domain to be defined on the lines like OSCRE and BIM and Uniformat Standards for design and construction. Global standards can also be implemented in conjunction with local practices.

Integration elasticity: Standardised API and web sockets interfaces to subscribe/publish/connect to various other portals. Data Governance Model to strengthen Data APIs with use-case-based access and data protection.

Reusability: Any software system/application used should be IT infrastructure-agnostic. Any operational or technological component should be inherently designed so that it can be reusable with only behavioural changes to fit to achieve another business objective in the process.

Independence: The entire technological stack (hardware/software) and operational process should be loosely coupled so that it caters and adapts to new-age technologies in the IT hardware industry, like PAAS, IoT-enabled, and also in software industry like AI/ML-based project approval assisting systems.

Thus, SM-RE@di envisions the following for Madhya Pradesh Real Estate:

- To provide background on issues and challenges in establishing interoperability and information sharing among various departments and e-Governance systems involved in delivering services related to land, property registration, development, building approvals.
- To describe an approach to overcome these challenges: the approach specifies a set of commonly agreed concepts to be understood uniformly across all departments and e-Governance systems.
- To offer a set of specific recommendations that can be adopted by various stakeholders to proactively address the challenges in interoperability.
- Suggest ICT components which can be used to enable operational as well as technical interoperability.

Acknowledgement

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References

Atal Bihari Vajpayee Institute of Good Governance and Policy Analysis, GoMP. (2019). *Madhya Pradesh real-estate policy, 2019*. Urban Development and Housing Department, Government of Madhya Pradesh. Retrieved from https://aiggpa.mp.gov.in/uploads/project/Real_Estate_Policy_for_Madhya_Pradesh_2019_compressed.pdf.

Das, R. K., Patra, M. R., & Patnaik, S. (2014). SOeGov: A service oriented e-governance approach for effective service delivery. *International Journal of Information Technology Convergence and Services*, 4(3), 1–20.

Department of Industrial Policy & Promotion. (2017). *State business reform action plan – Implementation guide for states*. Retrieved from http://andssw1.and.nic.in/swc/assets/docs/EoDB-Guidelines/Implementation_Guide_%20State%20BRAP_2017.pdf.

Humphrey, A., & Mayoka, K. G. (2015). A framework for usability of e-government services in developing countries. *Global Advanced Research Journal of Social Science*, 5, 1–10.

Mishra, P., & Suhag, R. (2017). *Land records and titles in India*. New Delhi: PRS.

National Real Estate Development Council. (2017). *Report of the committee of streamlining approval procedures for real estate projects in India – Key recommendations (volume 1)*. Committee on Streamlining Approval Procedures for Real Estate Projects – SAPREP Ministry of Housing and Urban Affairs (2013). Retrieved from https://prsindia.org/files/bills_acts/bills_parliament/2013/SAPREP_Committee_draft_report_Volume_I.pdf.

Nordic Institute for Interoperability Solutions, 2018. X-Road as a Platform to Exchange MyData. s.l.:s.n. https://www.niis.org/blog/2019/10/30/x-road-as-a-platform-to-exchange-mydata

OSCRE. (2019). *Building digital ecosystems in the housing industry*. London: OSCRE.

Sankhe, S., Vittal, I., Dobbs, R., Mohoan, A., Gulati, A., Ablett, J., ... & Sethy, G. (2010). McKinsey Global Institute, 2010. *India's urban awakening: Building inclusive cities, sustaining economic growth*. Available online at - https://www.mckinsey.com/featured-insights/urbanization/urban-awakening-in-india Date of Access June 12, 2022.

Sharma, Y. (2019, December 1). NITI Aayog preparing draft model Land Title Act, 2019. *The Economic Times*. Retrieved from https://economictimes.indiatimes.com/news/politics-and-nation/centre-aims-switch-to-conclusive-land-title-system/articleshow/72322631.cms.

Shi, L., Nikolov, N., Sukhobok, D., Tarasova, T., & Roman, D. (2017). The proData market ontology for publishing and integrating cross-domain real property data. *Territorio Italia*. Retrieved from https://www.agenziaentrate.gov.it/portale/documents/20143/325279/The+proDataMarket+Ontology+Shi_1+Shi.pdf/48ed22e7-b74c-3c4c-8552-27e37da86935.

World Bank. (2014). *Doing business 2014 – Understanding regulations for small and medium-size enterprises*. Washington, DC. The World Bank and the International Finance Corporation.

World Bank. (2019). *Doing business 2019 – Training for reform*. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.

5

CRITICAL SUCCESS FACTORS FOR ENABLING A NATIONAL DATA EXCHANGE PLATFORM

Ankit Anand

5.1 Introduction

Amidst the growing importance of the data revolution and the technological advancements in the field of AI and Big Data, it has become pertinent for nation-states to be able to draw a roadmap for data collection, processing, and utilisation–especially for delivering public good, realising their economic aspirations, and even for preventing misuse by foreign powers. Given that India has an abundance of data that continues to increase, owing to the unique combination of its demographic quotient coupled with the pace of internet adoption and increase in digitalisation, it becomes even more important that we have a National Data Exchange that allows us to harness the power of this data–whether it is from the public sector or the private sector. However, any such data exchange platform would also need policy support, not only for it to be legal but also to provide trust-based services and to avoid litigation costs.

Currently, we do not have fully evolved data exchange platforms, per se, in our country. The National Data Sharing and Accessibility Policy (2012) played a fundamental role in accelerating access to government data by giving birth to India's Open Government Data Platform which is present at data.gov.in. This open data portal contains multiple datasets from various departments but is mostly one-way in its operation. Besides, various departmental websites offer their data either in raw form or in pre-selected processed form. In the private sector, too, we can find instances of data being shared by organisations through their portals. Still, there is no formal platform where various institutions may come along and exchange their data or even allow visitors to use data from multiple sources in a single

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place. However, there is a desperate need to bring the whole-of-government approach, as this piecemeal system has not been very successful in helping put data governance in a shape that could aid both the public sector as well as a commercial enterprise.

Although technology has enabled us to establish huge data lakes, the absence of a coordinated regulatory approach has ensured that we remain backwards in our approach to using data to solve problems (NITI Aayog, 2018; United Nations Department of Economic and Social Affairs (UNDESA), 2020). One of the major reasons for this is the absence of an overarching policy framework that deals with the usage of data. Thus, there is a need for crafting practical approaches to architect and implement a National Data Exchange that involves all segments of our federal structure and leverages the strengths of the private sector. This could help us in achieving the aim of a USD5 trillion economy much faster, as it could lead us to identify the problems and their solutions in a relatively easy manner. For instance, the access to institutional finance is a known problem in India's agriculture sector. A majority of small land holders are denied this facility because of the absence of a documented credit history. The recent emergence of direct benefit transfer in the accounts of farmers and the increase in digital payments means that a documented history could now be traced for the farmers. A data exchange could therefore be set up that allows the exchange of this information with various public and private entities thereby giving the farmers entry into the formal system. Coupled with the digitised land records, this may lead to a revolution in Indian agriculture. Similar examples in the field of healthcare and education could be easily visualised. Such data exchanges would allow the governments to track the impact in near real-time and make policy interventions with much greater clarity. One of the most useful instances could be the use of cross-sectoral data in creating a multidimensional poverty index (Oxford Poverty and Human Development Initiative (OPHI), n.d.). Such indices are being used to closely understand and monitor the causes of poverty and are being refined to capture the instances from various dimensions – not being limited to just 'income of the household'. In addition, these exchanges would open newer avenues for businesses, thereby giving them growth opportunities in hitherto unexplored territories. Another interesting use case is being implemented through the National Digital Health Mission wherein it has been envisaged that health data may flow between various service providers (such as diagnostic labs) and doctors with the consent of the patient. This would not only reduce the burden of carrying various reports but would also help the user in getting near real-time and holistic health updates, including historical references. Such a platform could also aid in the design of public health and preventive healthcare-related policies in the country along with contributing adequate sources of finances for diseases that carry more burden. Currently, the Indian policy design is more on a reactive basis, but the

availability of such aggregate data in near real-time would also aid in proactive policy making.

The focus on data collection, processing, and analysis could be attributed to three primary reasons–advancement in technology-driven mainly by corporates, affordability of the internet for consumers, and increasing focus of the governments on digitalisation. With the focus increasingly shifting to Artificial Intelligence with relevance to the need and mechanism to regulate it, countries have started pursuing their national AI strategies. Data exchanges are at the heart of these strategies. Our national AI strategy also carries a recommendation for establishing such a data exchange by the name of the National AI Marketplace (NITI Aayog, 2018, p. 73). The strategy also details the impediments in its creation as well as focuses on why the government might have to take the first step in this direction.

Through this chapter, the author has attempted to identify critical success factors for implementing a National Data Exchange from an Indian perspective. A data exchange platform can also be recognised as an advanced version of e-governance systems. As such, many of the critical success factors required for e-governance would serve here as well. Othman and Razali (2018) have listed 12 such critical factors and have divided them into technical and non-technical factors. Taking this as a reference, the chapter will try and answer the following questions:

i. What would be a suitable policy framework that provides regulatory protection to both the data owner as well as the data user?
ii. How can participation in such a National Data Exchange be incentivised for both the public sector and the private sector enterprise?
iii. How can the infrastructure and skill gaps be reduced in the public sector institutions to enable overall convergence and a future-proof system?

The discussion in this chapter revolves around recommending policy action in an advanced technological space that is dynamic and is mostly in the evolution phase and has used exploratory research tools. The methodology is primarily focussed on secondary research based on literature review and case studies, both from the domestic and the international arena, as well as personal interactions with policymakers.

As such, Section 5.2 focuses on enabling a policy environment for the data exchange, while Section 5.3 discusses steps for incentivising public and private collaboration, followed by Section 5.4 that identifies the gaps in the infrastructure and public sector skill set and recommends remedies to overcome these gaps. The chapter concludes with a summary of the key recommendations around the observed issues.

5.2 An Enabling Policy Environment

Technological advancement and human endeavours have constantly been increasing the horizon of data usage in the world. However, attempts at harnessing data for policymaking have been restricted due to the absence of a comprehensive policy framework, including the key questions around ownership, privacy, and monopolistic behaviours.

There has been enough literature that highlights the positive impacts of using data for policymaking. The Economic Survey of India 2018–2019 devoted an entire chapter highlighting the advantages of allowing datasets to be interlinked–to make them more useful for a variety of purposes for public welfare and social good. It went ahead and equated data to the very principle of democracy–'of the people, by the people and for the people'. Although this chapter was limited in its coverage around data available with public agencies, the same principles hold even for data with private entities. Therefore, the criticality of the success of any National Data Exchange lies in building an enabling policy framework that could catalyse these use cases and make this data work 'for' the people.

Hallsworth and Rutter (2011) have suggested that any framework for sound policymaking must include seven fundamental concepts. Clarity on goals is the first such concept enunciated in that framework. As such, any regulatory schema enabling data exchange will have to be judicious in its categorisation and taxonomy for the data to make it comprehensive and compact without making it complicated. This does not mean we tightly define the terms, but it suggests that we must make things specific and non-repudiable, leaving enough space for future use cases.

The first area of concern is ownership and privacy-related issues. Per the existing literature on the topic, the researcher has attempted a categorisation as shown in Figure 5.1. The logical next step would be to understand their definitions. The analysis in this chapter would be limited to bringing out the development of the policy framework and would not delve into defining these terms.

5.2.1 Inherent Characteristics

Every data (set) would contain elements that would have some inherent characteristics that could be used to identify the person from whom the data is collected. The Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules, 2011, notified under the Information Technology Act 2000, defines 'personal information' as 'any information that relates to a natural person, which, either directly or indirectly, in combination with other information available or likely to be available with a body corporate, is capable of identifying such person'. The rules even go ahead to define what all data would be considered

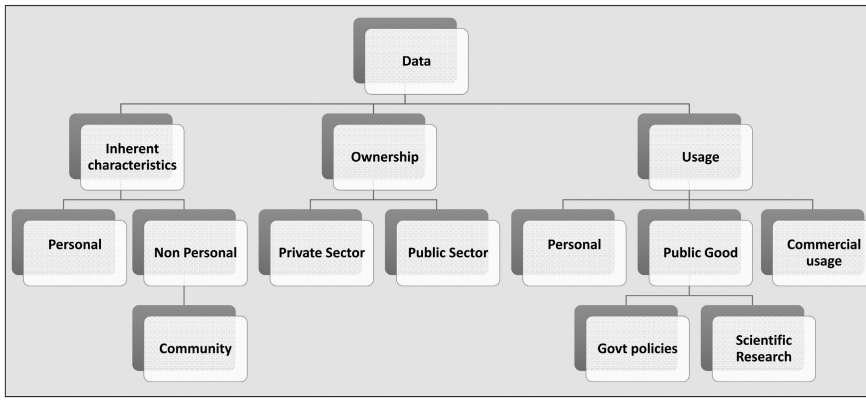

FIGURE 5.1 Categorisation of Data for Policy Making

Source: Author

'sensitive personal data'. The draft Personal Data Protection Bill 2019 builds on this definition and adds 'and shall include any inference drawn from such data for the purpose of profiling' to the above definition. It also has different provisions for the treatment of 'sensitive personal data' and 'critical personal data'. Globally too, various privacy acts have either been promulgated or are in the process of being adopted by the national/state legislatures. The European Union's General Data Protection Regulation has been touted as one of the most comprehensively framed regulations in this respect and has proved to be an important catalyst in shaping the global debate around privacy. Overall, there is an emerging consensus on the enactment of such privacy legislation and the next round of changes would be mostly through the interpretation of such rules by judicial action.

Once the personal aspects of data have been characterised, it then becomes essential to clarify the role and usage of what can be termed as non-personal data. As a corollary, anything that is not personal should be non-personal. The EU has taken a similar approach in its regulatory framework for the free flow of non-personal data (EU, 2018). In India, the Ministry of Electronics and Information Technology (MEITY) constituted a committee of experts to study and suggest a regulatory framework for non-personal data. This committee released a draft report on its findings and suggestions in July 2020 for consultations and published a revised report in December 2020 for further consultation. The definition in this report is more of a suggestive draft that includes the above approach. The report cites data generated by weather-related sensors, industrial machines, or public infrastructure as non-personal data. Additionally, it mentions that data anonymised of personal information and data 'that never related to identified or identifiable

natural person' could also be included in this definition. Since the definition is evolving, various national regulations have also been recommending Data Trusts that could become an intermediary and help manage the regulatory aspects around the collection and usage of non-personal data (European Commission, 2020b; MEITY, 2020b)

5.2.2 Ownership through Collection

Another key distinction in data is regarding the ownership of data based on its collection. In most of the regulations and policy papers, the Data Principal has been recognised as the owner of personal data, but it is still a critical task to define the owner of the data once it has been collected from the Principal. For any data collected by the public sector, there is a stated position that the same must be made available to the public at large through the open data policy of the government (Department of Science and Technology (DST), 2012). However, the situation is a bit different when it comes to private/firm-level ownership of data. To make things clearer, there has been a growing discussion on the taxonomy to be adopted with an increased focus on inferred data or derived data. Organisations have been demanding that such inferences must be given protection under copyright laws as these are the result of analytical actions performed by such firms on the data collected or collated by them.

Another interesting concept evolving within India is that of the community ownership of data (MEITY, 2020b) which would be exercised through Data Trusts.

5.2.3 Usage of Data

Data has been collected by various entities for commercial as well as non-commercial usage. The public sector has generally been using the collected data for making policy decisions, but of late, there have been instances of providing a refined version of the collected data on a commercial basis. On the other hand, private entities have used this data mostly for commercial reasons. However, within India, there have been sectoral regulations and controls on how such data can be used. With an increased focus on better policymaking, governments worldwide are approaching new-age app companies to share their data for better policymaking. Most of these collaborations have been in the form of data philanthropy. This is mostly because there haven't been any hardwired regulations under which governments can ask for such data–but some recent regulations are being written with this context in mind. For instance, India's draft Personal Data Protection Bill (PDP), 2019, under section 91(2) has provisions to this effect. The EU's Data Governance Act, on the other hand, would allow the re-use of public data

even where 'such data is subject to a right of others'. It also goes ahead to allow remuneration-based data sharing, a provision that is also placed in India's upcoming non-personal data framework. Such data commerce could very well play a foundational role in enabling a Data Exchange Platform. NITI Aayog (2018) mentions that a National AI Marketplace would help in reducing pricing-related aberrations as the frequency of transactions increases.

The COVID-19 pandemic has also furthered the cause of data collection and its use for scientific and public good measures. Various governments, at times aided by the private sector, have used app-based mechanisms to trace and track. However, the absence of an overarching framework gave rise to apprehensions of government surveillance and other non-authentic data usage. The scepticism, thus generated, lowered the efficacy of this mechanism. With time, we are going to need more and more data to effectively reduce the time taken for developing vaccines, as indicated in the current times. Another common use case could be sharing of data related to X-ray and MRI scans. In a country like India, millions of such scans take place every day. This treasure trove of data, once anonymised, could be utilised to develop algorithms which can help in detecting anomalies for the public at large and may help in not only bringing down the cost of detection but also saving human lives. Apart from the field of healthcare, data sharing for the public good can be envisaged in the field of agriculture. The government has already embarked on a mission to produce soil health cards. The observations thus developed over time could be very helpful in detecting the salinity of soil as well as aid its regeneration, thereby saving precious natural resources. Many similar use cases could be employed in detecting impurities in water by using sensors distributed across the network of pipelines which are being set up in the Jal Jeevan Mission. Another interesting use case could be the assimilation of automobile diagnostics and sharing them across the wider community for fast-pacing the development of better alternatives.

As such, we would also have to evolve frameworks around the collection and usage of such data. The Data Governance Act of the EU has initiated the process by proposing a regulatory regime under the definition of 'Data Altruism'. It also calls for a new category of intermediaries that would be used for data exchange. India's draft PDP Bill has also defined a specific role for a new intermediary that will be called 'consent managers'. Further, NITI Aayog has also proposed the Data Empowerment and Protection Architecture (DEPA) framework, which would allow multiple parties to exchange their data with consent being transferred electronically (NITI Aayog, 2020). This would also aid the free flow of data across ecosystems by using these consent managers.

The most important point that could be understood from the above discussion is that the regulatory framework is still evolving. Even though some

jurisdictions have enacted privacy laws, the same is being constantly scrutinised through judicial interpretations. Particularly, in India, the PDP Bill is undergoing legislative scrutiny and it will still take some time, first to be adopted by the Parliament and then to be enacted as per provisions. The non-personal data framework is still being discussed at the level of broad principles.

Another key limitation is that of sectoral regulations and how they are addressed through the final legislation. Additionally, there is parallel legislative and judicial scrutiny going on from competition and anti-trust perspectives. The case law that emerges would again affect the ownership as well as usage and sharing of the collected data.

Therefore, it is pertinent that any National Data Exchange platform is accompanied, or preferably preceded by an enabling legal framework that establishes clear ownership titles and rights. Without this clarity, it would be difficult for the public sector and the private sector to build and contribute to such an exchange platform.

5.3 Attracting Public and Private Participation

For any data exchange platform to achieve its objectives, it would need active participation from several data owners, processors, trusts, etc., be it from the public space or the private sector. However, the nature of participants from both these spheres is quite different. Public sector agencies have been collecting data intending to make well-informed policies; thus, the frequency of collection has been slow, but the scope of the collection is generally very vast, as is in the case of the census and various NSSO surveys. The private sector, on the other hand, has narrower objectives and designs its data collection mechanisms more from the commercial angle. Therefore, the motivation factors for the engagement of participants from both these sectors would differ accordingly, along with their perceptions of such a platform.

5.3.1 The Public Sector

The public sector of any country, including ours, hosts a treasure trove of data, but being from the government side, agility on the technology front and capacity addition has always been a challenge. Moreover, the data collected by government agencies is also bound by various legislations or decrees and may not be amenable to being shared in the format that it is collected. Additionally, the digital means of data collection have picked up only in the last few years. As such, the availability of digital infrastructure as well as the digitisation of legacy data is a mammoth challenge. Along with this, public agencies are also bound by confidentiality and privacy

clauses for the same. Above all, multiple government departments collect data independently and in different formats. Also, there would be issues of skill and competency as public agencies are comparatively slower to adopt newer technologies than their private sector counterparts. Importantly, data collection exercises are also budget intensive. With an omniscient crunch in public finances, the objectives are met by choosing the 'cheapest' contractor or technology. Thus, political will and a thrust from the top leadership become extremely critical for making way for new concepts and advanced technologies to be used by public agencies while conducting such massive data collection exercises.

Klievnik et al. (2017) have devised a framework to study the readiness of public sector agencies for the usage of Big Data, wherein the assessment depends on three factors–(a) organisational alignment; (b) organisational maturity; and (c) organisational capabilities. We could easily categorise the factors discussed above into these three categories. The following section elaborates on the need for infrastructure and relevant skills in the public sector.

The UN eGovernment Survey, 2020 posits the importance of the 'system thinking approach' and advocates its usage to derive organisational and technological interoperability. It also details an approach for 'digital government transformation and capacity building', as shown in Figure 5.2, that could very well be adopted in the current context.

To build confidence in the data exchange platform and to motivate the public sector employees, the government(s) could use the various components and start providing clarity with a statement of purpose. To begin with, data privacy and governance frameworks can be clarified and legislatively defined to indemnify the users of this data. With the growth and acceptance of privacy-enhancing techniques, these roadblocks around privacy could be handled, but accountability should also be defined to keep the system in check.

Another key issue of standardisation could be solved by taking either the private sector's help or using monetisation principles, i.e. the data could be provided in standard formats against the defined payments. This could help the public agencies overcome the shortfall of the budget as well as create some capital reserves that could be used for the betterment of the systems. For instance, New Zealand's official statistics agency, Stats NZ, has been trying this commercial route. It has created a commercial arm, known as Data Ventures (Unique Trusted Data, n.d.), that works with public and private sector companies to collect data from them and build it into a data product, inherently protecting the IP of all concerned, and then monetising this product. There is another example from New Zealand, wherein the Social Investment Agency (now rechristened as Social Wellbeing Agency) has partnered with a private player to evolve a national data exchange platform.

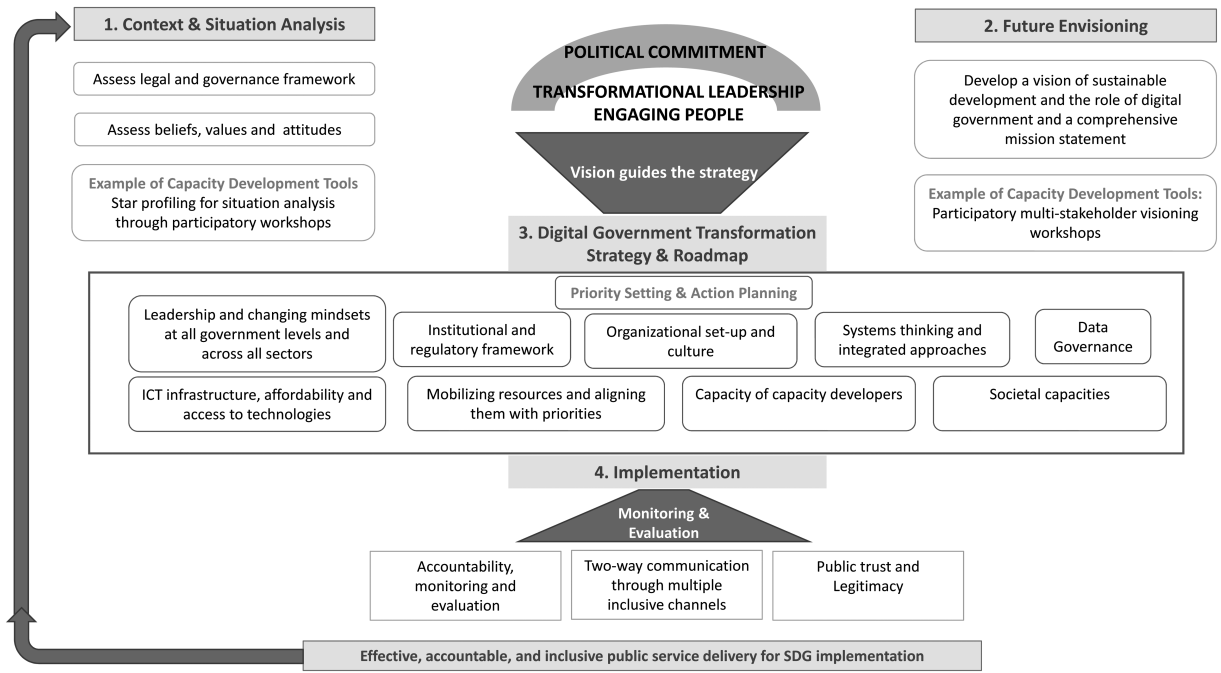

FIGURE 5.2 UN's Suggested Holistic Approach to Government Transformation and Capacity Building

Source: UNDESA, 2020, p. 182

And most importantly, the intrinsic motivation of public sector employees must be drawn through the leadership approach of the highest offices of the land. Such support not only galvanises the different units but would also catalyse the progress of the ongoing efforts. Efforts should be made to utilise the scholarship around Public Service Motivation (Chen & Hsieh, 2015) to address these issues.

5.3.2 The Private Sector

In recent times, we have witnessed the transformational growth of the app economy. This has been mostly led by the private sector and has made the sector 'data-rich'. Not only established firms but small-scale start-ups have started creating a stronghold of data on their adopted sectors. As such, governments have started reaching out to private firms to seek support in collating data, not only in times of need, such as the current pandemic, but also for making informed public policy choices in regular instances.

Susha et al. (2019) give an interesting view on the nomenclature being used for defining data-sharing-based partnerships, as illustrated in Figure 5.3.

As can be seen, the partnerships are mostly unstructured and seem to be driven by philanthropic ideals. Therefore, we must understand the challenges faced by private firms when it comes to sharing data with public agencies so that these could be addressed. Without such changes, it would be difficult for the private sector to contribute to any Data Exchange organically except for voluntary collaborations.

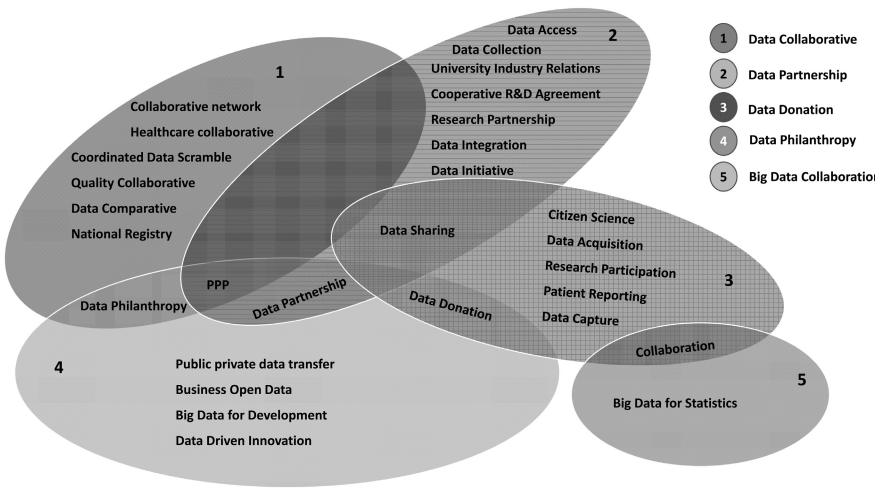

FIGURE 5.3 Nomenclature of Data-Driven Social Partnerships
Source: Susha et al., 2019

Susha et al. (2019) had comprehensively shown the issues prevalent in the wide literature on the subject of public-private data sharing by bucketing them into four categories – regulatory, organisational, data related, and societal. A few important ones are present in Table 5.1.

Going a step further, Martens and Duch-Brown (2020) presented an economic analysis and highlighted the following factors as being of primary concern for purposes of Business to Government (B2G) data sharing:

- Ex-ante transaction costs because of lack of technical infrastructure and skills within the public sector as well as ex-post risks related to unauthorised data usage or leakage.
- Lack of trust resulting in the perception that the shared data might be used against them for anti-competition investigations.
- Absence of price discovery mechanisms and financial incentives.

Another evolving threat relates to domestic laws and regulations being framed by countries which prohibit the sharing of data collected by companies under their jurisdiction, with the countries from where the data was collected as part of their business operations.

Some progress is being made on this front, wherein nation-states or groups of nations are working on reforms that could ease the regulatory burdens and fasten the progress. The European Commission (2020a) lists out the revised list of principles for B2G data sharing within the European Union. These deal with mitigating both the monetary risks as well as the reputational risks. On the other hand, capacity-building initiatives are also being

TABLE 5.1 Categorisation of Challenges in Data-Driven Partnerships

Data Related	*Organisational*	*Regulatory*	*Societal*
Privacy-related issues	Lack of or misalignment of incentives	Lack of consistent and comprehensive legal provisions	Data ownership
Bias in data	Lack of coordination among various departments	Ambiguous data sharing policies of organisations	Digital divide
Risk of flawed data analysis	Resource constraints	Lack of clear and ethical guidelines	Public perception
Lack of appropriate tools and consistency	Fear of losing control and lack of trust	The problem of informed consent of data subject	Implementing interventions based on data insights

Source: Susha et al, 2019

planned and implemented in various institutes. One such initiative is the Contracts for Data Collaboration, which is being run by the GovLab, SDSN TReNDS, University of Washington's Information Risk Research Initiative, and the World Economic Forum. The Contracts for Data Collaboration has created a repository of Data Sharing Agreements and has used real-life examples to illustrate the shortcomings as well as their resolutions that may help users while building such agreements (Hayden, 2020).

In light of these submissions, it could be ascertained that (a) the policy environment – both from a privacy and competition lens, and (b) the quality of infrastructure and competence within the public sector could act as major enablers for B2G data sharing if enacted correctly.

5.4 Addressing Gaps in Infrastructure and Public Sector Skillset

As per its etymology, 'infrastructure' is composed of 'infra' and 'structure'. Infra means below or underneath, and as such, the word 'infrastructure' came to be used for the basic structure on which military operations depended. Of late, infrastructural growth has become the foundation for economic growth as well.

With the coming of the digital age, the focus on digital infrastructure has come at par, and at times exceeds that on the physical one. Increasing efforts are also being made by governments to cover their geographic area with digital connectivity and digital gateways. In the same context, if data is the 'new oil' or 'sunshine' ('Are data more like oil or sunlight', 2020), then we need the digital version of our 'oil-rigs' or 'the energy grids' to be able to extract the economic and the social value out of this precious resource. The data exchange platforms could be these grids that help us achieve the stated objectives.

This development has been gradual. The world has witnessed the evolution of e-governance systems, and the field is now more easily recognised by GovTech. If divided into phases, we could attribute phase 1 to the basic automation of government processes and phase 2 to digitalisation. Currently, GovTech systems are said to have been at the cusp of phase 3, wherein the focus is on the development of the entire ecosystem rather than any single platform. Figure 5.4 describes the journey in detail.

As is generally known, that major part of the spending in creating infrastructure is done by the public sector. Similarly, for the digital world and particularly for the data exchange platforms, the government seems to be the most appropriate owner or steward to lead the development.

This chapter also advocates that the National Data Exchange should be built under the ownership of the government with active collaboration from the private sector. This assumption draws strength from the data

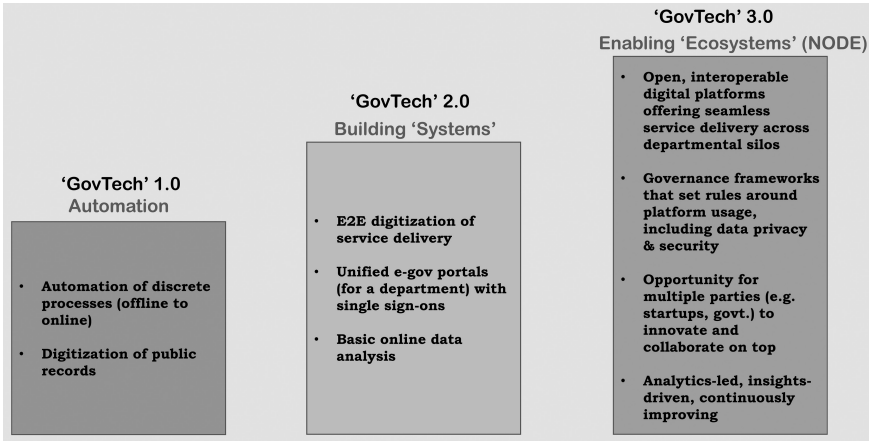

FIGURE 5.4 Evolution of e-Governance

Source: MEITY, 2020a:3

governance mechanisms being put in place–nationally and globally. It has been brought out in multiple publications that a limited set of private organisations are becoming 'data' monopolies or oligopolies. As such, a platform with government ownership would bring in the sense of equity along with regulatory supervision needed within this evolving ecosystem. More so, it will enable a level-playing field between the incumbents and the start-ups. However, instead of absolute ownership, the best results could be achieved in a public-private partnership model. We, in India, have experience in such a model and could easily replicate the ownership structure of the National Payments Corporation of India (NPCI) which is an amalgamation of various public sector undertakings, private banks, and even fintech firms (NPCI, n.d.; 'NPCI makes the private placement of 4.63% to 19 entities', 2020).

For the purpose of this chapter, digital infrastructure has been further disaggregated by the author into 'hardware' or the 'platforms' and software or the 'skills'.

5.4.1 The Hardware or the Platforms

Given India's tryst with the telecom revolution and the spread of the internet in recent years, the pace of digitalisation has been rapid in most of the emerging GovTech systems. Presently, we have quite a few functioning systems, which could be termed as data exchange platforms for the 'limited' or 'singular' purposes that they are designed for. A few of them are mentioned below:

i. The Aadhaar Platform is being used by various service providers for authentication purposes.
ii. The Account Aggregators, once licensed by RBI, are able to procure an individual's financial data from various service providers and showcase the results on a single screen (Sahamati, n.d.). The OCEN framework has been developed by CredAll Collective to work in tandem with the Account Aggregator system and democratise small-scale lending for MSMEs.
iii. The Public Credit Registry is another example from the financial world. This would help in building a credit profile of an individual after sourcing data from various financial service providers.
iv. The Mobile Number Portability Clearinghouses could also be categorised as a data exchange platform, as they receive and dispatch data pertaining to mobile number portability requests among the telecom operators.

The learnings from all these experiences have served the country well and we are now witnessing a spurt in Open Data ecosystems. The National Open Digital Ecosystem (ODE) has been defined as 'open and secure delivery platforms, anchored by transparent governance mechanisms, which enable a community of partners to unlock innovative solutions, to transform societal outcomes' (MEITY, 2020b). These would not only be an aggregation of the distributed services/platforms pertaining to a single department, but would also aid inter-sectoral collaboration, aided by the use of open application programming interface (API) and the open data approach being adopted. These ecosystems are also a representation of the whole-of-government approach, which is not only an essential but an indispensable feature of the entire work structure. A BCG-ONI (2020) report estimates that more than USD 700 billion worth of additional value and savings can be generated in India by 2030, by setting up ten high-potential National ODEs.

The public sector is already working on a few such initiatives, which are as follows:

i. National Digital Health Mission (NDHM). The mission, being driven by the National Health Authority, envisages the creation of an ecosystem that represents the whole-of-government approach by connecting the patients, the institutions (hospitals, laboratories etc.), the service providers (insurance, diagnostic etc.), and the governments (Union and State) through the use of IT systems, providing consent-based information exchange as well as portability. Although the mission is in pilot mode, the government has already designed and deployed a sandbox for any interested party to participate in the same (NDHM, n.d.).

ii. Indian Urban Data Exchange (IUDX): This platform has been launched by the Indian Ministry of Housing and Urban Affairs (MoHUA) on a pilot basis. The IUDX is based on the underlying data collected in the smart cities[1] and aspires to be of use not only in the maintenance of the infrastructure but also for newer use cases that may evolve after such data is analysed. It would follow the open-access model and would be accessible through APIs (IISc-Robert Bosch Centre for Cyber-Physical Systems, 2018).
iii. The Government of Telangana has also announced the creation of a data exchange platform as part of its AI framework (ITE&C Department, 2020).
iv. The Ministry of Agriculture and Farmers Welfare has released a consultation paper on the India Digital Ecosystem for Agriculture, which prominently talks about setting up a Data Exchange Platform for the agriculture sector (Department of Agriculture, Cooperation & Farmers Welfare, 2021).

Although these platforms are in their initial stages of implementation, the overall momentum seems to be in the right direction, and it is through churn that the best model would evolve. As can be seen, India has made considerable progress in building such platforms and the need for institutionalising policy reforms would play a bigger role in easing their implementation and adoption. One of the first steps in this direction would be to study the impact of the National Data Sharing and Accessibility Policy 2012. Krishnakumar and Gupta (2021) have pointed out both the lacuna of this policy and the improvements that can be made to accelerate sharing of government data, which is already being generated as an outcome of this policy.

Globally too, there are only a few examples of national data exchange platforms. The Estonian X-road project was probably one of the first implementations of the data exchange platform and has been active since 2001 (Paide et al., 2018). The Singapore Financial Data Exchange (Yu, 2020) and Open Banking in the UK (Open Banking, n.d.) are like the Indian Account Aggregator framework. Similar to the ODEs, European companies and public agencies are collaborating to create a pan-European Cloud Network by the name of Project Gaia-X (Federal Ministry for Economic Affairs and Energy, 2020, 2020). The US Social Security Department also operates a network like Aadhar for exchanging information about the social security number of US citizens. Apart from these public platforms, there are a few data exchange platforms operated by non-government entities too and can be seen in the compilation presented by Singh (2019). Overall, this is an evolving space but one that has an important role to play in the future, especially in the context of digital currencies coming into play.

5.4.2 The Software or the Skills

From the submissions made in the section above, it is amply clear that the platforms are highly technical and would require specialised skill sets, even from the ideation and design phase. Given the structure of the public services in India, we have a specialised core of services, but these are restricted to a select few departments or sectors.

The Union or State Public Service Commissions have been entrusted with a responsibility to choose people primarily for administrative job roles, but with the increase in design and deployment of digital infrastructure, there is a definite need for 'technocrats' – people with specialised skill sets to deal with such specialised systems. Skills like data architecture design, cyber security, etc. are some of those that would need people from the field, and it is rare to find a government servant who has worked in these types of job roles in their typical career. The UN eGovernment Survey 2020 discusses this aspect of the problem and goes ahead to recommend suitable job descriptions and skill set requirements for data users in the government. These have been mentioned in Table 5.2.

As such, there are specific skill set requirements suggested for each of the designated role. Therefore, it becomes necessary for organisations to do a skill-gap analysis across their human resource network and identify both the skills that are present but need to be sharpened and the skills that are not there at all. The Open Data Institute's Data Skills Framework ('ODI', n.d.) can be utilised as an important tool for any such exercise in the public sector. It helps the organisation understand the key skill sets and analytical requirements from both the management perspective as well as the operational perspective. The framework as shown in Figure 5.5 is not a rigid marker but can be used flexibly as per the demands and the nature of the organisation. As public sector agencies are more domain-focussed, such a flexible framework can come to their aid in helping design their data journey, from the basic phase to the advanced stages.

It has been generally observed that projects of this nature are generally outsourced or subcontracted to the private sector not only for implementation but also at the planning and procurement stages. This stop-gap arrangement could suffice only for a limited period, but with an increase in such infrastructure, we would need a specialised core of services or a framework through which private individuals could be laterally hired for government services. The model adopted for the UIDAI[2] project could be an initial framework, but transparency and accountability requirements demand better-defined arrangements going forward.

If we glance towards the developed economies, we could observe the emerging trends in their public services. Many countries have established dedicated agencies for carrying out the digital transformation activities as

TABLE 5.2 Roles and Skill Sets for Data Users in the Government

Roles (non-exclusive)	*Description*	*Required skill sets*
Data leadership, data stewards	Various titles and functions: • Chief data officer (national and/or subnational) • Chief digital strategy officer • Chief information officer • Chief government technology officer • Chief evaluation officer • Chief innovation officer • Data ambassador	Leadership skills (in technical and policy areas) to provide data oversight, policy, and technical frameworks for data reuse, sharing, scalability (such as master data management), data quality, security, and privacy; set cross-government data standards and manage inventory of data assets; manage OGD
Policymakers and decision-makers	Ministers, secretaries, directors-general or other senior officials with decision-making roles	Understand and interpret reports in data analytics for value-adding insights and decision-making; derive data-driven or data-centric insights to generate desired outcomes and impacts through strategic decision-making. (Senior executives are unlikely to be engaged users of analytics technology, but can direct others to conduct analyses for them.)
Policy analysts (sectoral)	Those with analytical skills, especially with domain expertise relating to specific sectors (such as health or education); able to assist in policy analysis in support of public policymaking (from planning to implementation to evaluation)	Skills in using business intelligence tools and self-service analytics; adept at working with data to 'discover' answers; provide insights and foresight for policymakers to understand structured and unstructured data; use algorithms in analytics software programmes to make informed decisions in diverse fields (including health care, disaster management, crime and security, and traffic management)

(*Continued*)

TABLE 5.2 Continued

Roles (non-exclusive)	*Description*	*Required skill sets*
Public officers (administrators)	Majority of public sector employees	Able to benefit from data visualisations; can use data for daily operations or reporting
Data scientists	Technically trained specialists in analytics and data science; 'power users' associated with business intelligence	Trained academically or technically; have specific skills (able to deal with Python and other data tools and data services); able to handle data-based infrastructure, data warehousing and statistics; have a contextual understanding of domain subject-matter expertise; may have specialised skills (in areas such as AI)

Source: UN, 2020, p. 169

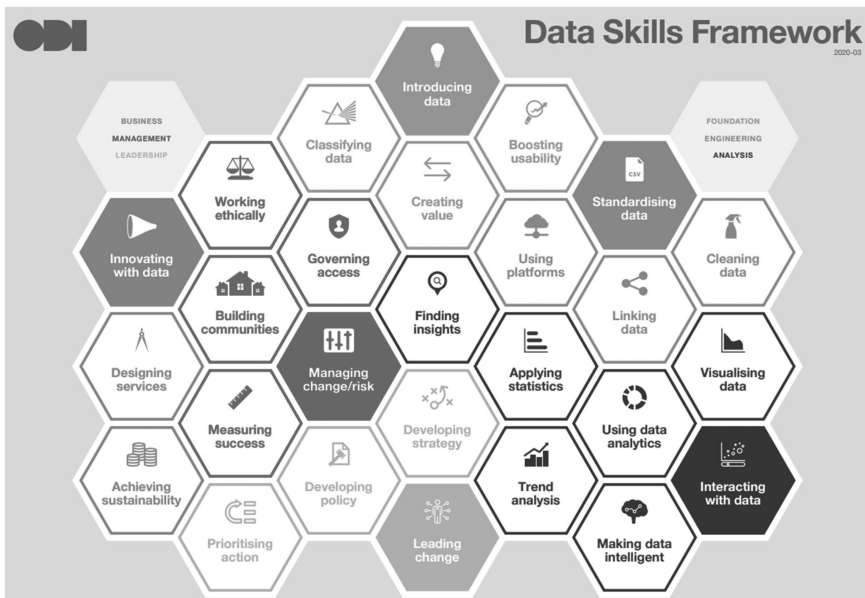

FIGURE 5.5 Open Data Institute's Data Skill Framework

Source: Open Data Institute

part of their governance agenda. Over the past couple of years, the United States has had the offices of a Chief Data Officer and then a Chief Technology Officer for the country. Estonia, the country known for digital government, had its President leading the mantle and has now established an office for a Chief Information Officer (CIO) for the county. UK's Government Digital Services is another such agency, and it operates within its Cabinet Office, which reports directly to the PM. It is touted that this UK agency has trained their US counterparts for a similar role ('The sad tale of Britain's government digital service', 2020b). Similarly, Singapore also has the Digital Industry Singapore (DISG) that leads the digital initiatives for the island nation. Additionally, they also have an office of the GovTech Singapore Team that drives the Smart Nation Programme and reports directly to their Prime Minister. Some countries have even appointed ambassadors to the tech world, whose primary job responsibility is to bridge the gap between political governance and technology governance. Denmark was one of the first countries to appoint a tech ambassador, but the trend has picked up and a sizeable number of countries have appointed officials in similar roles (Wichowski, 2021).

In India, we have the following officials who can be said to be responsible for establishing and operating the digital infrastructure in the country:

i. The Office of Principal Scientific Advisor to Prime Minister is responsible for all science and technology related innovative initiatives. Currently, the focus has also shifted to emerging digital technologies. The current official was appointed for a term of three years at a Secretary-level post, once he retired from the government.
ii. The Ministry of Electronics and Information Technology (MEITY) is the line ministry for all IT-related matters. It also hosts the National eGovernance Division that is responsible for various eGovernance initiatives and is headed by a CEO (typically an Additional Secretary level posting). The Ministry is also in charge of the National Informatics Centre (NIC) that operates the IT systems for all public agencies.
iii. Chief Data Officers are nominated by various public agencies and government departments under the directions in National Data Sharing and Accessibility Policy, 2012. Though they are responsible for the open data initiative of the government, a cursory glance tells us that most of these postings are treated as regular bureaucratic appointments and, thus, are vacant as the next-in-line officer has not joined (Chief Data Officers, n.d.).

Apart from the bureaucracy, technical talent is being hired through the National eGovernance Division at the operational level and by the ministry(s) for critical projects. As mentioned earlier, Mr Nilekani was hired

from the private sector to develop the unique identity card programme for the Government of India. However, as we progress in our digital journey, there is an urgent need to evolve from this ad-hoc approach to a more structured one. We need to come up with a planned process and framework for increasing the skill set as well as the size of the skilled workforce within the government, along with provisions for timely reskilling and upskilling in the fast-moving technology world. For the short term, lateral hiring from the market is the fastest way, though compensation remains a problem. But for the long haul, there is a need to create a specialised cadre from within the government, and across all levels in the hierarchy.

5.5 Conclusion

This chapter had aimed to identify and discuss the critical success factors for a National Data Exchange platform from the Indian perspective. The chapter has identified and focussed on the following three factors that would be crucial to the success of any such data exchange platform. First, a suitable policy framework that provides regulatory protection to both the data owner as well as the data user. Second, an incentivisation framework that accelerates participation for both the public sector and the private sector enterprise. Third, overcoming the infrastructure and skill gaps in the public sector institutions to enable them in the establishment and maintenance of data exchange platforms. Based on the review of existing and upcoming policies, e-Governance programmes, and analysis of various case studies from the domestic and international arena, it can be concluded that the whole-of-government approach is critical to driving such an initiative, as it cuts across horizontal and vertical divisions of power in the government. Given the nature of governance in India, any such mechanism would have to be driven through the political will from the highest offices and must be effectively supported by the executive branch at all levels through comprehensive policy planning and execution. Along with it, the policies need to be comprehensive and flexible, considering the needs of an agile and evolving ecosystem around data governance. The chapter also brought out various incentives that could be offered to the public sector agencies for opening up their data ecosystems and participating in a data exchange platform. On the other hand, the jury is still out on what could be the appropriate incentivisation framework for private organisations. Having said that, giving them protection from competition and regulatory compliances could be a good starting point and can enable a trust-based relationship for them to enhance and formalise their participation. Finally, the chapter discussed the state of digital infrastructure – both on the platform approach and the skills part. On the platforms' aspect, the coming years would be interesting as India is establishing several Open Digital Networks, and their scaling up would help

the stakeholders in understanding the implementation challenges as well as in spurring innovation through their architectural frameworks. As far as skilling is concerned, the chapter concludes that the government's short-term strategy of lateral hiring and skill-based outsourcing for these specialised projects has delivered some results, but in the long term, it would have to define and develop a programme that could yield civil servants and administrators who are well-versed with the skills to undertake such specialised projects in the digital world.

Notes

1 Smart Cities Mission was launched by the Govt. of India to help 100 cities of India in improving their infrastructure and deliver better services to the citizens through use of technological innovations and urban management systems.
2 Unique Identification Authority of India (UIDAI) is the statutory body that was created to enable unique identity for every Indian citizen, better known as Aadhar. Mr. Nandan Nilekani was appointed as the first Chairman of UIDAI in June 2009, in the rank of a Cabinet Minister. Mr. Nilekani was a private citizen at that time, serving as the Co-chairman of Infosys.

References

Are data more like oil or sunlight? (2020a, February 20). *The Economist*. Retrieved from https://www.economist.com/special-report/2020/02/20/are-data-more-like-oil-or-sunlight.

Boston Consulting Group & Omidyar Network India. (2020). *The potential of open digital ecosystems*. Retrieved from http://opendigitalecosystems.net/pdf/ODE-Report.pdf.

Chen, C. A., & Hsieh, C. W. (2015). Knowledge sharing motivation in the public sector: The role of public service motivation. *International Review of Administrative Sciences*, *81*(4), 812–832. https://doi.org/10.1177/0020852314558032.

Dahmm, H. (2020). *Laying the foundation for effective partnerships: An examination of data sharing agreements*. UN Sustainable Development Solutions Network's Thematic Research Network on Data and Statistics (SDSN TReNDS). Retrieved from https://www.sdsntrends.org/research/dsainsightsreport.

Department of Agriculture, Cooperation & Farmers Welfare. (2021, June). *Consultation paper on IDEA*. Ministry of Agriculture & Farmers Welfare. Retrieved from https://agricoop.nic.in/en/consultationpaper.

Department of Economic Affairs. (2019). *Economic survey 2018–19*. Ministry of Finance. Retrieved from https://www.indiabudget.gov.in/budget2019-20/economicsurvey/doc/vol1chapter/echap04_vol1.pdf.

Department of Science & Technology. (2012). *National data sharing and accessibility policy-2012*. New Delhi: Government of India.

EU. (2020b). *Proposal for a regulation of the European parliament and of the council on European data governance (data governance act)*. Publications Office of the European Union. Retrieved November 30, 2020, from https://ec.europa.eu

/digital-single-market/en/news/proposal-regulation-european-data-governance-data-governance-act.

European Commission. (2020a). *Towards a European strategy on business-to-government data sharing for the public interest*. European Union. Retrieved from https://www.euractiv.com/wp-content/uploads/sites/2/2020/02/B2GDataSharingExpertGroupReport-1.pdf.

Federal Ministry for Economic Affairs and Energy. (2020). *GAIA-X – The European project kicks off the next phase*. Federal Ministry for Economic Affairs and Energy (BMWi) Public Relations. Retrieved from https://www.data-infrastructure.eu/GAIAX/Redaktion/EN/Publications/gaia-x-the-european-project-kicks-of-the-next-phase.pdf?__blob=publicationFile&v=7.

Hallsworth, M., & Rutter, J. (2011). *Making policy better: Improving Whitehall's core business*. Institute for Government. Retrieved from https://www.instituteforgovernment.org.uk/sites/default/files/publications/Making%20Policy%20Better.pdf.

IISc-Robert Bosch Centre for Cyber Physical Systems. (2018). *The Indian urban data exchange an overview of the rationale, architecture and methodology*. Ministry of Housing and Urban Affairs. Retrieved from http://www.rbccps.org/wp-content/uploads/2018/12/The-Indian-Urban-Data-Exchange.pdf.

ITE&C Dept. (2020). *Telangana's AI framework*. Government of Telangana. Retrieved from https://it.telangana.gov.in/wp-content/uploads/2020/07/Govt-of-Telangana-Artificial-Intelligence-Framework-2020.pdf.

Klievink, B., Romijn, B.-J., Cunningham, S., & De Bruijn, H. (2017). Big data in the public sector: Uncertainties and readiness. *Information Systems Frontiers*, 19(2), 267–283. https://doi.org/10.1007/s10796-016-9686-2

Krishnakumar, S., & Gupta, A. (2021). *Accelerating data sharing and access implementation and monitoring recommendations on national data sharing and accessibility policy (NDSAP)*. Wadhwani Institute of Technology & Policy.

Martens, B., & Duch-Brown, N. (2020). *The economics of business-to-government data sharing* (JRC Technical Report No. JRC119947; JRC Digital Economy Working Paper 2020-04). European Commission. Retrieved from https://ec.europa.eu/jrc/sites/jrcsh/files/jrc119947.pdf.

Ministry of Electronics & Information Technology. (2020a). *Strategy for national open digital ecosystems consultation whitepaper*. Government of India. Retrieved from https://www.medianama.com/wp-content/uploads/mygov_1582193114515532211.pdf.

Ministry of Electronics & Information Technology. (2020b). *Report by the committee of experts on non-personal data governance framework*. Government of India. Retrieved from https://static.mygov.in/rest/s3fs-public/mygov_159453381955063671.pdf.

National Digital Health Mission. (n.d.). *NDHM – About us*. Retrieved February 12, 2021, from https://abdm.gov.in/home/abdm.

National Payments Corporation of India. (n.d.). *About NPCI—Enabling digital payments in India*. NPCI. Retrieved December 1, 2020, from https://www.npci.org.in/who-we-are/about-us.

NITI Aayog. (2020). *Data empowerment and protection architecture draft for discussion*. Retrieved from https://niti.gov.in/sites/default/files/2020-09/DEPA-Book_0.pdf.

NITI Aayog. (2018). *National strategy for artificial intelligence*. Retrieved from https://niti.gov.in/sites/default/files/2019-01/NationalStrategy-for-AI-Discussion-Paper.pdf.

NPCI makes private placement of 4.63% to 19 entities—ET BFSI. (2020, November 26). The Economic Times. Retrieved from https://bfsi.economictimes.indiatimes.com/news/fintech/npci-makes-private-placement-of-4-63-to-19-entities/79429646.

Open Banking. (n.d.). *About the OBIE*. Retrieved February 12, 2021, from https://www.openbanking.org.uk/about-us/.

Open Data Institute. (n.d.). *Data skills framework – The ODI*. Retrieved January 24, 2022, from https://theodi.org/article/data-skills-framework/.

Open Government Data (OGD) Platform India. (n.d.). *Chief data officers*. Digital India. Retrieved February 15, 2021, from https://data.gov.in/datacontrollers.

Othman, M. H., & Razali, R. (2018). Whole of government critical success factors towards integrated e-government services: A preliminary review. *Jurnal Pengurusan (UKM Journal of Management)*, *53*. http://ejournals.ukm.my/pengurusan/article/view/28138.

Oxford Poverty and Human Development Initiative. (n.d.). *Global multidimensional poverty index*. Retrieved January 21, 2022, from https://ophi.org.uk/multidimensional-poverty-index/#:~:text=The%20global%20Multidimensional%20Poverty%20Index,that%20a%20person%20faces%20simultaneously.

Paide, K., Pappel, I., Vainsalu, H., & Draheim, D. (2018). On the systematic exploitation of the Estonian data exchange layer x-road for strengthening public-private partnerships. *Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance*, 34–41. https://doi.org/10.1145/3209415.3209441.

Sahamati. (n.d.). *Sahamati—Collective of the account aggregator ecosystem*. Retrieved February 12, 2021, from https://sahamati.org.in/.

Singh, V. (2019, November 16). *Data marketplaces: A schema for voluntary data sharing*. Ikigai Law. Retrieved from https://www.ikigailaw.com/data-marketplaces-a-schema-for-voluntary-data-sharing/.

Susha, I., Grönlund, Å., & Van Tulder, R. (2019). Data driven social partnerships: Exploring an emergent trend in search of research challenges and questions. *Government Information Quarterly*, *36*(1), 112–128. https://doi.org/10.1016/j.giq.2018.11.002.

The European Parliament and The Council of The European Union. (2018). *Regulation (EU) 2018/1807 of the European parliament and of the council of 14 November 2018 on a framework for the free flow of non-personal data in the European Union*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1807&from=EN.

The sad tale of Britain's government digital service. (2020b, October 29). *The Economist*. Retrieved from https://www.economist.com/britain/2020/10/29/the-sad-tale-of-britains-government-digital-service.

United Nations Department of Economic and Social Affairs. (2020). *E-government survey 2020 digital government in the decade of action for sustainable development*. United Nations. Retrieved from https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020.

Unique Trusted Data. (n.d.b). Data ventures. Retrieved March 6, 2022, from https://dataventures.nz/.

Wichowski, A. (2021, April 16). *Nations need ambassadors to big tech*. Wired. Retrieved from https://www.wired.com/story/nations-need-ambassadors-to-big-tech/.

Yu, E. (2020, December 7). *National data exchange platform lets Singaporeans consolidate financial data*. ZDNet. Retrieved from https://www.zdnet.com/article/national-data-exchange-platform-lets-singaporeans-consolidate-financial-data/.

6

STRIVING TO BUILD CITIZENS' TRUST IN DIGITAL WORLD

Data Protection Bill (2021) of India

Charru Malhotra and Anushka Bhilwar

6.1 Introduction

The world has become quite simpler with the growing use of new-age digital technologies including Artificial Intelligence/Machine Learning (AI/ML), Immersive technologies, Internet of Things (IoT) and so on. However, all these digital technologies could be deemed as 'data-guzzler'. Users are exposed to inconceivable misuse of their personal sensitive data by corporates (or their partnering agencies) – who are dealing with collection, selling, analysis, and dissemination of data. Some core concerns, therefore, are – who handles the data, how it is handled, and what is done to the data? For instance, Jain and Siu (2020) have cited that '1mg', an Indian online pharmacy, collects information about a user in the form of a prescription, which is then further utilised in community profiling to understand the need for medicines in a particular area/community. Presumably, this personal information of clients is also shared with nearby pharmacists to help them rationalise their inventory. Furthermore, based on the client's personal information, 1mg provides the users with discounts and offers on medicines. While this initiative does not sound like a matter of concern, the amount of data companies like 1mg give away surely invades users' privacy and in some other cases puts someone under surveillance. Personal Data Protection (PDP) is, thus, a primitive need for digital users across the world. There is another side of this coin – which is related to effective public service delivery using new-age digital technologies. For instance, the Government of India is providing Direct Benefit Transfer (DBT) to the relevant beneficiaries by verifying the validity of their claims through their unique identity called Aadhaar, which is assigned to Indian citizens. Similarly, important governance activities such as nabbing

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tax defaulters or tracking labour migrants from one state to another to ensure their basic livelihood and transportation are dependent on the analysis of the huge amounts of structured and unstructured data collected by various state agencies. The Indian government has also started using data analytics for data-driven public policy formulation for efficiently providing services to its citizens. Therefore, the entire development agenda of the country could suffer a setback due to barriers erected in the data collection processes deemed particularly for 'public good'. There surely stands some conflict between privacy and innovation. Therefore, there is a need to establish a fine balance while attempting to regulate 'data protection' and 'privacy'. Different countries have framed their respective regulations – GDPR of the EU, The California Consumer Privacy Act (CCPA) of the United States, Personal Information Protection and Electronic Documents Act (PIPEDA) of Canada (Privacy Commissioner, Canada, 2019), etc. The Government of India too introduced its own Data Protection Bill, 2021 (Bannister, 2020). The chapter attempts to trace the genesis of this journey in the Indian context up until the year 2021, when this chapter was going to the press.

6.2 The Proposed Study

6.2.1 Scope of the Study

There are various perspectives to the study of the bill – from the viewpoints of a citizen, government, and stakeholders. However, the scope of the present study is to identify the key problems and challenges of the Data Protection Bill (DPB, 2021) of India from a citizen's perspective and explore its potential implications on an individual's life. While it forms the core of the study, the authors also aim to incorporate the ripple effect of the bill on the recent startup culture of the country.

6.2.2 Methodology

The study is a desktop study. To understand the formulation of the Data Protection Bill in India, a timeline of data privacy in India has been presented till the year 2021. Based on this, some of the key concerns related to the bill 2021 have been presented.

6.2.3 Study Layout

The study has been presented in five sections –

1. **Introduction**: The first section sets the tone of the study – that is, it provides background insight into the cyber world and the need to safeguard one's data in this digital world.

2. **About the Study**: It presents a description of the proposed study – how the present study defines its scope, methodology, and layout.
3. **Data Protection in India**: The third section is devoted to the Indian context of the Data Protection Bill – it talks about the entire journey of the Data Protection Bill, 2021, from its genesis till now. Particularly, it presents the key highlights of the new provisions of the bill. To understand the formulation of the current bill, the authors have tried to turn the reader's attention towards a comparative study of the Personal Data Protection Bill 2019 with its pre-cursor version of Justice B.N. Srikrishna Committee's recommendation and the erstwhile Personal Data Protection Bill, 2018. This section closes with a critical comparison of the earlier version of the bill, referred to as the PDP Bill (2019) with both of its preceding versions – PDP Bill (2018) and Justice B.N. Srikrishna Committee formulations.
4. **The Latest Advents – Joint Parliament Committee Session Report (2019) and the Critique of DPB (2021):** The study elaborates on the key aspects of the Joint Parliament Committee report published on December 16, 2021. When this background is set, the study highlights key concerns of the proposed Data Protection Bill (DPB) 2021 from the citizen's perspective.
5. The final section rounds up the deliberations by succinctly presenting these issues in its Conclusive Remarks.

6.3 Data Protection in India

6.3.1 Background

In India, data protection is governed by loosely constructed provisions of the Information Technology Amended Act (ITAA), 2008, under Sections 43-A and 72A of the Act. Compensation for failure to protect data (Section 43-A) was introduced by way of an amendment in 2008, which states the liability of a corporate body to compensate in case of negligence in maintaining and securing 'sensitive data'. However, the Act fails to define 'sensitive data' and states the same as 'personal information as may be prescribed by the central government'. The IT Rules, 2011, were issued by the central government, defining, in detail, the term 'sensitive data' and what it entails. It had focused on digital signatures and had also provided legal recognition for electronic documents (Government of India, 2011). However, the IT Rules 2011 have been criticised for being poorly drafted and hence their applicability has always been in question. Breach of data privacy has also been mentioned under the ITAA and is punishable under Section 72-A of the Act (introduced by an amendment in 2008), which penalises the offender with three-year imprisonment or a maximum fine of INR5 lakh. The current legislation (ITAA) fails to mention

the body corporates that store data or question their liability in case of a breach and compensation to consumers. Therefore, there has been an effort to bring in the second piece of legislation – the Personal Data Protection Bill.

6.3.2 Genesis and Evolution of Personal Data Protection Bill

India has now been moving closer towards its first framework to protect an individual's rights with respect to the processing of their information. In October 2012, Justice K.S. Puttaswamy (Retired) filed a petition in the Supreme Court challenging the constitutionality of Aadhaar on the grounds that it violates the right to privacy. During the hearings, the central government opposed the classification of privacy as a fundamental right. The government's opposition to the right relied on two early decisions – MP Sharma v/s Satish Chandra in 1954 and Kharak Singh v/s State of Uttar Pradesh in 1962 – both of which had held that privacy was not a fundamental right (Figure 6.1).

Over the next 40 years, the interpretation and scope of privacy as a right expanded, and was accepted as constitutional in subsequent judgements. Sensing the need to reconcile the divergence of opinions on privacy, the Supreme Court referred for technical clarification on the constitutionality of the right to a larger bench. The bench determined whether the reasoning applied in MP Sharma and Kharak Singh cases was correct and still relevant in the present day. The bench was set up not to look into the constitutional validity of *Aadhaar*, but to consider a much larger question: whether the right to privacy is a fundamental right and can be traced to the rights to life and personal liberty. In August 2017, a nine-judge Supreme Court bench declared the Right to Privacy as an integral part of the Right to Life and Personal Liberty guaranteed in Article 21 of the Constitution.

6.3.3 Formation of Justice B.N. Srikrishna Committee (2018)

The Justice B.N. Srikrishna Committee was made responsible for drafting a bill for data protection and coining a legal framework that aimed to shape the country's digital agenda. In July 2018, a ten-member committee of experts – including the former head of the Supreme Court, Justice B N

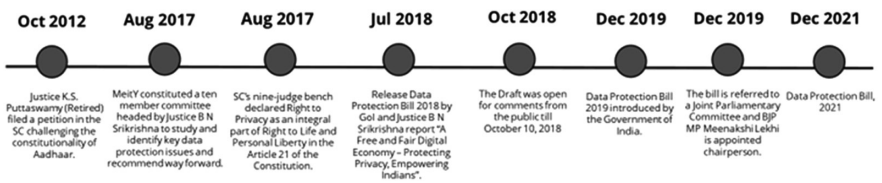

FIGURE 6.1 Genesis of Data Protection (DP) Bill in India

Srikrishna – proposed a report to the IT Minister, Ravi Shankar Prasad, named 'A Free and Fair Digital Economy – Protecting Privacy, Empowering Indians'. The ten-member committee was tasked with studying and identifying key data protection issues and recommending methods for addressing them. Here are some of the highlights from the Justice Srikrishna Committee report:

1. The committee recommended that processing (collection, recording, analysis, disclosure, etc.) of personal data should be done only for 'clear, specific and lawful' purposes. Only the data necessary for such processing should be collected from individuals.
2. The committee recommended giving 'data principals' (persons whose personal data is being processed) the 'right to be forgotten'. This means they will be able to restrict or prevent any display of their personal data once the purpose of disclosing the data has ended or when the data principal withdraws consent from the disclosure of their personal data.
3. Data Localisation: Personal data will need to be stored on servers located within India, and transfers outside the country will need to be subject to appropriate safeguards.
4. The committee recommended that 'sensitive' personal data (such as passwords, financial data, sexual orientation, biometric data, religion, or caste) should not be processed unless someone gives explicit consent – which factors in the purpose of processing.
5. The committee had recommended setting up a Data Protection Authority (DPA) which would be supposed to 'protect the interests of data principals', prevent misuse of personal data, and ensure compliance with the safeguards and obligations under the data protection framework by corporations, governments, or anyone else processing personal data (known as 'data fiduciaries'). The obligations of data fiduciaries include conducting audits and ensuring they have a data protection officer and grievance redressal mechanism – the DPA will need to publish Codes of Practice on all these points and shall have the power to inquire into any violations of the data protection regime, and can also take action against any data fiduciaries responsible for the same.
6. The committee had suggested recommendations to the Aadhaar Act, 2016 to ensure the autonomy of the Unique Identification Authority of India (UIDAI) and 'bolster data protection'. These include offline verification of Aadhaar numbers and new civil and criminal penalties – though the ability to file complaints will remain with the Unique Identification Authority of India (UIDAI) alone.
7. The committee recommended the amendment of Section 8(1)(j) of the RTI Act, which pertains to the disclosure of personal information in the larger public interest. The old 8(1)(j) said there would be no obligation

to reveal personal information which was not related to 'public activity or interest' or would be an invasion of privacy.

6.4 PDP Bill (2018): Some Salient Aspects

In light of the *Aadhar* case, it became a necessity for India to have its own data protection law. Along with the Justice B N Srikrishna Committee report, the Government of India, in July 2018, introduced the Personal Data Protection Bill (2018) which provided for the formation of a Data Protection Authority (DPA) to protect Indian citizens' data and privacy. Some of its key features were:

i. **Applicability:** Major focus was shifted towards the individual consent of data sharing, awarding rights to users and imposing obligations.
ii. **Definitions:** Personal data, data processing, data principal, data fiduciary, and data processor were defined. For any bill, defining the terminologies are essential and required for a better understanding.
iii. **Data fiduciaries** include all entities – the State, private entities incorporated in India, and entities incorporated overseas (if they systematically deal with data principals within the territory of India).
iv. **Grounds of processing:** Even though the bill allows data processing by fiduciaries if consent is provided by the individual, in certain exempted cases, processing of data may be permitted without the consent of the individual. It also talks about the rights of the data principal and penalties and punishments for the data fiduciary for non-compliance with the regulations.

However, no matter how lucrative the PDP Bill 2018 was, it failed to provide basic protection for an individual's data. For instance, the Government of India got a blanket power under this bill to access any personal information for national security, legal purposes, journalism, and parliamentary use. What should have been the case is the explanation for each and every provision; after all, a citizen's data is at stake. Further, the Data Protection Authority was said to be an independent body, wherein the companies were supposed to report data breaches themselves. Now the problem with such a provision is why any business venture or organisation would like to come forward with any small issue of a data breach. For a large-scale data breach, they might alert the DPA, but in some instances, these business ventures and organisations cannot be trusted enough. Other issues included problems with unclear definitions such as 'fair and reasonable purposes', etc. The bill left too many loose ends which could be quite problematic in the future course of action. Therefore, there was a need to tie these loose ends and include some new amendments for the better protection of citizens' data.

6.5 PDP Bill (2019): Some Salient Aspects

The Personal Data Protection Bill 2019 was introduced in Lok Sabha by the Minister of Electronics and Information Technology (MeitY), on December 11, 2019. The Bill had meant to provide for the protection of the personal data of individuals and had strived to establish a Data Protection Authority (DPA) for the same. Some of its key aspects are presented herewith:

Applicability: The bill governed the processing of personal data by (i) the government, (ii) companies incorporated in India, and (iii) foreign companies dealing with the personal data of individuals in India. Personal data is data which pertains to characteristics, traits, or attributes of identity, which can be used to identify an individual. The bill categorised certain personal data as sensitive personal data. This included financial data, biometric data, caste, religious or political beliefs, or any other category of data specified by the government in consultation with the DPA and the concerned sectoral regulator.

Obligations of data fiduciary: A data fiduciary is an entity or individual who decides the means and purpose of processing personal data. Such processing would have been subject to a certain purpose, collection, and storage limitations. For instance, personal data could be processed only for specific, clear, and lawful purposes. Additionally, all data fiduciaries must have undertaken certain transparency and accountability measures such as: (i) implementing security safeguards (such as data encryption and preventing misuse of data) and (ii) instituting grievance redressal mechanisms to address complaints of individuals. They must also have instituted mechanisms for age verification and parental consent when processing the sensitive personal data of children.

Rights of the individual: The bill set out certain rights of the individual (or data principal). These included the right to (i) obtain confirmation from the fiduciary on whether their personal data has been processed, (ii) seek correction of inaccurate, incomplete, or out-of-date personal data, (iii) have personal data transferred to any other data fiduciary in certain circumstances, and (iv) restrict continuing disclosure of their personal data by a fiduciary if it is no longer necessary or consent is withdrawn.

Grounds for processing personal data: The bill allowed processing of data by fiduciaries only if consent is provided by the individual. However, in certain circumstances, personal data could be processed without consent. These included: (i) if required by the State to provide benefits to the individual, (ii) legal proceedings, (iii) to respond to a medical emergency.

Social media intermediaries: The bill defined these to include intermediaries which enable online interaction between users and allow for sharing of information. All such intermediaries, which have users above a notified threshold, and whose actions can impact electoral democracy or public

order, have certain obligations, which include providing a voluntary user verification mechanism for users in India.

Data Protection Authority (DPA): The bill set up a Data Protection Authority which may have: (i) taken steps to protect the interests of individuals, (ii) prevented misuse of personal data, and (iii) ensured compliance with the bill. It would have consisted of a chairperson and six members, all with at least 10 years of expertise in the field of data protection and information technology. Orders of the DPA can be appealed to an Appellate Tribunal. Appeals from the Tribunal will go to the Supreme Court.

Data Protection Officer (DPO): In the latest version of the bill, the role of a Data Protection Officer had been well and intensively defined. The section defining the role of the DPO is divided into three clauses. These assigned roles account for the appointment of DPO by respective data fiduciaries for following certain functions, such as providing information and advice to the data fiduciary on matters and obligations under the bill once it becomes an Act, monitoring personal data activities, providing advice to carry out data protection impact assessments, development of mechanisms for safety of data, providing assistance on matters of compliance, and also provide redressal. Furthermore, the role also includes the management of an inventory of records to be maintained under data fiduciaries.

Transfer of data outside India: Sensitive personal data may have been transferred outside India for processing if explicitly consented to by the individual and subject to certain additional conditions. However, such sensitive personal data should continue to be stored in India. Certain personal data notified as critical personal data by the government could only be processed in India.

Exemptions: As quoted in PDP, 2019, the exemptions from the provisions of the Bill when it would become an Act were several:

The central government can exempt any of its agencies from the provisions of the Act: (i) in the interest of the security of the state, public order, sovereignty and integrity of India and friendly relations with foreign states, and (ii) for preventing incitement to the commission of any cognisable offence (i.e., arrest without warrant) relating to the above matters. Processing of personal data is also exempted from provisions of the bill for certain other purposes such as (i) prevention, investigation, or prosecution of any offence or (ii) personal, domestic, or (iii) journalistic purposes. However, such processing must be for a specific, clear and lawful purpose, with certain security safeguards.

Offences: Offences under the bill include: (i) processing or transferring personal data in violation of the bill, punishable with a fine of INR15 crore or 4% of the annual turnover of the fiduciary, whichever is higher, and (ii) failure to conduct a data audit, punishable with a fine of five

crore rupees or 2% of the annual turnover of the fiduciary, whichever is higher. Re-identification and processing of de-identified personal data without consent is punishable with imprisonment of up to three years, or fine, or both.

Sharing of non-personal data with government: The central government may direct data fiduciaries to provide it with any: (i) non-personal data and (ii) anonymised personal data (where it is not possible to identify data principal) for better targeting of services.

Amendments to other laws: The bill amends the Information Technology Act 2000 to delete the provisions related to compensation payable by companies for failure to protect personal data.

As the country is now moving towards digitisation, efficient data protection law is the need of the hour. Therefore, this bill is understood to be the keystone development in the evolution of data protection laws in India. However, the intention of the bill should not be just to fill the vacuum that existed but enhance individual rights by giving individuals full control over their data and ensuring its protection as well. No matter how lucrative the policymakers or change makers tried to make the bill look, they still couldn't provide solutions or answers to basic questions. The bill itself is drawn from the General Data Protection Regulation of the European Union rather than making it original by understanding the Indian problems of the cyber world. The aim of the bill should have been 'to bring the citizens more transparency and accountability to their data, wherein they are able to track the usage of their data by various stakeholders and government bodies'.

6.6 Comparing PDP (2019) with PDP (2018) and the Guidelines of Justice B.N. Srikrishna Committee Report (2018)

There exists a palpable difference between the Personal Data Protection Bill, 2019 – its precursor regulations in Personal Data Protection Bill, 2018 – and the initial guidelines recommended by Justice B.N. Srikrishna Committee (Table 6.1).

The Personal Data Protection Bill, 2019, had focused on how personal information was expected to be handled by body corporates and government agencies within India. It highlighted how technology companies must manage the data of Indian citizens. The PDP Bill, 2019, had required sensitive data to remain on servers within India's territory, at the same time permitting non-sensitive data to be stored outside of the country. The scope of sensitive or critical data which is to be stored locally is defined by the Government of India. Another key feature is the regulatory authority, i.e., the Data Protection Authority. It is an independent body which shall facilitate the functioning and regulations of the PDP Bill 2019. A minor violation

TABLE 6.1 Comparative Study – PDP 2019, PDP 2018, and Justice B.N. Srikrishna Committee

b	*Parameters*	*PDP (2019)*	*PDP (2018)*	*Justice B.N. Srikrishna Committee (July, 2018)*
1a.	Definition – Personal Data	Yes	Yes	Yes
1b.	Definition – Sensitive Data	Yes	No	Yes
1c.	Data Controller or Fiduciaries	Yes	Yes	Yes
2.	Right to Erasure	Yes	No	Yes
3.	Reasonable Purpose for Processing	Yes	No	Yes
4.	Data Localisation	Yes (with exemptions but GoI can still request)	Yes	Yes (with some provisions)
5.	Social Media Intermediaries	Yes	No	No
6.	Anonymised Data	Yes	No	No
7.	Committee	Yes (Independent body selected by GoI)	Yes	Yes (Independent Body)
8.	Data Protection Officer	Yes	Yes	Yes
9.	Exemptions of Government	Yes	Yes	No
10.	Penalties	Yes	Yes	Yes
11.	Breach Notification	Yes (Limited Requirements)	Yes	Yes

of the law, or data breach offence, can result in a fine of 2% of a company's global annual turnover. The penalty can reach 4% when a major violation occurs.

The PDP Bill, 2019, is, however, different from the original content produced by Justice B.N. Srikrishna. In an interview, Justice B.N. Srikrishna pointed out the drastic changes in his first draft and the current draft. One, the Data Protection Authority's (a regulator that will take steps to protect the interest of individuals and prevent misuse of personal data) composition is dominated by the government which is a contrast with the diverse and independent composition as suggested in the committee's draft. In the PDP Bill, 2019, the DPA's chairperson and six full-time members will be

appointed on the recommendation of a committee comprising cabinet secretary, IT secretary, and law secretary. Two, there is a blanket power of exemption from all provisions of the law (including access to personal data without consent, citing national security, investigation and prosecution of any offence, or public order) in favour of a government agency. Three, there is an attempt to control social media by reserving a right of access without the consent of non-personal data or anonymised data.

6.7 The Latest Advents: Joint Parliament Committee Session Report (2019) and DPB (2021)

The Joint Parliament Committee reviewed the country's first data protection law for further inspection in December 2019, and after two years of deliberation, a new version of the Data Protection Law known as the 'Data Protection Bill, 2021' has been presented in both the houses of the parliament (Figure 6.1).

6.7.1 Joint Parliament Committee Session Report (2019): Some Salient Aspects

The Joint Parliamentary Committee (JPC) is a type of ad hoc parliamentary committee constituted by the Indian parliament when any motion is adopted by one house and is supported by the other house. It can substantiate the matter under consideration by seeking 'evidence' from experts or even the public (in certain cases). It was in March 2020 that PDP (2019) was submitted for analysis to the Joint Parliamentary Committee in consultation with experts and stakeholders. The JPC was expected to finalise the draft law before the Budget Session 2020, which, however, was extended for submission till the winter session of the parliament of the next year (November 2021). It won't be out of context to point here that though the JPC had submitted the report, eight of its 30 members had expressed dissent on the report. Let us first enumerate the key aspects of this report before proceeding to delineate the possible reasons for dissent.

Vision and mission of the framework: According to the JPC Report, the draft has been renamed as Data Protection Bill, 2021. The bill now encompasses both Personal Data Protection and Non-Personal Data Protection Bill (earlier drafted in the parliament). As a result, the regulation of all data would be administered now under a single body called the Data Protection Authority (DPA), India. Following the enactment of the 2021 Bill, a separate regulation on non-personal data shall also be expected, focusing on the expansion of regulation of 'non-personal data'.

Definitions: The new committee report provided a new set of definitions and expanded the definition of 'harm'. Accordingly, the bill provides compensation against harmful processing of personal data. 'Harm' includes – (i) bodily or mental injury; (ii) financial loss; (iii) denial of service/benefit; (iv) identity theft; (v) discrimination; and (vi) unreasonable surveillance. Furthermore, 'harm' also includes 'psychological manipulation', which impairs the autonomy of the individual, followed by other such definitions that government sees fit to add.

Data localisation: In the proposition, the JPC has recommended that the central government take concrete steps for the data that is saved in foreign countries and to have mirror copies of that in India in a time-bound manner. Furthermore, the central government, in consultation with sectoral regulators, should also develop a comprehensive policy on data localisation.

Regulation of digital media: Regulation of digital media, especially 'social media intermediaries', has been proposed. The JPC has recommended that collection and hosting of data by social media intermediaries, platforms, and processing of personal data for journalistic purposes should be regulated more actively. A regulatory authority should be set up for the regulation of content on different media platforms and safeguard the privacy rights of individuals in press and journalism. Furthermore, the committee also recommends setting up offices of social media platforms in India and certain social media platforms to be classified as 'publishers'. By doing so, the JPC aims to increase the accountability of these social media platforms for what they post.

Right to be forgotten: The Bill provides the right to data principal to restrict continuing their disclosure of personal data, which is no longer necessary for the purpose it was being collected or if the consent is withdrawn. Further recommendation focused on the restriction of any processing of data, as even after the consent is withdrawn the collected data can be processed. Lastly, this right should not override the right of the data fiduciary to retain, use, and process such data as per the Bill.

Children's data: Some key recommendations follow around processing children's data, i.e., data principals below the age of 18 years. This includes registration with the DPA and fresh consent to be obtained three months before the child attains the age of 18 years. The provision of services to the individual should not cease unless the individual opts out or gives fresh consent. On the contrary, as part of the recommendations, 'processing of data relating to children or provision of services to them' has been added as a qualifying factor determining a data fiduciary as a significant data fiduciary (SDF).

Data after death: The new committee report gives the data principal's family the option to nominate a legal heir and exercise their right to be forgotten in the event of death.

Right to data portability: Data fiduciaries no longer have the right to deny data portability. The right to refuse has been limited to technical non-feasibility as determined by the data fiduciary under clause 19(2)(b) [see Annexure 2].

Transparency: Recommendations include data fiduciaries with the need to provide information to ensure fairness of the algorithm or method to be used for processing of personal data.

Reporting data breaches: Suggesting amendments to the 2019 Bill, the JPC has recommended a fixed time for reporting data breaches to the DPA. Moreover, DPA has also been recommended to give directions requiring data fiduciaries to report all breaches to the data principal only after assessing the breach and the severity of harm resulting from such breach. On the contrary, with respect to data breaches around non-personal data, DPA has been assigned to take the necessary steps as it may be prescribed.

Data processing by employers: Giving employers the complete freedom to process the personal data of the employee gives organisations unwanted advantages and power over their employees. Enabling the processing of personal data for employment had been incorporated in the 2019 Bill to provide operational flexibility. Keeping this in light, the JPC has recommended that the processing shall happen if the processing is necessary or reasonably expected by the employee.

Retention of data: According to the 2019 Bill, the data was required to be deleted after processing. However, according to JPC, this has been recognised as challenging and detrimental for entities which process personal data numerous times for various welfare purposes. Therefore, it has been proposed that personal data would be deleted only when the purpose of processing the personal data has been satisfied and is no longer required to be retained for such purposes, thus reducing the compliance burden and giving clarity to digital businesses.

Transfer of data to third parties: The JPC has recommended the inclusion of subsection 8(4) [see Annexure 2], which restricts data fiduciaries from sharing or transferring any personal data with other data fiduciaries or processors as part of any business transaction other than the ones permitted.

Certification of digital and IoT devices: Emerging technologies have had fruitful growth in the Indian market. Especially Internet of Things (IoT) and artificial intelligence are quite prolific. However, it imposes a greater risk of breach of privacy. In this draft, the JPC recommended a separate regulatory framework to be framed for hardware manufacturers and related entities with an official body for monitoring, testing and certifying hardware and software in computing devices.

Role of data protection officer: According to the 2019 Bill, certain 'data fiduciaries', on the basis of the sensitivity of the personal data to be

processed, the volume of personal data processed, or any other considerations as per Data Protection Authority were to be regarded as Significant Data Fiduciaries (SDF). These SDFs must appoint a 'Data Protection Officer' (DPO) based in India. The role of a DPO encompasses monitoring personal data processing activities and providing advice to the data fiduciary according to the obligations and proposed framework. Further, the role includes acting as the point of contact for data principals for grievance redressal. The JPC has also suggested that there is a need for further clarity regarding the qualification/position of the DPO and recommends that such an officer be holding a key position in the management of the SDF and must have technical knowledge in the field. This shall help provide crucial clarifications for foreign entities who fall within the category of SDFs and are required to appoint a DPO.

Selection for DPA: According to the Bill, a selected committee is to recommend appointments to the DPA. The committee shall comprise – (i) Cabinet Secretary: Chair; (ii) Secretary of Legal Affairs; and (iii) Secretary of Electronics and Information Technology. The members of the selection committee should also include – (i) the Attorney General of India; (ii) an independent expert from fields such as data protection, information technology, or cyber laws, and (iii) Directors of IIT and IIM.

Penalties: As per the new recommendations, the JPC proposes that penalties, as prescribed under the 2019 Bill, should be subjected to a maximum cap than having a fixed penalty and to be imposed by taking into consideration various factors, such as the size and nature of the data fiduciary.

Finally, the report with revised changes was submitted to the parliament in November 2021 for further deliberations.

Regarding the dissent, some reasons were cited like 'biased selection of members of JPC and even DPA by the Centre', 'premature and hasty' inclusion of non-personal data that could eventually hamper innovation and some more. However, the main reason for dissent has been quoted as follows:

> The blanket exemptions under Clause 35 provided to the government are violative of the right to privacy as affirmed in the Puttaswamy judgment and create parallel legal universes for the private sector, where the Bill applies with full force, and the government, which can exempt itself from the provisions of the Bill.
>
> *(Dissent is democratic: Looking at the dissent notes in the report of the JPC, n.d.)*

This was asserted by one of the eight dissenting members, endorsed by two other dissenting members, who had also asserted the 'Orwellian nature' of the Bill, echoing the concerns of the surveillance state. However, the report was submitted with the assertion that Clause 35 was for 'certain legitimate purposes' and is a prerequisite for national security and sovereignty and reminded that though this clause has been provided, 'this power may, however, be used only under exceptional circumstances and subject to conditions as laid out in the Bill, once it becomes an Act'.

6.8 Data Protection Bill, 2021, and Its Critique

First and foremost, the word 'personal' has been dropped from its initial name that had been traversing ever since its genesis. This is because several provisions on non-personal data have been added in the JPC Report, 2019). In its report, the JPC has further recommended a phased approach to implement the Bill as a law. The purpose is to forge a reasonable timeline post-consultation and provide data fiduciaries and data processors sufficient time for required transitions. The recommendation has also asked DPA to start its activities within six months of the Data Protection Bill becoming law and then gradually implement it over a period of two years. The JPC's report also contained a revised draft of the bill, which is likely to be passed by the parliament in its ensuing session of February 2022 (Valid as of January 2022).

Armed with sufficient background on its genesis, let us proceed to pragmatically analyse the present format of the Data Protection Bill (2021) in its present form (in January 2022). The analysis is being carried out on salient aspects of the most premium aspect of 'Users Consent', followed by core 'Definitions', basic premise of 'Data Retention', and so on, as elaborated herewith.

6.8.1 Consent

Looking back at the Bills proposed in 2018 and 2019, the controversial clause around the 'consent' still pertains. Earlier the clause stated that the state can and is allowed to process data – personal, anonymous, and non-anonymised, without obtaining consent under certain exemptions like a medical emergency or by the State for providing benefits. Other exemptions are for national security, legal proceedings, and journalistic purposes. While all are self-explanatory, 'national security' and 'State benefits' are not defined. Even for journalism, research, and legal proceedings, these criteria could be questioned if they meet the standards of necessity and proportionality required for infringements of an individual's right to privacy.

According to the JPC report, the 2021 Bill retains the clause that provides the central government exemptions and the power to exempt any government

agency from processing one's information. In addition, the amendment adds that it is 'subject to just, fair, reasonable and proportionate procedure'.

By adding the said qualification, the committee aims to create a balance between the Constitutional Rights, the Puttaswamy judgement, and one's individual rights of privacy. Furthermore, recommendations amend the clause by removing public order as a basis for exemption. However, judicial oversight or parliamentary oversight should be required with written orders explaining why exemptions should be granted and safeguard to be put in place to ensure that these exemptions are valid, necessary, and appropriate.

Much of its criticisms roll around the exemptions provided to the government bodies in processing individuals' personal data without their consent, thus, violating the mere Right to Privacy. 'Consent' is not necessarily the only factor that allows the government to process one's information. Terms such as 'public order' and the reasons to provide the State the exemptions are quite unclear in the eyes of tech policymakers and provide the government with the power over citizens' data. Thus, the need is to have well-grounded and defined terminologies and fewer ambiguities, especially around the processing of individual data.

Similarly, certain exemptions need to be focused on and questioned, especially the ones pertaining to the State. Rather than exempting it under 'State purposes', valid arguments and facts could be proposed to access the data which gives the State more credibility and authority. Furthermore, the rationale given for not requiring consent for the provision of services and benefits by the State is unclear. If the same is being done for the benefit of the citizens, then asking for consent shouldn't be an issue for the State. This will not only give the government the authority but also validate a person's credibility while applying for any services. Other exemptions also include parliament usage of the data – which again is unclear as to what functions of the parliament would necessitate a citizen's data for processing without the consent of the individual.

6.8.2 Definitions

Definitions in the Bill certainly need to be worked upon. For instance, it provides little or no information under 'Fair and reasonable manner', i.e., gives employers an unhealthy degree of discretion on how they can deal with employee's data. Various definitions are open to interpretation either by the State itself or the data principal (the person or individual whose data is being collected). Now the issue is that every individual party that forms the government or state has their own understanding. Even though the guidelines are fixed, how 'sensitive personal data', 'anonymous data', and 'non-personal data' are categorised depends on the State. This shall create confusion as different parties who form the government may interpret this in their own way,

therefore, leaving the citizens and the business ventures and organisations in a tumultuous situation. Moreover, the definition of 'critical personal data' is not clear or worded properly and left to the discretion of data principals. A primary guide (or a help book) to define the distinctions between the kinds of data shall be adequately helpful for individuals and organisations.

6.8.3 Data Retention

Under Section 9(1) [See Annexure 1], the 2021 Bill includes language requiring the deletion of data after the conclusion of the period of its purpose of processing, and section 9(2) [See Annexure 1] includes a provision for explicit consent to be obtained for longer retention. However, the main question arises whether these clauses will be overridden by the purpose requirement under Section 4 of the Bill or not. The section states that 'No personal data shall be processed by any person, except for any specific, clear and lawful purpose'. The Bill, therefore, does not provide any clarification on it and leaves it to open-ended interpretation. The JPC report also sheds light on this suggestion and recommends either explanation of the clause or the removal of the same.

6.8.4 Social Media Verification

According to the Personal Data Protection Bill, 2019, the government had advised putting social media verifications for those social media intermediaries who have a significant amount of impact on electoral democracy, security of the State, public order, or the sovereignty and integrity of India. Following this, the JPC has rolled out a new set of recommendations under 'digital media'. Clauses 28(3) and 28(4) [see Annexure 1] allow users to enable visible verified marks. While this is voluntary, such a need for verification adds to the concerns around surveillance and the privacy of a user will be impacted massively. Furthermore, this also affects minorities, whistle-blowers, and victims of harassment or discrimination who use social media with anonymous accounts to share experiences. Lastly, large industry players shall have all government identification about a user, thus further enhancing their targeted marketing tool at the cost of citizens' personal privacy.

6.8.5 Data Localisation

The JPC report focuses an entire section towards the importance of data localisation. The process of data localisation with strengthened powers of the State has a negative impact towards the digital rights of the citizens and the tech-innovation industry in India. The section also states that the regulatory body, the Data Protection Authority, permits the transfer of sensitive personal data. However, to exercise such power, one has to consult with the central government, therefore, indicating a reduction in autonomy of the regulatory

body and growing power of the government, and has to also ensure the provision of adequate data-centre breeding in appropriate parts of the country.

Also, the Bill has no provision to keep a check on data collection by hardware manufacturers. It has recommended that the government make efforts to establish a mechanism for the formal certification process for all digital and IoT devices that will ensure the integrity of all such devices with respect to data security (Bhargava & Nair, 2021).

6.8.6 Start-Ups and Their Growth

The central government can call for non-personal data (NPD) from data processors or companies. This is a form of forced nationalisation of data that in the long run will damage not only social media companies or multi-national companies but will be harmful to domestic companies and start-ups as well.

6.8.7 Reporting to Data Protection Authority

There is optional reporting of data breaches to the DPA by data fiduciaries. Under this, a fiduciary shall inform the DPA in case of any data breach only if such a breach is likely to cause harm to any data principal with further addition of a time clause of 72 hours. Now, how and why shall a fiduciary inform the DPA about one's own mistake or harm? Selective reporting at the end shall put the burden of reporting itself on the fiduciary, which can further escalate to a conflict of interest while determining whether a breach is to be reported or not.

6.8.8 Power of Data Protection Authority (DPA)

Previously, the DPA was considered an independent body with unlimited powers. However, with new revisions, such powers are under the restrictions of the central government. From the appointment to regulation and added a new clause of 'the Authority should be bound by the directions of the Central Government under all cases and not just on questions of policy'. Therefore, the revisions have allowed the government to extend its power in other ways – once again leaving an unchecked power balance.

6.8.9 Penalties

The penalties charged for various organisations and business ventures are comparatively higher than the government bodies. Even though 'other cases' are not defined, it still indicates majorly towards the State. This shows a disparity between how people who are liable are not seen or observed as equally 'responsible'. After all, a data breach is harmful to anyone, be it on a small scale or a large scale. Therefore, the penalties as a base penalty should be the same and then depending on the case, the same could be increased.

6.8.10 Compensation to the Citizens

Section 91 [See Annexure 1] of the 2021 Bill enables the central government to require data processors or data fiduciaries to provide anonymised personal data or other non-personal information for targeting the delivery of services or the formulation of evidence-based policies. However, the provision does not provide any form of compensation or remuneration for such data.

6.8.11 Citizen Awareness

The main aim of the Bill is to safeguard the citizens of India from any form of data breach and malicious activity. While the government has proposed this bill, there is still a need to add a section of guidelines on teaching citizens about their rights and practices to secure their data. The Bill is made for the citizens; therefore, it should include provisions like how to secure one's data, cases where a data breach is likely to happen, and mechanisms for the redressal of grievances. Furthermore, sensitisation programmes are not focused upon. There is an active need to engage with the citizens to make them aware of data protection and its consequences, which the Bill fails to investigate.

It is pertinent to add here that presumably due to several glaring concerns and respecting the emerging trends in technology spaces, Government of India had withdrawn PDP-2021 on August 3, 2021, and had instead announced 'Digital Personal Data Protection Bill, 2022' (DPDP-2022) on November 18, 2022. DPDP-2022 is based on seven principles including Lawful use, Purposeful dissemination, Data minimisation, Data accuracy, Duration of storage, Authorized collection and processing, and Accountability of users. However, the critique of these principles forms the premise of a subsequent study.

6.9 Concluding Remarks

A culmination of some of the issues and proposed concerns assailing various versions of the Personal Data Protection Bill of India till 2021 have been summarised in this study. For instance, PDP-2021 had posed challenges for body corporates, businesses, and investors by insisting on 'data localisation' and 'forced nationalisation'. Another pertinent concern of PDP 2021 had revolved around the extended powers of the government through given exemptions and the deciding power over Data Protection Authority (DPA). Finally, the Bill has certain gaps that need to be filled for the security of citizens. There is a clear challenge to the availability and affordability of implementing the proposed framework. As already highlighted above in the context of data localisation, is the government ready with the infrastructure

that is required for data localisation? It requires a heavy amount of investment in terms of data centres, electricity, manpower, etc. While availability is one factor, affordability of the same is another which needs to be kept in mind when introducing such a complex structure. Indeed, for any technological innovation to succeed, trust is an important factor to build upon, which the Data Protection Bill, 2021, did not completely account for. It did not provide citizens with their basic rights – transparency and accountability. The DPB-2021 heightened the need to formulate policies in a way that provides adequate 'breathing space' to technology and innovation in an ambitious country like India while putting in necessary safeguards to ensure citizens' welfare. Has its new *avatar* DPDP-2022, the recently announced Digital Personal Data Protection Bill, 2022, been able to provide so or not is the next moot question to be analysed. This stays the most relevant consideration especially since India is gearing up to be a $1 trillion digital economy by the year 2030. After all, the whole strive is that many citizens wholeheartedly embrace digital technologies and simultaneously trust the advent of digital transformation in governance.

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In this two-year jerky journey, we both have learned new themes and dimensions of the topic. Our profuse gratitude for several independent bodies (Medianama, Internet Freedom Foundation, The Dialogue – in no particular order). We are also thankful to all the experts who supported us, particularly the ones from the Indian School for Business. We are particularly thankful to our blind-reviewers, who steered us to update this study to include the latest developments in the realm, such as JPC (2019) and DPB (2021); it has helped us not just to keep our readers updated, but it has also kept the research spark alive for a very relevant topic. Last, but not the least, we also would like to extend heartfelt thanks towards the young interns – Ms. Khushboo Kain and Ms. Czai Maluja from Lady Irwin College (New Delhi), for supporting and helping us to hurriedly stitch the last section on Data Protection Bill, 2021. Gratitude is also overdue to Mr. Swetanshu for helping us to ensure that this piece stays a grammatically correct attempt.

References

Bannister, A. (2020). India's answer to GDPR: Data protection legislation set to pass this year. Retrieved from https://portswigger.net/daily-swig/indias-answer-to-gdpr-data-protection-legislation-set-to-pass-this-year.

Bhargava, Y., & Nair, S. (2021). JPC retains exemption clause, adopts personal data bill. *The Hindu*. Retrieved from https://www.thehindu.com/news/national

/parliamentary-panel-retains-controversial-exemption-clause-in-personal-data-protection-bill/article37633344.ece.

Government of India. (2019). *The personal data protection bill, 2019 (373)*. New Delhi: Ministry of Electronics and Information Technology (MEITY).

Jain, A. Shu, & Anthony, S. (2020). Online pharmacy in India-A SWOT analysis. *Parishodh Journal* Paper available online at https://www.researchgate.net/profile/A-Jain-4/publication/340592506_Online_Pharmacy_in_India-A_SWOT_Analysis_2020/links/5e9312a292851c2f52991275/Online-Pharmacy-in-India-A-SWOT-Analysis-2020.pdf Date of Access - March 22, 2023

JPC (n.d) Dissent is democratic: Looking at the dissent notes in the report of the Joint Parliamentary Committee. *Internet Freedom Foundation*. Retrieved from https://internetfreedom.in/pdpb-jpc-report-dissent-notes/. Date of Access July 23, 2022.

Ministry of Electronics and Information Technology, Government of India. (2011). *Notification*. New Delhi. Retrieved from https://meity.gov.in/sites/upload_files/dit/files/GSR313E_10511.pdf.

Nandi, S. (2019, December 16). Exemptions for govt agencies in data bill can be disastrous: Justice Srikrishna. *Livemint*. Retrieved from https://www.livemint.com/news/india/exemptions-for-govt-agencies-in-data-bill-can-be-disastrous-justice-srikrishna-11576456701898.html.

Office of the privacy commissioner of Canada (2019).. Commissariat à la protection de la vie privée du Canada. Retrieved from https://www.priv.gc.ca/fr/. Date of Access – March 22, 2023.

Singh, S. S. (2011). Privacy and data protection in India: A critical assessment. *Journal of the Indian Law Institute*, *53*(4), 663–677.

7

DIGITAL EDUCATION LEADING TO A DIGITAL DIVIDE

As an Emerging Form of Inequality

Jyoti Sharma

7.1 Introduction

Indian society is a cohesion of people from different cultures, economic backgrounds, and social statuses. It is stratified and divided on the bases formed by the Indian caste system, which operates hierarchically with the upper caste at the helm of the ladder-like structure, followed by other caste groups. On the economic front, society has been divided in a similar way. This structure has resulted in an unequal distribution of basic resources and facilities, which in turn has widened the socio-economic disparity, thus resulting in inequality of opportunity. The inequality of opportunity can be defined as a system where people living in the same society do not have access to the same opportunities. It occurs in a society when equal and fair chances are not given to individuals in the fields of education, health, and justice. This phenomenon is now visible in the digital realm and is known as the 'digital divide'. The chapter aims to discuss the impact of the digital divide on the education sector. It focuses on the issue of the digital divide in India and its impact on education during the COVID-19 lockdown. The first section provides a brief understanding of the phenomenon, while the subsequent section provides a detailed account of the policies adopted by the Government of India to bridge the digital divide. See Figure 7.1 for more information. The last section discusses the effect of the digital divide on education during the COVID-19 lockdown.

For a long time, the digital divide has impacted the field of education. However, the COVID-19 pandemic exacerbated its effect. As a term, the 'digital divide' simply means unequal access to information technology. In the past, there has been a huge advancement in information technology, but in terms of accessibility, we do not fare well. Despite great advancements,

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the gains have not been felt by a huge percentage of the population due to a lack of accessibility. The lockdown, due to the COVID-19 crisis, changed the realities of everyday life. With everything shifting online, the virtual world has gained the upper hand in our lives. Schools and universities were shut down, and 'online' became the primary mode of imparting and receiving education. However, due to the lack of digital infrastructure, students faced hardship in attending classes. Due to the growing popularity of smartphones, it was the most commonly used device to attend online classes by students. This also pertains to the affordability of other devices, such as computers, laptops, and tablets, which are expensive to buy. There were cases when a single smartphone was shared by the whole family to attend their respective classes and work. In such a case, male children were given priority, thus widening the gender gap in education. The situation has become more complicated due to low connectivity, especially in rural areas. The digital divide exacerbates inequalities in the field of education, which leads to further exclusion in the Indian education system.

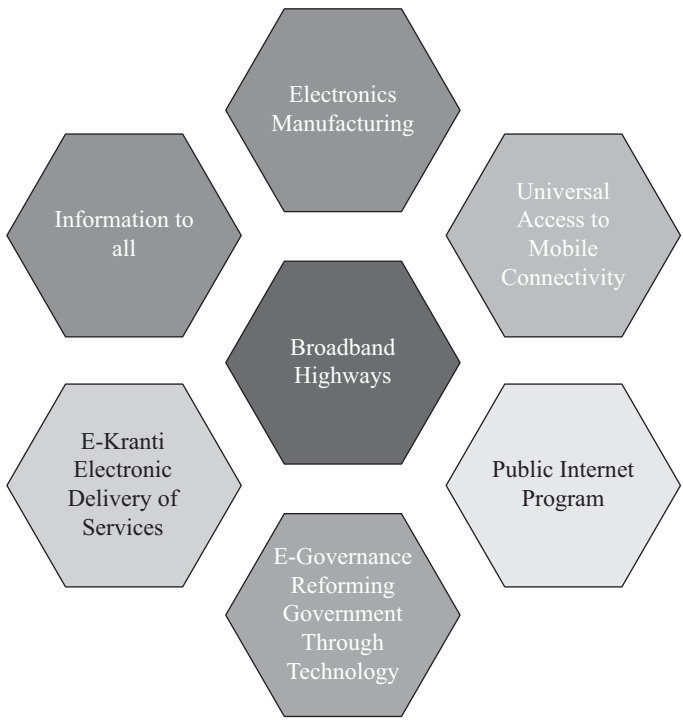

FIGURE 7.1 Nine Pillars of Digital India Vision

Source: Program pillars. (n.d.). Digital India. Retrieved from https://di.negd.in/programme-pillars/

7.2 Technology and the Digital Divide

Evolution has been one of the most important features of the existence of the human race. Humans have evolved and developed according to their personal and biological needs. With the evolution of man, technology has also developed. Humans in different eras have understood the idea of technological advancement. In different times, the most advanced innovation was considered technological advancement. For instance, fire was the greatest and the most advanced development of the stone age. In the modern era, technological advancement is usually associated with advancements in computing knowledge, automobiles, electronics, cell phones, and engineering capabilities, and this has brought major changes in the world. Indeed, the technology of the 21st century has completely and irreversibly changed the way people meet, communicate, gain knowledge, take up a job, commute, and operate a business.

Technology, especially information technology, impacts the lives of people and the economy. It was expected that information technology would lead to socio-economic development and will positively impact the lives of people. The benefits of information technology depend on the access and adoption of technology. Technological advancements result in an increase in information and knowledge and further open up new avenues for growth and better understanding. On the other hand, technology quite often brings out changes that exacerbate inequalities. In other words, the already existing gaps rapidly get wider. The overall adoption rate of information and technology is lower in developing countries in comparison to developed countries (*A Few*

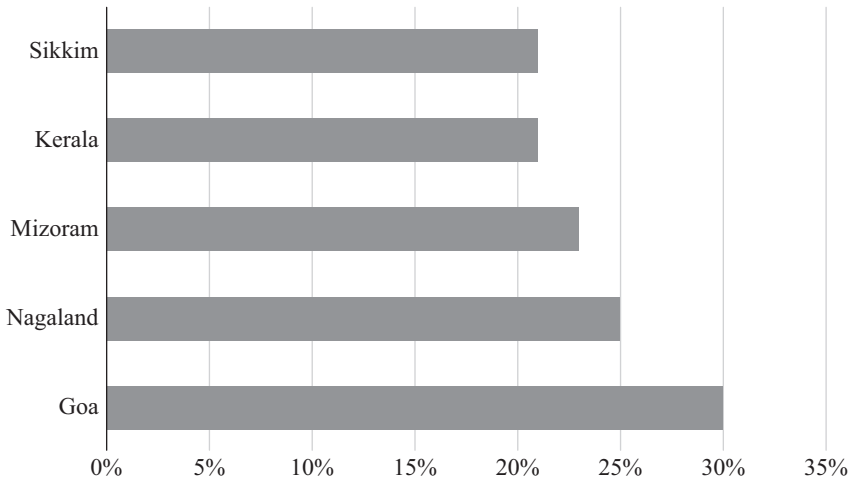

FIGURE 7.2 Top 5 Best-Performing States with respect to Digital Infrastructure Accessibility for Students

Source: Adapted from Reddy et al. (2020)

Developing Countries Overperform on Frontier Technologies, but Most Lag Behind, 2021). However, developing countries are trying hard to keep up with changing technologies and acquiring Information and Communication Technology (ICTs) at a faster rate (Singh, 2010, p. 2). For instance, in India, the boom in information technology has led to major changes, but it is also a hard fact that access to information technology has not reached every corner of India. It has also created a huge gap between the 'haves' and 'haves not' of information technology, which in turn further creates technological stratification. However, this has also led to a renewed emphasis and efforts on providing equal access to all. Technological stratification can be classified into two forms: (i) unequal access to technology, depending on class which further leads to a digital divide, and (ii) digital divide, which in turn creates another form of technological stratification, i.e. knowledge gap. It refers to an increasing and ongoing gap in information for those who have unequal access to technology. The concept of the digital divide in the past has caught the attention of social reformers, policymakers, and the government.

The digital divide is defined as 'economic, social, or cultural deprivation caused by a lack of access to and skills in information and communication technologies (ICT)' (Singh, 2010, p. 5). Thus, the digital divide refers to an unequal distribution of access to information and communication technologies (ICT) among a large number of different groups. These groupings can be established based on sociological, geographical, or geopolitical characteristics. The phrase 'digital divide' refers to a disparity in access to any kind of information and communication technology. Norris (2001) explains the digital divide as a phenomenon that is multidimensional and encompasses three unique aspects – global divide, social divide, and democratic divide. First, the global divide refers to the difference in internet access between developed and developing societies. Second, the social divide concerns the gap between people being information-rich and information-poor in each nation. And third, the democratic divide is the distinction between individuals who engage, mobilise, and participate in public life using a variety of digital means (Norris, 2001).

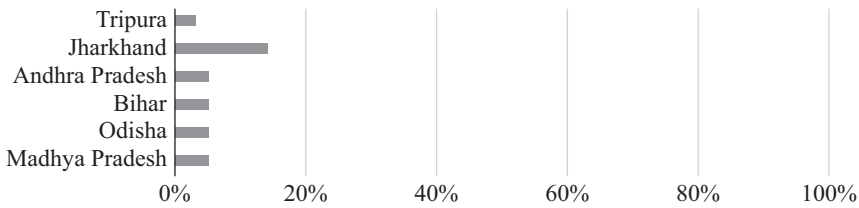

FIGURE 7.3 Worst-Performing States with respect to Digital Infrastructure Accessibility for Students

Source: Adapted from Reddy et al. (2020)

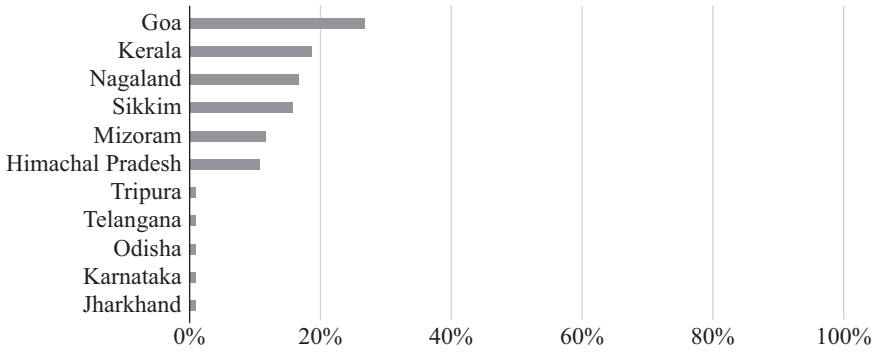

FIGURE 7.4 Percentage of Students Having Access to Digital Infrastructure in Rural India

Source: Adapted from Reddy et al. (2020)

India is a vast country, and it is geographically and culturally very diverse. There are many parts of the country where there is no access to basic facilities. A report in *The Financial Express* states that India's digital divide remains huge as more than 400 million people still have no access to the internet. The spatial divide is also huge, with the internet density in rural areas where more than 60% of the people live, standing at 25% compared to the internet density in urban areas, which stands at 90% (Ghani & Mishra, 2020). Even though 66% of the country's population lives in its villages, rural internet density is just 25.3% (Paresheera, 2019). In comparison, urban areas have a significantly higher density of 97.9%. This means that for every Indian who has access to the internet, there is at least one person who does not have internet access, and that person is most likely living in a rural area (Paresheera, 2019). A research study by Neena and Kaur (2014) shows that the inter-state digital divide has narrowed down during the period 2001–2012. In 2012, only one state, Himachal Pradesh, turned from medium to high type.[1] States are classified as low, medium, or high in terms of the digital divide*. States in the low category are the same except for the state of Rajasthan, which moved from the low to the medium category in 2012. According to the annual report of the Telecom Regulatory Authority of India, urban telephone subscribers are calculated to be 656.46 million, and rural telephone subscribers 521.51 million (Telecom Regulatory Authority of India [TRAI], 2020). In India, the total number of internet subscribers per 100 population is 55.12 million, and urban internet subscribers per 100 population are 99.12 million, whereas rural internet subscribers are 32.24 million (TRAI, 2020). There is much variation in terms of the level of access among different states of India. For instance, states like Bihar, Uttar Pradesh, and Orissa have very low internet density. On the other hand, Kerala is the state where the difference based on internet density is the least (TRAI, 2020).

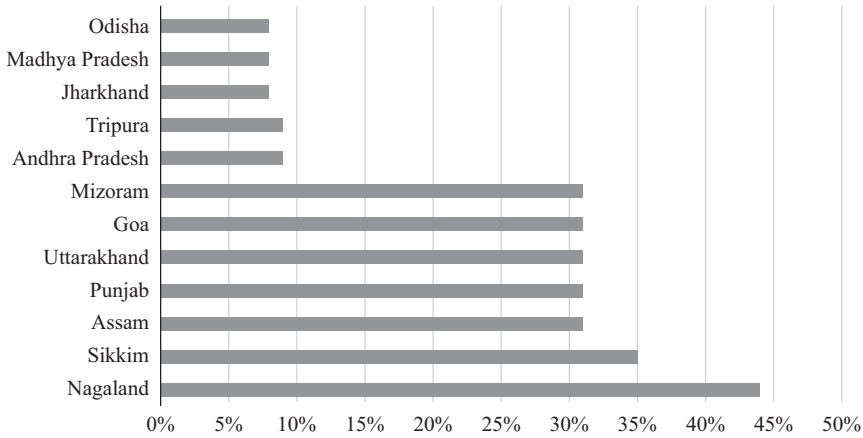

FIGURE 7.5 Percentage of Students Having Access to Digital Infrastructure in Urban India

Source: Adapted from Reddy et al. (2020)

7.3 Bridging the Digital Divide: Policy Efforts

The digital divide is a crucial issue faced by Indian society. There are many challenges in bridging the digital divide in India. According to Sheikh (2017), socially and economically disadvantaged people in India are getting access to information technology and the internet, but their advantages are restricted due to the following factors:

i. Infrastructural Barriers: Since the 1990s, there has been a significant expansion in information technology, but despite the expansion, India lacks a well-established digital infrastructure. The essential infrastructure is not equivalent to that of other countries, so despite the expansion of the internet, the digital gap is widening as technical standards become even higher.
ii. Literacy and Skill Barriers: It is imperative to provide citizens with proper education, skills, and training in information technology as it plays a key role in preventing society from splintering into 'haves' and 'have–nots'. Literacy in information technology (IT) is critical for acquiring access to digital information.
iii. Economic Barriers: People with low socio-economic status do not have the discretionary funds to spend on private cyber cafes or on having an internet connection.
iv. Content Barrier: Access to information technology is critical to the free flow of information between individuals all over the world. Since no

entity controls the internet, anybody with an internet connection can express their opinions and knowledge. As a result, if the problem of the digital divide is to be solved, a time-bound and progressive effort on the part of the government is required to ensure that all citizens can receive information relevant to their lives as well as be able to produce their own ideas or content for their communities and the internet at large.

v. Language Barriers: Language is an important medium for connecting individuals and conveying information between diverse groups. India is a multilingual and multicultural nation. At the moment, the globe is undergoing an information revolution in which a great volume of material on the internet is in English, which works as a limitation or barrier for individuals in countries where English is not the major language (Sheikh, 2017, p. 131).

Despite India's tremendous efforts to improve its information and technology skills, the country is becoming polarised between those who have access to technology and those who do not. In India, there are only five personal computers (PCs) per 1,000 people, nine mobile lines per 1,000 people, and 37 fixed lines per 1,000 people, which is exceedingly low when compared to China. The task of the Indian government is to bridge the digital gap while also promoting technological growth and acceptance (Singh, 2010, pp. 15–16). However, the government has been trying to resolve the issue by implementing policies and initiatives that aim to reduce the gap. One such initiative is 'Digital India', which aims to empower society digitally. The Digital India programme was started to transform India into a digitally enabled society and a knowledge economy. The various initiatives of Digital India were implemented with the aim of giving the citizens access to all government services electronically. On several parameters of digital adoption, India is one of the top two countries in the world, trailing only behind China. India's digital economy is expected to surpass $1 trillion by 2022. This was the focal point at the India Digital Summit 2019, which took place in New Delhi. Digital India focuses on providing high-speed internet in rural areas (Digital India (n.d.). It has three main visions. First, in terms of digital infrastructure, the programme aims to provide high-speed internet and online financial and banking space. The government intends to give access to high-speed internet to 2,50,000 programme panchayats as a fundamental utility for digital inclusion (Mohananta et al., 2017, p. 728). Second, in terms of digital empowerment, the programme intends to make citizens digitally literate. Third, the vision aspires for seamless integration among government departments and jurisdictions, as well as real-time service availability from online and mobile platforms (Mohananta et al., 2017, p. 728).

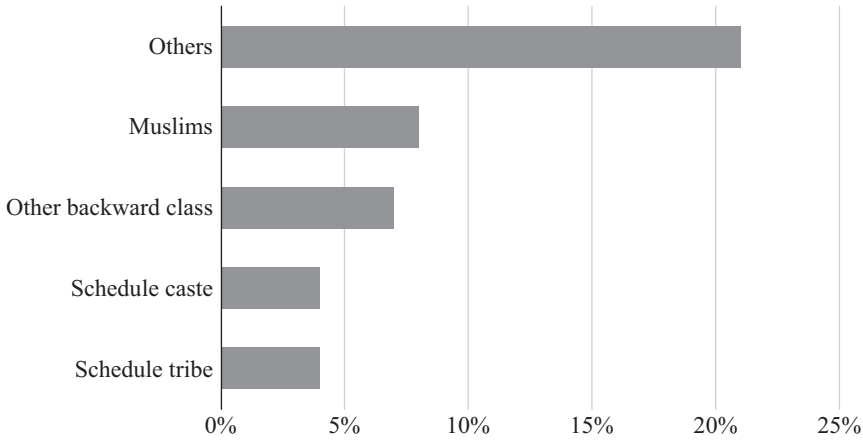

FIGURE 7.6 Percentage of Students with Access to Digital Infrastructure on the Basis of Socio-religious and Income Groups

Source: Adapted from Reddy et al. (2020)

The Digital India scheme has nine pillars:

The primary pillar – Broadband Highways – aims to provide broadband connectivity to all. It has three main subcomponents: (i) Broadband for all-rural, (ii) Broadband for all-urban, and (iii) National Information Infrastructure (NII) (*Programme Pillars*, 2019). 'Broadband for all rural' aims to cover 2,50,000 village panchayats under the National Optical Fiber Network (NOFN) under the supervision of the Department of Telecommunication (DoT), which is the nodal department for this project. In the scheme 'Broadband for all-urban', future urban projects would employ virtual network operators to provide service delivery and communication infrastructure. The National Information Infrastructure (NII) combines the country's network and cloud infrastructure to deliver high-speed connections and a cloud platform to various government ministries, all the way down to the panchayat level. Networks such as the State-Wide Area Network (SWAN), the National Knowledge Network (NKN), the National Optical Fiber Network (NOFN), the Government User Network (GUN), and the MeghRaj Cloud are the infrastructural components of NII, and it aims to integrate all ICT components. Further, horizontal connectivity will be provided to 100, 50, 20, and 5 government offices/service outlets at the state, district, block, and panchayat levels, respectively (*Programme Pillars*, 2019).

The second pillar – Universal Access to Phones – focuses on providing mobile coverage to uncovered villages and covering the connectivity gap in the country. The Department of Telecommunications (DoT) will be the nodal department for this project, and it will cost around INR16,000 crores (*Programme Pillars*, 2019).

The third pillar – Public Internet Access Programme – has two subcomponents: (i) Common Services Centres (CSCs), and (ii) post offices as multi-service centres. The CSCs would be reinforced and raised to 25,000, with one CSC in each Gram Panchayat. It would be transformed into a viable, multi-functional endpoint for the delivery of government and commercial services. The initiative would be implemented by the Department of Electronics and Information Technology (DeitY) as the nodal department. Around 1,50,000 post offices are to be turned into multi-service centres. The Department of Posts would be the key agency for carrying out this plan (*Programme Pillars*, 2019).

The fourth pillar is Electronics Manufacturing. This pillar focuses on increasing domestic electronics production, with the goal of achieving Net Zero imports by 2020 (*Programme Pillars*, 2019).

The fifth pillar is the Early Harvest Programme, which comprises initiatives that must be accomplished in a brief span of time (*Programme Pillars*, 2019).

7.3.1 Initiatives

The following initiatives are included under this programme:

i. IT platform for messages: The Ministry of Electronics and Information Technology (MeitY) has created a mass messaging app that will be used by elected officials and government staff. The database has around 1.36 billion mobile phone numbers and 22 lakh emails. The site was launched on August 15, 2014. The collection and sanitisation of data are continuous activities (*Programme Pillars*, 2019).
ii. Government greetings to be e-Greetings: A collection of e-Greeting templates is now provided. The MyGov platform has been used to crowdsource e-Greetings. Crowdsourcing has also been utilised to produce designs for greeting cards commemorating Independence Day, Teachers' Day, and Gandhi Jayanti. On August 14, 2014, the e-Greetings platform became online (*Programme Pillars*, 2019).
iii. Biometric attendance: All central government offices in Delhi will be covered under this scheme. Over 40,000 government employees from around 150 organisations have registered on the common biometric attendance portal. At the entry gates of various central government buildings, more than 1,000 biometric attendance terminals are under installation (*Programme Pillars*, 2019).
iv. Wi-fi in all universities: The National Knowledge Network (NKN) shall cover all universities across India under this scheme (*Programme Pillars*, 2019).

v. Secure email within government: The primary mode of communication would be emailed, with an improved and upgraded email infrastructure (*Programme Pillars*, 2019).
vi. Standardised government email designs: Standardised email templates for the government would be created. MeitY is in charge of implementing this (*Programme Pillars*, 2019).
vii. To develop digital cities, cities with a population of more than one million, and all tourist destinations will be equipped with public wi-fi hotspots. The system would be administered by the Department of Transportation and the Ministry of Urban Development (MoUD) (*Programme Pillars*, 2019).
viii. School books to be e-Books (*Programme Pillars*, 2019).
ix. SMS-based weather information and disaster alerts: Weather and catastrophe notifications will be delivered by SMS. For this, MeitY's Mobile Seva Platform has been made available (*Programme Pillars*, 2019).
x. Lost and found children: This would allow for real-time information collection and sharing on missing and discovered children, which would help to reduce crime (*Programme Pillars*, 2019).

The sixth pillar – e-Governance – plans to reform the government through technology. To improve the delivery of government services across multiple government domains, the government uses IT to facilitate efficient government processes (*Programme Pillars*, 2019).

The seventh pillar is e-Kranti. Given the crucial need to change, e-Governance and develop mobile governance and good governance in the country, the Union Cabinet approved the approach and major components of e-Kranti on March 25, 2015, with the goal of transforming e-Governance for Transforming Governance (*Programme Pillars*, 2019).

The eighth pillar is Information for All. Its main focus is to provide authentic and reliable information to the citizens via various online platforms such as MyGov.in, social media handles, and open data platforms (*Programme Pillars*, 2019).

The ninth pillar is 'IT for Jobs' which is focused on teaching youngsters the skills necessary for career prospects in the IT/ITES sector (*Programme Pillars*, 2019).

Digital India proved to have a good influence in a variety of fields. In total, 12,000 rural post office branches have been electronically linked. There has been an increase in electronic transactions connected to e-governance since India is anticipated to have more than 100 million mobile phones. The Bharat Net programme has connected over 1.15 lakh Gram Panchayats via a 2,74,246 km optical fibre network (Digital India, n.d.).

7.3.2 Policies under Digital India

Under the Digital India initiative, the government has announced many policies:

i. The Digital Locker system intends to reduce the use of physical paper while allowing for the exchange of e-documents among agencies.
ii. MyGov.in was established as a platform for citizen participation in governance by adopting a 'discuss', 'do', and 'disseminate' strategy.
iii. To achieve the goals of the Swachh Bharat Mission, a Swachh Bharat Mission mobile application has been developed, which is to be used by people and government organisations.
iv. In the e-Sign framework, citizens would be able to digitally sign a document online using Aadhaar authentication.
v. Under the e-Hospital application, the Online Registration System (ORS) has been introduced. This application offers vital services such as online registration, fee and appointment payment, online diagnostic testing, online blood availability inquiry, and so on.
vi. The National Scholarship Portal is a one-stop site for end-to-end scholarship process rights, including student application submission, verification, sanction, and transfer of funds to end beneficiaries for all Government of India scholarships.
vii. Bharat Net is a high-speed digital highway that will connect the country's 2.5 lakh Gram Panchayats.
viii. BHIM is a smartphone application that uses a unified payments interface to make payment transactions simple, straightforward, and rapid (UPI). It enables quick bank-to-bank payments and money collection using a cellphone number or payment address.
ix. The Deen Dayal Upadhyaya Gram Jyoti Yojana is one of the main programmes of the Ministry of Power, intended to offer uninterrupted power supply to rural India.
x. In an attempt to automate Gram Panchayat operations, e-Panchayat is a rural e-Governance programme that provides full software solutions.
xi. A unified mobile application named UMANG is a major initiative of the Digital India programme. It aims to provide a single platform where all government services can be provided.

Under the Digital India policy, the Government of India has announced various policies in the field of education with the objective of providing education to all.

i. The Digital Saksharta Abhiyaan (DISHA) and the National Digital Literacy Mission initiative have been designed to provide IT training

to 52.5 lakh people across the country, including Anganwadi, ASHA workers, and authorised ration dealers.

ii. The National Informatics Centre (NIC), Department of Electronics and Information Technology, created E-Granthalaya, an integrated library management software. The programme is useful for automating in-house library tasks and providing various online member services.

iii. The Pradhan Mantri Gramin Digital Saksharta Abhiyan is an initiative that aims to provide digital literacy to six crore people in rural regions across states/UTs, with a mission of reaching about 40% of rural households by covering one member from every eligible home.

iv. SWAYAM aims to bridge the digital gap for students who have been left behind by the digital revolution and are unable to participate in the knowledge economy. This is accomplished through the use of an indigenously designed IT infrastructure that allows for hosting all courses taught in classrooms, from Class IX to post-graduation, for being accessed by anybody at any time (Swayam Central, n.d.).

v. By using ICT tools, the National Mission on Education aims to benefit students and instructors from higher education institutions.

However, the programmes lack several critical components, such as a legal framework, privacy and data protection regulations, the possibility of civil rights abuse, legislative supervision for e-surveillance in India, intelligence-related reforms in India, insecure Indian cyberspace, and so on. Several challenges must be addressed before launching the Digital India plan in India (Kedar, 2015, p. 2).

7.4 COVID-19 and the Digital Divide in Online Teaching

Despite many programmes and initiatives by the government, the digital divide is very evident in India. The COVID-19 pandemic has just escalated the gap. The first few cases of COVID-19 were reported in January 2020, and since then, there has been a steady increase in COVID-19 cases in India. In March 2020, the Government of India announced a complete lockdown that affected every aspect of life. The COVID-19 outbreak across the globe impacted more than 120 million students. More than 32 crore students in India have been impacted by the lockdown (Jena, 2020, p. 12582). In their article, Bheemeshwar Reddy A, Sunny Jose, and R Vaidehi (2020) discuss the National Sample Survey Office (NSSO) data on social consumption in education (2017–2018). It states that only 9% of students enrolled in any course have access to essential digital infrastructure. According to the data, 24% of households in India had internet access through a digital device, whereas only 11% had a computer or tablet, which is a perfect device for attending online classes (Reddy et al., 2020, pp. 24–25).

Goa has the best performance with 30% of currently enrolled students having access to computers with internet access in Goa, which is followed by Nagaland with 25%, Mizoram with 23%, and Kerala and Sikkim with 21% (Reddy et al., 2020, pp. 24–25). See Figure 7.2 for more information.

At the bottom, on the basis of accessibility are Tripura 3%, Jharkhand 14%, and Andhra Pradesh, Bihar, Odisha, and Madhya Pradesh all at 5% (Reddy et al., 2020, pp. 24–25). See Figure 7.3 for more information.

In rural parts of Jharkhand, Karnataka, Odisha, Telangana, and Tripura, only 1% of students have access to computers with the internet, and the rest 99% lack basic facilities. Six states remain at the top where accessibility is greater than 10%: Himachal Pradesh (11%), Mizoram (12%), Sikkim (16%), Nagaland (17%), Kerala (19%), and Goa (27%) (Reddy et al., 2020, pp. 24–25).

In the urban areas, Nagaland is at the top with 44%, followed by Sikkim with 35%. Five states (Assam, Punjab, Uttarakhand, Goa, and Mizoram) have access above 30% (Reddy et al., 2020, pp. 24–25). Andhra Pradesh and Tripura are poor performers with only 9%, followed closely by Jharkhand, Madhya Pradesh, and Odisha (Reddy et al., 2020, pp. 24–25). See Figures 7.4 and 7.5 for more information.

In socio-religious and income groups, the percentage of students with access to digital infrastructure, that is, a computer with internet, is as follows: scheduled tribes 4%, scheduled castes 4%, other backward classes 7%, all Muslims 8%, and others 21% (Reddy et al., 2020, pp. 24–25). See Figure 7.6 for more information.

Here, the data points out that digital infrastructure is meagre in rural areas of most states. In urban areas, though the situation is better than in rural areas, around 80% of currently enrolled students do not have access to computers with the internet (Reddy et al., 2020, pp. 24–25). Students who have an economic advantage have better digital infrastructure than students from low socio-economic groups (Reddy et al., 2020, p. 25).

Sanumyajit Bhattacharya (2020), in his article, discusses issues faced by students in online teaching. The issue of accessibility is concerning for many students. They use the internet on their mobile phones, and very few have laptops. On mobile phones, attending classes for two-three hours continuously is difficult. The laptop has a big screen, and it is easier to maintain a reasonable concentration on a laptop than on a mobile phone. Many students don't have wi-fi plans; they use mobile data packs with limited usage. This puts a burden on low-income groups. Apart from the internet and gadgets, students also faced the issue of 'space'. Some students could not get personal, quiet, isolated spaces at their homes where they could attend classes peacefully. All these issues put much pressure on students and affected their studies during the lockdown (Bhattacharya, 2020, pp. 19–20). The announcement of the lockdown in India in 2020 forced educational institutes to shut down. This resulted in massive changes in the structure of the academic calendar. The biggest impact was the shift of classes to online mode. Social media

platforms were used by students and teachers to conduct everyday school and college routines. During this time, online teaching became the only way of disseminating education. However, not every student could benefit from it, and many students suffered due to the lack of equipment. There was a sudden transition from traditional classroom teaching to more digital-oriented teaching, and every student could not cope up with it. A few weeks into the COVID-19 lockdown, 75% of students said that their lives had become more stressful, and 50% believed that learning objectives would be harder to procure as a result of the sudden move to online education (*Student's Experiences with Online Teaching Following COVID-19 Lockdown: A Mixed Methods Explorative Study*, 2021). During the COVID-19 crisis, a survey among university students was conducted by professors Pavarala and Belavadi at the Department of Communication at the University of Hyderabad. A total of 2500 students responded to the survey in which 90% of students recorded that they have a mobile phone, but only half of them had access to a laptop. The majority of students of above 90% said they had access to the internet, with three-quarters of them using it via mobile data packs and the rest using wi-fi or fixed internet lines. On the question of whether they would be able to access the classes online, 37% responded with a 'yes', 45% mentioned 'infrequently', and 18%, i.e. approx. 450 students, said, 'can't access at all' (Proposal for online classes elicits mixed responses from UoH students, 2020). Not only students but even teachers also faced difficulties while conducting classes online. This was even when the majority of teachers, i.e. 96%, had access to smartphones. In urban areas, it amounts to 97%, while in rural areas the amount stands at 94%. In terms of access to laptops, merely 46% of teachers had access to it. In urban areas, only 48% of the teachers had access to laptops, while in rural areas, it further dropped to 41%. Further, in urban areas, 71% reported having access to a good internet connection whereas the percentage in rural areas dropped to 51% (Singh et al., 2020, p. 17).

In the past, the government had started several online portals, such as Diksha, which provide instructors, students, and parents with exciting learning content that is related to the authorised school curriculum. E-Pathshala is an online portal where books and study materials for students are available for free (Diksha, n.d.). The National Repository of Open Educational Resources (NGOER) offers study materials in different languages. SWAYAM is designed with the aim of achieving quality, equity, and accessibility in education. It focuses on bridging the digital gap for students who have previously been left out of the digital revolution and have been unable to participate in the knowledge economy. The aim of these portals is to make knowledge and learning more accessible and easy. Even during the COVID-19 crisis, the government announced various programmes to help students cope with online classes. The Deputy Chief Minister of

Delhi distributed 230 smartphones to students at a government school in Rohini, Delhi, and 1,900 tablets to the students of Class XI. Last year, the West Bengal Government announced that it would transfer an amount of INR10,000 to the bank accounts of 9.5 lakh students of Class XII studying in government schools in the state (The Wire, 2020). Odisha's School and Mass Education Minister, Sameer Ranjan Dash, said that out of 66 lakh students, the dissemination of school lessons could only reach 22 lakh students. To reach a maximum number of students, the government decided to turn to the radio. They planned that students from classes I to VIII could hear their lessons on radio, as radio has far more reach and can be heard even in the remotest places (Pujari, 2020).

7.5 Conclusion

The COVID-19 crisis changed the world around us, and it impacted our everyday lives in an unprecedented way. During the pandemic, technology helped us make our everyday routine as normal as it could be, but there were many sectors, such as education, where help could not reach everyone. Many states and schools opted for online education as the only medium for the subsequent academic session. However, online education could not reach every student. According to the above analysis, the digital divide is very prevalent, and there is clearly an inequality of opportunity. Every student could not get fair and equal access to education. The majority of currently enrolled students did not have access to a computer or tablet with the internet. Even if a smartphone was available, in most cases, it was seen that one smartphone was shared with the whole family. Among children, usually, the male child was given the preference, and the female sibling was expected to compromise. It was noticed that in urban areas, stations were better as compared to rural areas. Both in rural and urban areas, it was seen that students belonging to low socio-economic groups had difficulty accessing online classes. It was also observed that the government took enormous measures so that every student got a fair opportunity to learn. This raises a very important question: Are we ready to go completely virtual in the field of education? Do we have the proper digital infrastructure? We need a digitally inclusive approach. We need strategies, investments, and technology that are more accessible and that reach every individual in our country. We need to remove structural barriers to the access and use of technology. Digital equity is required in which all individuals have access to information technology and can use it for the betterment of themselves. Digital equity will also enable individuals to participate in the economy, democracy, and society. We need more affordable internet services that meet the needs of their users. For the betterment and development of the whole society, every citizen should have access to quality technical support and digital literacy training.

Note

1 The above-mentioned study examines the ICT diffusion in India and further studies the inter-state technological divide. The study divided states according to high, medium, and low groups on the bases of overall averages that is for 2001(0.244), 2006 (0.245), and 2012 (0.287). For the year 2001, states with a score greater than 0.244 are classified with respect to the large group, while those with a score less than 0.244 are classified as falling into the medium or low group. Again, we determined the average index value of the other states, and states with values higher than the average are classified as medium states, while the rest are classified as weak states for 2001. The same approach was used in 2006 and 2012.

References

A few developing countries overperform on frontier technologies, but most lag behind. (2021, February 25). UNCTAD. Retrieved January 9, 2022, from https://unctad.org/news/few-developing-countries-overperform-frontier-technologies-most-lag-behind.

Almendingen, K., Morseth, M. S., Gjølstad, E., Brevik, A., & Tørris, C. (2021, August 31). *Student's experiences with online teaching following COVID-19 lockdown: A mixed methods explorative study*. Retrieved December 23, 2021, from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0250378.

Bhattacharya, S. (2020). What is so wrong with Online Teaching? *Economic and Political Weekly*, *55*(23), 19–21. https://www.epw.in/journal/2020/23/commentary/what-so-wrong-online-teaching.html.

Diksha--Digital Infrastructure For School Education. (n.d.). *Home*. Ministry of Education. Retrieved May 7, 2022, from https://diksha.gov.in/.

Digital India. (n.d.). *Digital India initiative*. Di-Initiatives. Retrieved March 10, 2021, from https://digitalindia.gov.in/di-initiatives.

Ghani, E., & Mishra, S. (2020, November 12). Closing digital divide. *Financial Express*. Retrieved from https://www.financialexpress.com/opinion/closing-the-digital-divide/2126724.

Jena, D. P. K. (2020). Impact of pandemic Covid-19 on education in India. *International Journal of Current Research*, *12*(7), 12582–125826. https://doi.org/10.24941/ijcr.39209.07.2020.

Kedar, M. S. (2015). Digital India new way of innovating India digitally. *International Research Journal of Multidisciplinary Studies*, *1*(4), 1–10. Retrieved from https://www.researchgate.net/publication/338514008_Digital_India_New_way_of_Innov ating_India_Digitally.

Mohananta, G., Debasish, S. S., & Nanda, S. K. (2017). A study on growth and prospect and management studies. *Saudi Journal of Business and Management*, *2*(7), 727–731. http://scholarsmepub.com/.

National repository of open educational resources by ministry of education. (n.d.). National Government Services Portal. Retrieved December 24, 2021, from https://services.india.gov.in/service/detail/national-repository-of-open-educational-resources-by-ministry-of-education-1.

Neena, N., & Kaur, K. (2014). Pattern of inter-state digital divide in India. *Economic Affairs*, *59*(3), 379–388. https://www.indianjournals.com/ijor.aspx?target=ijor:eaj&volume=59&issue=3&article=006.

Norris, P. (2001). *Digital divide: Civic engagement information poverty, and the internet worldwide*. Cambridge University Press. Retrieved from https://www.google.co.in/books/edition/Digital_Divide/wfNPdyiwbYQC?hl=en&gbpv=1&dq=digital+divide:+civic+engagement+information+poverty,+and+the+internet+world wide&pg=PR9&printsec=frontcover.

Paresheera, S. (2019, October 17). *India's on a digital sprint that is leaving millions behind*. BBC News. Retrieved March 8, 2021, from https://www.bbc.com/news/world-asia-india-49085846.

Proposal for online classes elicits mixed responses from UoH students: Survey. UoH Herald. Retrieved March 17, 2021, from https://herald.uohyd.ac.in/proposal-for-online-classes-elicits-mixed-responses-from-uoh-students-survey/.

Programme pillars. (2019, September 6). Digital India. Retrieved December 23, 2021, from https://digitalindia.gov.in/content/programme-pillars.

Pujari, N. K. (2020, August 5). *No smartphones, internet access: Odisha's rural kids caught in digital divide*. DownToEarth. Retrieved from https://www.downtoearth.org.in/blog/governance/no-smartphones-internet-access-odisha s-rural-kids-caught-in-digital-divide-72656.

Reddy, A. B., Jose, S., & Vaidehi, A. (2020). Of access and inclusivity digital divide in online education. *Economic and Political Weekly*, *55*(36), 23–26. https://www.epw.in/journal/2020/36/commentary/access-and-inclusivity.html.

Reddy, A. B., Jose, S., & Vaidehi, R. (2020, September 5). Of access and inclusivity: Digital divide in online education. *Economic & Political Weekly*, *55*(36). Retrieved from https://www.epw.in/journal/2020/36/commentary/access-and-inclusivity.html.

Sheikh, M. M. (2017). Bridging digital divide in India: Way forward & challenges. *International Journal of Advanced Research and Development*, *2*(4), 129–136. https://www.researchgate.net/publication/352442075_Bridging_digital_divide_in_India_Way_forward_challenges.

Singh, A.K., Satyavada, R. S., Goel, T., Sarangapani, P., & Jayendran, N. (2020). Use of EdTech in Indian school education during COVID-19 a reality check. *Economic and Political Weekly*, *55*(44), 16–19. https://www.epw.in/journal/2020/44/commentary/use-edtech-indian-school-education-during-covid-19.html.

Singh, S. (2010). Digital divide in India: Measurement, determinants and policy for addressing the challenges in bridging the digital divide. *International Journal of Innovation in the Digital Economy*, *1*(2), 1–24. https://www.igi-global.com/article/digital-divide-india/43683.

Swayam Central. (n.d.). *About Swayam*. Ministry of Education. Retrieved May 7, 2022, from https://swayam.gov.in/.

Tawney, R. H. (1995). The religion of inequality. In M. Desai (Ed.), *LSE on equality*. London: London School of Economics. pp. 19–48.

Telecom Regulatory Authority of India. (2020). *TRAI annual report 2019–20*. Retrieved from https://www.trai.gov.in/sites/default/files/Annaul_Report_02032021_0.pdf.

The Wire. (2020, December 23). *Bengal govt to give Rs 10,000 to 9.5 lakh class 12 students to buy phones, tablets*. The Wire. Retrieved from https://thewire.in/government/online-education-west-bengal-election-mamata-banerjee-tablets.

8

OLD CASTE EXCLUSIONS AND NEW DIGITAL DIVIDES

Anant Kamath

8.1 Introduction

This study presents a fresh perspective on the complicated liaison between new technologies and disadvantaged castes in India. It aims to deepen the understanding of the impact of digital communication technologies on the lives and livelihoods of socially and historically deprived castes in peri-urban south Bangalore. I rely on oral accounts to uncover the engagement of Dalit castes[1] in this region with new digital technologies, such as mobile phones, over the last decade and a half. Reading these oral accounts against conceptual and empirical perspectives in the existing literature, I ask three questions: first, what has been the nature of engagement of the region's Dalit castes with digital communication technologies, such as mobile phones? Second, have these technologies bypassed or been insufficiently harnessed by these historically disadvantaged social groups? Third, have these technologies assisted in the reinforcement of socio-economic exclusion for some members of these groups?

The contemporary socio-technological outcomes among subaltern communities in peri-urban south Bangalore are a result of a convergence of three elements – (a) the durability of caste in peri-urban metropolitan India, (b) the social construction of the usage of ICTs (information and communication technologies – in this study mobile phones), and (c) myopia in the conventional policy and popular understanding of the digital divide in India. Recognising this convergence helps build a new perspective on the relationship between caste, ICTs, and development policy. I argue for a re-look at the idea of the 'digital divide', a concept often encountered in development policy related to ICTs, and for expanding our understanding of the social

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construction of the usage of this technology. In the process, I call for deeper documentation of the experience of the subaltern in the history of technological change in metropolitan India.

The setting of this study in peri-urban Bangalore city is founded on the commonly held vision of the region being a central pivot in India's information economy, pictured by policy and popular perception as a fertile ground for spawning the archetypical information society with all the trappings of a 'technological culture'.

To understand the significance of each element in the convergence, this chapter focuses on three cohorts: (a) households of Dalit families in a socio-economically deprived neighbourhood in peri-urban south Bangalore, (b) individuals belonging to Dalit castes engaged in commercial or entrepreneurial ventures, and have experienced tremendous upward economic mobility over the last decade, and (c) civil society activists who also hail from Dalit castes, but are at the forefront of challenging historical deprivation. I divide my respondents into these three cohorts to demonstrate variances in the mobile phone experience among Dalits.

The structure of the chapter entails a discussion of issues and themes around the research questions, followed by an explanation of the methods and theoretical approach. In the end, the empirical findings are presented.

8.2 ICTs, Development, and Mixed Possibilities

ICTs have enjoyed a global reputation for furthering positive development outcomes, particularly advancing well-being among historically deprived groups. As India seeks to upgrade from a 'developing' to a 'knowledge economy', the state has constantly been framing solutions to address the challenges of socio-economic and environmental well-being, primarily around the deployment of ICTs and other new technologies. Not only in India but across the developing world, the digital divide is viewed as a conspicuous obstacle in achieving an information society or knowledge economy. This obstacle is conventionally overcome with digital solutions (Warschauer, 2003). This convenient course of action finds its roots in the combination of (a) the general observation that ICTs play an overwhelmingly critical role in all aspects of contemporary economies and societies and (b) the idealistic assumption that increased access to ICTs for deprived communities will lead them from historical marginalisation to seamless inclusion and participation in the contemporary economic era.

ICTs are assumed to embolden skill-learning and open access to new resources and networks, which are expected to deliver discernible improvements in the lives and long-term livelihood prospects of individuals and households, including, in the case of India, socio-historically deprived castes. However, as the literature has established, the 'stuff' of innovation is

not just science and engineering but also sociology and politics (Bijker et al., 1987; Bijker, 1997; Bijker, 2010). There is sufficient evidence that identity and community are as relevant in virtual worlds as they are in the social world around us (Hammersley & Atkinson, 2007). The digital world is not flat since ICTs hold different meanings for different social groups who are unevenly empowered (Bijker et al., 1987; Stehr, 1994; Bijker, 1997, 2010; Faulkner et al., 2010; Wajcman, 2004, 2010; Qiu, 2009; Jeffrey & Doron, 2013; Ahmed et al., 2014; Lupton, 2015). A technological artefact, such as a mobile phone, is interpreted by a social group through its idiosyncratic perspective to the extent that there may be heterogeneity in interpretation even within the same social group in one geographical region. A social group may attribute subtle or overt meanings to that technological artefact (or its usage) depending on its respective socio-hierarchical position and the perceived possibilities of livelihood improvement it attaches to the technology in question. Hence, the access or usage of any technological artefact is invariably embedded in highly context-specific social structures, social processes, power relations, interest groups, norms, and values (Stehr, 1994; Warschauer, 2003; Bell, 2006; Guy & Karvonen, 2011). These socio-political variables significantly influence whether or not the ICTs, such as mobile phones, deliver their reputed positive outcomes and improve well-being.

Conventionally perceived as a boon for the poor, ICTs can also demonstrate creative possibilities of perpetuating the exclusion of marginalised people from new livelihood-improving opportunities, improved social networks, and evolving social capital.

Consider, for instance, social networks, which are the foremost source of livelihood information for the peri-urban poor in India (Schilderman, 2002). These networks can be either nourished or starved, which in turn strengthens or diminishes the social capital of disadvantaged castes (Kamath, 2015). It is well known that even in the contemporary era, being a member of a dominant caste assures livelihood benefits which stem from the highly exclusionary nature of their internal social networks and the resultant strong social capital within these castes (Thorat & Attewell, 2007; Das, 2008; Thorat & Newman, 2010; Harriss-White, 2004; Harriss-White et al., 2014; Kapur et al., 2014; Verma, 2015; Prakash, 2015). The exclusionary character of such dominant social groups (and their already rich internal social networks) gains additionally through ICTs, which in turn fuel new forms of exclusion against subaltern castes, thwarting the latter's attempts to improve their livelihoods. In the formal and informal economies in peri-urban Bangalore, disadvantaged castes have been systematically excluded from valuable networks and opportunities. For instance, studies have found that most well-paid workers in the information technology-enabled services (ITES) industry in Bangalore come from well-off agricultural families or are members of upper castes, demonstrating that there are spatial solid and

social discontinuities in technological experiences within India's 'IT city' (Heitzman, 2004; Upadhya, 2007; Upadhya & Vasavi, 2006). Greater dependence on ICTs might have exacerbated the economic exclusion of disadvantaged castes, especially the informal sector that emerged as a spin-off from the ITES industry in this region.

Caste-based exclusion may now be nurtured by employing ICTs, which efficiently assist in pushing the already caste-based social capital into a very exclusive, closed social network in digital space (Prakash, 2015). Although the instant exchange of electronic messages using ICTs has, as studies have shown, created a 'more intense sense of shared experience and a shared social world' (Hammersley & Atkinson, 2007, p. 138), in reality, they may not have changed long-term livelihood outcomes and the well-being of the deprived. As Jeffrey and Doron (2013) emphatically state, mobile phones may have improved some conditions, but they have not reordered society (Jeffrey & Doron, 2013). Hence, the durability of caste in peri-urban metropolitan India may further the social exclusion using ICTs, which is quite diametrically opposite to the well-intentioned vision of ICTs improving well-being and expanding livelihood opportunities beneficially percolating through every aspect of life and livelihood.

Very little of these complex dynamics are appreciated or accounted for in policy debates in India. Popular and policy notions on development often begin with grandiose fantasies associated with advancing towards an 'information society' or a 'digitally empowered local economy' wherein old sociological variables, such as caste, are perceived to have aged and deteriorated and are now too impotent to have any place or relevance in the crafting of socio-technical trajectories that lead us towards these ideals. The thriving incarnations of caste – both new and old – are given only passing mention (if mentioned at all) in the general policy discourse about the role of ICTs in the development of India. Especially in the popular imagination of Bangalore city (considered by many as India's 'Silicon Valley'), caste is popularly imagined as having been 'modernised', 'democratised', or even rendered 'irrelevant' (Natrajan, 2012). This assumption is reflected in popular and policy narratives of the developmental role of ICTs in India. Programmes, such as the National Digital Literacy Mission, which are indeed noble in purpose, demonstrate a shallow understanding of the political nature of the relationship between technology and caste. Apart from an appreciable recent international policy recognition (very notably by the World Bank)[2] that maximising the 'digital dividends' in a society requires working with the 'analogue' foundations of that society, in India, there has generally been policy myopia of the complicated relationship between technology and society.

However, if ICTs are the newfound apparatus in creating adverse experiences for socio-historically deprived groups, have there been responses from these groups to mitigate the above adverse effects? Do factors, such as

age, stimulate innovative use of ICTs to renegotiate or rework power relations, and counter subordination in everyday life and work? Has the broad permeation of mobile phones among Dalits intensified the drive for social cohesion? Empirical evidence in this study indicates that these possibilities have not materialised. Instead, the convergence of the sturdiness of caste, the usage of ICTs, and credulous understanding of the digital divide has in most cases connived in producing adverse results.

8.3 Sites of Enquiry

To address these issues, I identified three different cohorts within the Dalit community in one part of peri-urban south Bangalore. Members of Cohort A (households) reside in a traditional region of historically deprived Dalit castes who face various forms of deprivation, including quality of housing; access to potable water; quality of education and health services; and upward economic mobility opportunities. Cohort B comprises individuals within these Dalit castes who have experienced dramatic upward mobility over the last decade to the extent that they now manage or even own businesses of various sizes in Bangalore city. Cohort C includes individuals and organisations among the vast network of civil society workers and Dalit activists in Bangalore, most of whom operate in peri-urban and metropolitan settings. The selected area of study for Cohort A – two clusters of houses at Choodasandra – is located near Electronics City, one of Bangalore's major ITES enclaves. Residents of this area have experienced violent and brutish reinforcement of socio-historical exclusion (Madsen, 2010) and exhibit severe economic deprivation even as recently as in the 1980s. The entire region is substantially populated with demarcated dwelling areas for Dalit castes. Offices of several organisations that cater to the welfare needs of Dalits, such as the Dalita Sangharshana Sene, Dalita Sangharsha Samiti, and Dalit Panthers of India, are located here. I focussed on two housing clusters with 96 families and interviewed members of 71 households (out of a total of 214 individuals, each family comprising two to four individuals). The other 25 individuals were not present across all three months of the fieldwork, and I assumed household members had migrated, most likely for employment. The homes, primarily concrete-built with access to regular water supply and sanitation facilities within the house,[3] were generally owned by families of Dalit castes and at times rented out to other families (which were not necessary for Dalit caste, but still economically highly deprived). Issues such as visible malnutrition in children, youth unemployment, illiteracy, and a general sense of precariousness in livelihood were all too apparent.

Cohort B, on the other hand, lived not in one single site but in various locations within Bangalore city. These individuals, all of whom were men, have vivid memories of living in conditions equal to or worse than Cohort A,

yet proudly stating that they have risen high, to the extent that caste 'didn't matter' (as one respondent said) to them anymore. They owned businesses large and small, ranging from cooking gas distribution outlets and electrical shops to small firms. Among them, one well-recognised and felicitated individual had been featured as a 'Dalit millionaire' in popular media (Kapur et al., 2014). All these individuals now reside and operate within Bangalore city and have built a strong socio-economic network among themselves.

Cohort C, again not in one locale, consists of a sample of civil society workers and activists. These are members of a spectrum of organisations that include the Dalita Sangharshana Sene, Dalita Sangharsha Samiti, Dalit Panthers of India, Dalita Samara Sene, DSS Ambedkar Vedi, and the Karnataka Mahila Dalit Vedike, among others. Most live in peri-urban Bangalore, while some individuals and organisations operate from within the city.

8.4 Methods

The data collection process aimed at eliciting primary oral information on what mobile phones have played in livelihood improvement over the last two decades to access networks and contacts that open the doors to better livelihood opportunities. My central method was documenting micro life histories of personal, cultural, sociological, and political engagements with mobile phones. This approach shows the variation in disadvantages among subaltern groups. The literature on oral life histories forcefully argues that this methodology provides a historical presence to those whose views and values have been disenfranchised by 'history from above' (Prins, 2001; Ritchie, 2003; Janesick, 2014; Bosi & Reiter, 2014). In this case, though, I did not seek highly detailed and lengthy oral life histories common to ethnographic studies of a larger scale. Instead, I have collected micro life histories, i.e., oral accounts of a period much shorter than an entire lifetime (here, around 15 years), and centred around my respondents' experiences with mobile phones.[4]

For Cohorts B and C (businessmen and activists), I used lengthy open-ended interviews. I interviewed 11 individuals in Cohort B and in addition, conducted a focus group discussion with these individuals under the auspices of the Bangalore Chapter of the Dalit Indian Chambers of Commerce and Industry (DICCI). I asked them to talk about their personal backgrounds, their opinions on the economic situation of Dalit castes, especially in the peri-urban regions of Bangalore, how they had moved out of these hard circumstances, and over the last 15 years, how mobile phones had influenced their upward trajectories.

For Cohort C, I interviewed 13 individuals from different activist organisations (selected by snowball sampling) about their experiences with cell

phones. Given the intense engagement that these individuals have with their phones, nearly on a 24-hour basis, it was interesting to collect information on how they perceived the device, not only in the obvious sense of faster and more instantaneous communication for collectivisation and social mobilisation but as to whether mobile phones have brought new challenges to activism as such.

To interview members of Cohort A, I went door to door across both housing clusters, building rapport with each family and interviewing them together. Their engagement with mobile phones was elicited by means of a questionnaire divided into five categories:

i. *On encountering mobile phones*: What kind of mobile phone do you have? For how long have you had this? If this isn't your first phone, what kind was that, and why did you change it? Do you wish to upgrade your phone now, and why?
ii. *On one's personal relationship with a mobile phone*: How much time do you spend on this? Do you have internet access to it? Does it help your job? Does it help maintain better contact with family and friends? Who else in your household owns a phone, and what do they mostly use it for?
iii. *On the role of a mobile phone in their work*: How does the phone help you in your everyday work? Do you see how phones are helping so many people better their lives by gaining new professional contacts and improving their jobs, or getting new jobs? Do you think you'll be benefitted in this way at some point in time?
iv. *On caste solidarity and phones*: Do you maintain contact with the local Dalit activist or Dalit political leader or any police officer or politician? If you're using platforms such as WhatsApp or Facebook, are you part of caste solidarity groups? Do you see news and updates about events and programmes (religious or civic) through these platforms? Do you share caste-related issues or problems, or civic issues with your contacts through your phone?
v. *On positive experiences with the phone*: Does the phone make you feel more 'liberated' compared to your parents or grandparents, and how? Or does it bring negative experiences?

Finally, I noted individual and group interpretations of mobile phones as technological devices.

8.5 Findings

All households surveyed in Cohort A owned a mobile phone. Most individuals in these households had owned a device for many years and had also

upgraded it over the years. For many, it was the first electronic device they had bought (Jeffrey & Doron, 2013).[5] Ownership of phones (and sophistication of the device) within households was generally unequal. Nearly all male individuals in Cohort A owned and operated mobile phones. This was not the case with all female individuals in this cohort, who either owned a more rudimentary model of a phone (almost never smartphones) as compared to the male members of their family or would state that they did not 'need' a phone at all.

Young men and women (under the age of 25), however, displayed equal ownership (of 100% for each), especially of smartphones. Among the elderly (above 55 years of age), this gender gap was starker, with women, for the most part, not owning a device at all and elderly men owning only a traditional mobile phone, not a touchscreen smartphone. Characteristics and information on ownership of the phone are presented in Table 8.2.

It was noted that almost everyone in this cohort used these primarily as communication devices, such as keeping in contact with their employers or superiors (for the intermittent periods during which they had work). Individuals in this cohort generally perceived a phone as anything beyond a device that makes communication convenient.

The younger men spent a far greater length of time on their devices. Their phones played a central role in entertainment, social media communication, and informal conversation among themselves. While this was a serious issue of disappointment and irritation between parents/elderly and younger male family members, these men stated that their usage was the 'reality' of mobile phones, which had to be accepted. An elderly respondent lamented:

> [We were never like this as youngsters. Our parents wouldn't allow us to even look at a girl! Now these useless boys even taunt young girls with bad pictures and messages. They keep giggling, showing each other things, and spending the whole day under that bus stop or near the auto stand, but we have to accept the modern-day reality.]

These young men were rarely employed and generally had little education. They spent much of their time in small groups, sharing amusing or vulgar content on their devices. Exceptions to this were very few (in fact, only three individuals among young men were found to be regularly at work). Many elderly interviewees lamented that if they had had access to these devices during their youth, 'things would have improved' for them for their long-term livelihood. Most people in this cohort rarely kept in touch with local civil society or political groups, and very few maintained phone numbers of local police or other state agents who might be helpful during emergencies. They complained:

TABLE 8.1 Characteristics of Cohorts

Cohort	*Principal Feature*	*Educational Level*	*Sample*	*Method Employed*
A	Households	Mostly non-literate or high-school passed. Younger men and women are mostly high-school educated. Elderly men mostly have primary education, while elderly women are mostly non-literate	71 households with 214 individuals	Semi-structured interview guided by a questionnaire
B	Businesses	Mostly high-school, and in some cases even college education	11 individuals	Lengthy open-ended interviews, and focus group discussions
C	Activists and Civil Society	Mostly high-school, and in some cases even college education	13 individuals	Lengthy open-ended interviews

TABLE 8.2 Characteristics of Cohort A

Age Group	*Men*	*Women*	*Total*
Aged under 25	51 (0)	13 (0)	64
Aged 25 to 55	78 (1)	30 (61)	108
Aged over 55	31 (4)	11 (9)	42
Total	**160**	**54**	**214**

Note: Figures in parenthesis indicate the number of individuals who did not own a phone.
Source: Fieldwork

what's the use? These politicians and activists are around only for their own individual and political organisations' interests. I have no idea who the influential people around are, and it doesn't matter anyway.

if I need something, I can help myself without approaching those selfish people.

I don't really recall any such messages on WhatsApp or Facebook, collecting everyone together for election cards or Dalit political rallies.

For many, the initial fascination of owning an advanced digital device waned after a few weeks of purchase, after which it only became a convenience and never once imagined as a tool that would permit them access or inclusion to economic networks of the upper or dominant castes of the region. Upon enquiring about this possibility, many responded with blank stares, often accompanied by the simple yet powerful statement – 'all this [upward mobility] is not for us'.

A minuscule number (only two individuals out of all Dalit households surveyed, and both under the age of 40) have some functional grasp of the English language. Only these individuals were able to access and succeed in operating simple employment-related apps or a rudimentary job search online. The act of searching online for job openings via portals or apps

TABLE 8.3 Primary Usage of Phone by Each Cohort

Cohort	*Principal Feature*	*Usage of Phone*
A	Households	1. Purely a convenience for communication with family and employer 2. Major source of entertainment 3. Job search by very few young men
B	Businesses	1. Crucial for upward financial and social mobility 2. Sustenance and expansion of business and livelihood opportunity 3. Expand interpersonal networks 4. Assistance in migration to cities 5. Assistance in sourcing capital 6. Facilitates caste anonymity
C	Activists and Civil Society	1. Virtual space for Dalit activism 2. Networking with various levels of activism 3. Caste solidarity 4. Formulation of intervention strategy 5. Quicker collective mobilisation for urgent issues 6. Counter false information and circulate information on threats received by vulnerable individuals 7. Social media for all the above purposes

does not require high technical qualifications and, hence, is quite popular among aspiring individuals from the lower middle and working class in peri-urban Bangalore. Several respondents commented that members of the dominant and economically well-to-do castes in the region (such as the Reddys, Gowdas, Lingayats, and other Kshatriya and Brahmin castes) had their monetary and political fortunes shoot up after the mobile phone era started in part because of their social and financial capital, as well as English language skills.

The worst affected are middle-aged, for whom, even after having mobile phones for over a decade, opportunities remain inaccessible. Their social contacts are often battling deprivation, and access to social networks of more well-to-do groups are beyond their horizon because of caste prejudices in informal interpersonal or economic networks. Personal interaction with members of dominant castes was formerly restricted or permitted only in a subordinate capacity. This continues today on electronic and virtual platforms, as useful and resourceful contacts through phones are exclusively shared only within these dominant groups. Some respondents commented:

> [if we want to start a paint and hardware shop, who's going to give us the money? The only people who can give us credit for very little collateral are those who will surely cheat us. And besides this, it's impossible to get those contacts who can give you better jobs or better suppliers to begin a small business. These contacts are only with the well-to-do landowners here. We are met with cold shoulders, or they tell us to become painters instead of opening paint shops.]

In a completely different experience, all 11 individuals in Cohort B not only owned mobile phones but also stated that their phones were crucial for their financial and social upward mobility. They perceived their phones as a constant companion in their journey over the last decade or more. What was especially different from Cohort A was that individuals in this cohort believed their phone was essential, not only for communication in their existing (formal or informal) job but also to 'expand' their existing business and livelihood opportunities – a virtue of technology, highlighted in the domain literature, and in policy discourse. Cohort B members believed their device did exactly this, i.e., to expand their interpersonal networks and to allow them to broaden their capabilities and fuel their upward mobility. A mobile phone, they said, assisted in their migration to the interior of the city from the peri-urban and rural locations they originally hailed from and also allowed them to get in touch with sources of capital and crucial business information. Although there were small informal businesses among Dalits in metropolitan and peri-urban Bangalore well before mobile phones dominated the scene, this technology added a strong boost to this process of

enhancing entrepreneurship possibilities. However, the most interesting issue that was brought up during the interviews and focus group discussions with members of this group was that mobile phones allowed a certain extent of caste anonymity or even liberation from caste identity. One respondent from this cohort stated:

> [We can easily gain new contacts of resourceful people in the city, even from higher castes, through this phone … after all (laughing), they can't hear my caste when I speak to them. In fact, not only across Bangalore … I can source new vendors even in towns just an hour or two away with the phone … I don't know their caste, as much as they don't realise mine … who cares? All we need mutually is a good price and quality service, not caste.]

Hence, respondents' claims explained how they could gain new contacts within the city across castes through their phones, since caste 'could not be heard through the device'. However, they also characterised members of Cohort A in highly derogatory ways:

> [They're just lazy. What does it cost to leave that place and come to the city? What do they lose? After all, the only thing they leave behind is some freebies that some politicians gave them to get some votes. No use staying there and constantly crying or constantly demanding things from the government. Just come here (to the city).]

So, according to this respondent, all that the young and able in Cohort A had to do, 'obviously', was to migrate into the city and use the immense power of this technology to expand their networks, and eventually the possibilities of upward socio-economic mobility by trying out new jobs:

> [Look at that fellow from North India selling street food. Does anyone ask his caste here in the city? Does anyone care for anything apart from the taste of his cooking? See? There's no point in depending on government reservations in jobs or some political activity. The phone helps you get many things here without bothering about caste.]

Members of Cohort C revealed that though it might be far-fetched that one can entirely conceal one's caste identity with a phone (or that it was irrelevant altogether), mobile phones have indeed opened a virtual space for Dalit activists to operate within, where the critical importance of caste is marginally eroded as well as explicitly presented, depending on the need at hand. While Cohort B members had clearly benefitted from the marginal erosion of caste identity, individuals and organisations in Cohort C explained how

caste was the very axis around which they developed intervention strategies and exercised agency in using phones as communication and mobilisation devices. Some activists boasted about how, through social media platforms, they were able to collect people and families together around the purpose of caste solidarity and increased political participation.[6] One respondent emphatically stated:

> [Just a few months ago, everyone was brought together for camps that I organised to apply for voter identification cards and ration cards (to access public distribution systems for food and fuel). There are so many government subsidies for our community! And every other month, there are celebrations related to religious festivals. All get possible with WhatsApp.][7]

However, others within this cohort stated that there was a bit of inertia among individuals and families in Cohort A to utilise their phones to build cohesion among themselves and with local activists. While activists in Cohort C stated that their social movements were alive and functioning even before the advent of widespread cell phone usage, the technology provided them with an extra boost for collective mobilisation and quick communication across distant geographical locales. Several activists who are prolific writers on the cause of Dalit emancipation have found phones and ICTs, in general, to provide a greatly liberating venue to escape not from caste, as such (as claimed by some in Cohort B), but to find a digital space which serves as an alternative to regular media coverage of caste questions and issues. One prominent activist from this cohort stated:

> [As a development journalist, things are so much easier for me now. Back in the day, I was restricted by newspaper editors and vernacular magazines from publishing my work. I don't need to beg them anymore. I have my regular blog, followed by thousands of people who, for their part, also didn't have access to reading this sort of thought. My fellow comrades and I write for so many online venues with no restrictions. No more gatekeepers!]

However, the converse experience also has been that those who perpetuate caste-based subordination in an ideal sense spread false information targeting Dalits or simply spew crude hatred and have also used this new digital space to operate and expand their intent:

> [The 'saffron brigade' (the Hindu right-wing) now circulates all sorts of stuff insulting our food habits, such as eating meat or even beef, which is an insult to much more than just food habits or preferences. They even call for bringing back the traditional order of 'keeping people where they

ought to be' for 'social stability' and 'traditional values'. At times, they even openly encourage violence against those who go against the traditional caste order, say through intermarriages or by indulging in political activities. Such individuals and groups now have access to these phones and their power.]

8.6 Disentangling the Convergence

The above findings, in themselves, may not be novel. They may well be applicable to other social groups too, not just Dalits in peri-urban Bangalore (Rashmi, 2017).[8] The issue here is to understand that such outcomes may be the result of a convergence between elements and whether the effects of ICTs as a tool for improving inclusive economic participation for disadvantaged castes are as assured as they are made out to be (Prakash, 2015).[9] The question is: have new digital communication technologies been insufficiently harnessed by historically disadvantaged social groups in this region, or have they reinforced caste-based socio-economic exclusion?

8.6.1 The Durability of Caste in Metropolitan India

One macroeconomic episode that constantly reared its head while interviewing members of Cohort B was the process of economic liberalisation that the Indian economy underwent from the 1990s onward. Many respondents agreed that it was economic liberalisation that gave the first lift-off to their rise. However, a close look at the evidence in the literature clearly shows how liberalisation benefitted those who were already on a rise, but not necessarily those who started from a setting such as those of Cohort A. Caste remains a prime source of social and economic capital despite economic liberalisation, as this process has strengthened mostly the already capitalised social groups and maintained the social exclusion of those lacking a critical stock of social and economic capital to catch the tide of economic growth and prosperity (Chalam, 2011). Dalits in urban India still do not generally have the requisite access to beneficial networks and markets and are left to operate in informal casual markets even within metropolitan areas (Das, 2008). They generally do not possess the means and opportunities to overcome vulnerabilities or their exclusion from the capital and beneficial information unless they are politically connected or happen to be fortunate enough to capture the ever-elusive opportunities in potential small business sectors (Duncombe, 2006). Economic outcomes thus clearly differ between Dalits and most other social groups in the urban or peri-urban economy, as caste is selectively reworked in these settings to create unfavourable terms of exchange for Dalits, excluding them from critical information and credit sources (Harriss-White et al., 2014). A large proportion of emerging businesses in peri-urban India operate on intra-caste or intra-class insular interactions between individuals and

groups, especially when they have access to political power in the region. This works in the converse for Dalits, who remain entrenched in their networks that are already in penury. This leads to Dalits in Cohort A, operating at the margins, to be reconciled to the thought that their phones will never have contact details of the wealthy and powerful. A general sense of disappointment prevails in communities such as Cohort A, in which people can clearly see, but not necessarily articulate, the fact that the mobile phone revolution has bypassed them since caste is still sturdy in peri-urban Bangalore.

However, individuals in Cohort B appear to have escaped these conditions and have succeeded in latching on to the wave of entrepreneurship in metropolitan Bangalore that emerged from the late 1990s onward. This wave emerged from the expansion of the unorganised sector that dominates the metropolitan economy outside of the organised or caste-led employment sectors of the city (Kapur et al., 2014). Respondents from Cohort B recalled another factor that allowed their rise: small businesses that have become a defining characteristic of urban economies all over India over the last two decades (Verma, 2015). A sense of connectedness with other members of the underclass (who may not be Dalit) in Bangalore city appears to have prevailed, demonstrating that within the city, these individuals in Cohort B would have, in all likelihood, recognised that networking with people across a spectrum of castes is an entry point to economic prosperity. Some respondents stated that they managed to 'overcome caste' by connecting and merging their own caste networks with those of other subaltern groups in the city, creating a win-win situation across a palette of castes. Solidarity with similar subaltern groups and networks was the way out, and the way up.

Hence, the durability of caste in peri-urban and metropolitan Bangalore is a lived reality. The drastically different operationalisation of this reality for members of Cohorts A and B has led to contrasting socio-technical outcomes.

8.6.2 The Interpretation of the Digital Divide

Wider patterns of inequity in urban India along the lines of caste are mirrored in inequalities with ICTs, which are not easily solvable by simple ownership by one and all (Saith, 2008). Owning or not owning a phone is not the only condition that characterises the digital divide in peri-urban or metropolitan India. This binary mode of thinking oversimplifies people and social groups as simply digital haves or have-nots in an archaic and trivialised sense (Qiu, 2009). There is a class of ICT users that Qiu terms the *information have-less*, which are a vast group of people who include migrant informal workers, those who seek to escape agrarian distress, those who have highly precarious and vulnerable working lives, and those who generally constitute the underclass in the city and the peri-urban. In the case

of India, this calls to mind Dalit neighbourhoods and communities that are either dispossessed and forced to leave urban areas or are forced out of villages into the peri-urban. They may possess a device such as a smartphone, but lack effective participation in the digital revolution either as creators of technological products and services or as customers who are beneficial for information feedback to the producers. Rather, they are simply passive consumers of digital technologies on the margins.

Conceptualising the peri-urban subaltern in this manner opens up a fresh and far more realistic understanding of the digital divide in its more realistic form, which, as Qiu proposes, builds on the existing digital divide and takes it beyond. There is, therefore, a populous category in the digital divide spectrum that the Indian policy discourse on this theme has entirely missed. Apart from the obvious recognition that those among the poor who possess digital devices must be taught to use them better, this is often stated almost as a pedagogic prescription. Programmes such as Digital India or the National Digital Literacy Mission speak of training lower-rung government workers and other social workers in ICT skills to access e-governance services, or of improving digital infrastructure in terms of device ownership and broadband highways. Even the portions of these programmes that directly address empowerment dwell on information accessed through mobile phone internet, with little interest in whether or not these spaces in the digital sphere will ever be accessed. These programmes are noble endeavours indeed, but certainly myopic of social realities. Even in the formal sector of the information economy in Bangalore, the literature has recognised that there is a large proportion of people even in the immediate locale of Electronics City, that is excluded, which has created a local, but highly significant and expanding urban dualism (Upadhya & Vasavi, 2006).

The 'information have-less', who constitute almost the entire Cohort A and some members of Cohort C of this study, may have information (say, about state programmes or information on subsidies), but are rarely informed users of digital technology (Qiu, 2009). They may own technological devices, but are still alienated and disempowered in a larger sense of citizenship and participation, which is clearly because these technologies operate within existing social conditions without changing them (Qiu, 2009). This is also similar to ideas in the literature on critiquing the separation of social inequity from digital access, arguing for a conceptual deepening of 'digital social inequality' (Halford & Savage, 2010; Lupton, 2015). Interestingly, there may even be a digital divide inside the home, as domestic spaces are mirrored in the use of digital devices, creating another digital divide.[10] Once we open up our understanding of digital inequities, not simply being a question of ownership of a device, the mammoth scale of the task and agenda ahead for reorienting technology policy becomes evident (Halford & Savage, 2010). *Naïveté* in the state policy discourse around ICTs

results in the interpretation of the digital divide as simply e-inclusion in the sense of ownership of devices and access to information rather than effective participation – demonstrating the flawed inclination of this policy orientation towards technological determinism and solutionism (Fortunati, 2008; Morozov, 2014, 2016).

Understanding the 'information have-less' is enriched by feminist literature on the diversity of users of a given technology, which differentiates users into 'end users', 'lay-end users', and 'implicated actors'. While the first two terms refer to those who are affected downstream by innovation and those who have been excluded from expert discourse, 'implicated actors' include those who have either not been physically present but discursively constructed and targeted by technology developers or those who are physically present but who have been generally silenced, ignored, or made invisible by those in power (Oudhsoorn & Pinch, 2003). All members of Cohort A own devices but have been excluded from the meta-narrative of the promised prosperity that mobile phones are supposed to bring them.

On a broader scale, according to the UNDP's human development data, there are about 78.8 mobile phone subscriptions for every 100 individuals in India. In this study, almost all individuals possess mobile phones and in principle, have access to general information. Has the digital divide been bridged for Dalits in peri-urban Bangalore, let alone for India as a whole? If the focus is on simple access, the answer is yes. If we broaden this to a spectrum of have, have-not, and 'information have-less', we arrive at a more realistic understanding of the actual digital divide in peri-urban India, as well as of the current socio-technological circumstances of each cohort in this study.

8.6.3 The Social Construction of Mobile Phone Usage

The third component of the convergence that leads to differential socio-technological outcomes is the manner in which social groups (whether caste, class, age group, or, in this study, cohort) idiosyncratically interpret and attribute meaning to that technology. This conceptual perspective to understand the social construction of technology is credited primarily to the work of Wiebe Bijker (Bijker et al., 1987; Bijker, 2010).

The diversity in the meaning attributed to a technological device by social groups results in the device experiencing interpretative flexibility. The interpretation of this device within a social group arises due to an interaction among its members, by which, eventually, there emerges a certain stability in meaning and interpretation, and discussions around the best uses for or the ideal operation of a device reach an equilibrium or stabilisation within that social group. All these processes operate within (and in turn build up) a technological frame, which is a broader paradigm comprising tacit knowledge,

procedures, goals, and techniques of technological problem-solving.[11] In this manner, interactions between members of a social group play a significant role in the evolution of a particular form of technology.

In this study, however, it can be seen that each cohort does not play a role in the technological evolution of mobile phones, rather, in how these are 'used' in interpersonal interactions. Cohort members interact, attribute meaning, and reach a consensus around the usage of a device. Each cohort interprets the device in its own manner, while groups within each cohort (for instance, young men, the middle-aged, or women) share an interpretation of what a device means to them and what a mobile phone is useful for, among other such concerns. Over time, these interpretations stabilise and socially construct the 'usage' of mobile phones. Supplementing this perspective is an understanding of how each cohort 'domesticates' phones.

There are four phases of the domestication of a technology – appropriation, objectification, incorporation, and conversion. Appropriation occurs when a device is sold to a consumer and owned by her, and objectification processes reveal the norms and principles of the individual's or group's sense of itself and its place in the world, the phases of incorporation (where the device is used in the routines of daily life) and conversion (where the device shapes relationships between its users and other people) (Oudshoorn & Pinch, 2003). Appropriation and objectification occur in (continually) constructed spatial environments, never in isolation. Similarly, incorporation, or how the device is used, is heavily determined by social variables, such as gender and age. In fact, incorporation can even reinforce the culture of the technology, for instance, its embedded masculinity. Similarly, conversion defines the relationship between the user and the external world (outside the household, caste group, or neighbourhood) in the process of claiming status in the wider society. Hence, the complexity of the experience of a device, such as a mobile phone, intensifies, as it is not simply a technological 'artefact' restricted within the individual domain (or even within a household), such as a refrigerator, but rather a 'medium' of interaction between individuals and social groups, therefore doubly articulating both private and public domains (Silverstone et al., 1992).

In the case of this study, the social construction of phone usage is conditioned greatly not only by ownership (and hence, prestige) or the relationships between individuals and their peers but importantly by incorporation and conversion, which rest on the contemporary subaltern condition or slow upward socio-economic mobility. Interactions around an artefact, within (sometimes between) social groups associated with it, result in the stabilisation in meaning and of the general technological frame around the device for each social group (Bijker et al., 1987). This is why members of each group have contrasting understandings of their experiences with mobile phones.

These different experiences within the same caste group, or even within cohorts, appear to ignore the 'script' attributed to this digital device by designers and policymakers who subscribe to its alleged transformative powers. Technological devices are usually defined within a framework of action, considering the actors and spaces within which they are scripted to operate. In other words, technologists anticipate the skills, motives, and behaviour of the represented users of this device, attributing to them certain assumed competencies, actions, and responsibilities, all of which then become materialised in the design of the device (Oudshoorn & Pinch, 2003). However, this idealised attribution – echoing an attitude of technological determinism – may not fructify. Akrich (1997) argues against restricting a device's attributes to designers (and, in this case, policymakers). One must appreciate and take stock of the form and meaning constituted by, and constituted of, the technological device to understand the *de*-scription of the device that emerges due to the mismatch between the users as imagined by the designers (and policymakers) and the real users.[12] The experience of a technological device rests significantly on how it constrains users in the ways that they relate to it as well as to one another, and in addition, how they reshape the usage of the device with these interactions. In designing an artefact such as a mobile phone, the user is also constructed in the process as one who completes both the function and vision embodied in it and hence the entity that needs to be harnessed to reinforce the place of the device in contemporary socio-economic life (Silverstone & Haddon, 1996).

Reality is far different from these idealised designs and assumptions, which is the reason why a scripted approach cannot explain the variety of technological outcomes and experiences. While scripts may foretell prosperity, the reality of the socio-technical outcome, due to the social construction of the usage of a device, can result in increasing or decreasing returns. It is uncertain as to which competing technologies will emerge dominant in any given situation (Arthur, 1989; Cowan, 1991). It may even transpire that the second-best gains dominance due to rapid lock-in, which can emerge even on account of small historical events. This can well apply to the usage of digital technologies too. Howsoever convincing the argument or intention may be, indicating towards an all-positive usage of ICTs and events on the ground, historical circumstances and other such conditions exogenous to the technological device itself can solidify the usage of the technology within a social group by the group's own interpretation and construction of the usage.

8.7 Conclusion

This study illustrates how technology – even its 'usage' – is a socio-material product, combining artefacts, people, cultural meanings, and knowledge

(Wajcman, 2004). Mobile phone experience among members of deprived castes in peri-urban Bangalore is, hence, not only a function of their immediate knowledge of using these phones, but also draws from the dynamics of peri-urban work and life, the durability of caste in the peri-urban setting, forms in which a digital divide manifests itself, and the role of ICT in society. There is nothing inevitable about the way a technological device operates within a society or a social group; technologies may be deployed highly heterogeneously and can have differentiated outcomes across society.

The peri-urban, therefore, much like a city itself, is a socio-technological outcome in which a device and social groups dealing with that device interact through the political, cultural, and economic dramas of daily life (Guy & Karvonen, 2011). The presence of technology and the closing of the digital divide as commonly understood are clearly insufficient, as the technology itself cannot budge social inertia and may even amplify social conditions (Toyama, 2015). A particular technology amplifies the inclinations of individuals and groups, such as those who wish to pursue entertainment (such as young men in Cohort A), who find ICTs helping them in manifold ways, and likewise for those who wish to pursue entrepreneurial ventures (like members of Cohort B). Because of this, low-cost technology need not always fight inequality, since technologies often act as reflections and amplifications of social inequities: as not bridges, but jacks (Toyama, 2015, p. 49).

Our understanding of the role of technology in alleviating historical deprivation must be significantly deepened, as there is clearly a huge overlap between the virtual and the real (Hammersley & Atkinson, 2007). Mobile telephones might have only increased the efficiency and speed of communication, but the larger outcome of whether or not ICTs have been insufficiently harnessed by historically disadvantaged social groups to overcome exclusion, and thereby combat deprivation over the long term, is contingent on the persistence of social structures, the understanding of what a digital divide really is, and how social groups interpret specific technologies (Castells et al., 2004; Toyama, 2015). By itself, technology cannot do much in the direction of social change. Simply making it all-pervasive in life and work does not create a knowledge society. By itself (and even in an urban or peri-urban setting with all its notions of liberation from caste and identity) ICTs do not automatically radicalise or politicise people who have been historically deprived (Morozov, 2014, 2016). Socio-technological outcomes depend greatly on the convergence of a series of factors. This is also why peri-urban Bangalore has emerged as an archetypical showcase of socio-economic inequity, hence digital inequality as well.

All this has very deep implications, especially for Dalits (Kamath, 2017). According to the 2011 Census of India and 2011 Socio-Economic and Caste Census, the literacy rate for Dalits is approximately 60%, compared to an overall national rate of 74%. They also have low average monthly

income, dwindling participation in organised employment, and very marginal land ownership rates. Given this reality, a mobile phone ends up as nothing more than a social communication device to maintain informal contact with friends or extended family for many, or, for the younger cohort, as an entertainment device. More positive outcomes for Dalits will be possible with greater political participation, increased access to quality education and healthcare, and other fundamental socio-economic variables; not just increased ICT ownership and internet access as what state programmes wish to do. For instance, civil society workers could work directly with households to use their phones to collectivise themselves and reach out to them for any legal or other help. Those successful in business could create groups online where opportunities could be disseminated to young men and women of Dalit communities who are far more tech-savvy than the older generations. Groups on platforms such as WhatsApp, which are increasingly used to encourage and nurture bigotry, could also be used for collectivisation and circulation of information on schemes, job openings, opportunities, etc. Lessons can be learned from the immensely successful 'Khabar Lahariya' in northern India to promote such initiatives on digital platforms in regions such as the one studied here. Even educational assistance online can be offered by the more affluent (in Dalit communities or outside) who are willing to empower school-going children among these communities; in several instances, mobile phone devices are freely used by students in such marginalised households for entertainment, a trajectory that can be altered by the willing. Government programmes must make greater engagement with the ground, encouraging bottom-up recommendations and evaluations, and involving civil society organisations much more deeply (something that is very sketchy in its present form). The National Digital Literacy Mission must be roped in to improve the quality of public education in such neighbourhoods, expanding from its current mission to merely improve the engagement with tangible devices and to familiarise with basic computer concepts and multimedia operations. Perhaps, even special awards can be constituted for teachers who have catered to the marginalised with ICTs in creative ways (such as one teacher in Karnataka who had created a brilliant animation of the solar system during online classes during the pandemic) – perhaps even offering incentives to patent. Similar initiatives can be applied to Dalit students who have deployed ICTs for learning and creativity. Mere IT literacy is insufficient in the Digital India mission – the very idea that ICTs can indeed transform capabilities and lives, must be inculcated in young minds among marginalised communities. It is the last point about redefining the very idea of what ICTs can do, rather than mere familiarisation of their tactile operations, that will go a long way to deliver positive benefits to such communities.

Technological trajectories can empower the marginalised only when the frameworks of equity and justice are in place, without which connectivity will only aggravate exclusion (IT for Change, 2014). As Toyama has noted, 'technology results in positive outcomes only where positive, capable human forces are already in place' (Toyama, 2015, p. 54).

This returns me to the question I asked at the beginning of this chapter – have these technologies been insufficiently harnessed by historically disadvantaged social groups, or have they assisted in the reinforcement of these exclusions for some? The evidence points towards the affirmative. For the most part, Dalits do not entirely remain passive onlookers in the technological trajectory of the mobile phone in India, as seen in the experiences of Cohort A, but they are not active agents either. They are generally 'passive participants' in this story who are subjected to a largely patronising attitude of state and market with respect to enriching their technological experiences. The intentions behind state programmes arise from well-accepted notions that ICTs facilitate greater participation in the development process, especially in metropolitan regions like Bangalore. Given that ICTs have pervaded life and work in urban India over the last 15 years, this optimistic outcome, especially for the urban poor and historically deprived sections, ought to have materialised. However, access is rarely translated into actual and automatic opportunities for upward socio-economic mobility (Kamath, 2017). Also, given that there is a vast population of the 'information have-less' in peri-urban areas, these optimistic outcomes may only play out on paper. All this, despite the fact that mobile phone penetration rate is nearly 80% in India with more than a billion devices in use.

This study has shown that caste continues to be overlooked or oversimplified in much research on technological change. There is a dearth of empirical writing on the relationship between subalterns (peri-urban and otherwise) and digital technologies, the concept of digital divide, recognising the technological solutionist bent in popular and policy discourse on ICTs and development, and on the imagination of an information society. The sociological literature on technological experiences and socio-economic history in India is very scanty as well. This study, demonstrating the complications of caste and ICTs in the case of one region, joins the literature in its call for a much richer documentation on the relationship between the subaltern and technological change in India. This is because the liaison between ICTs and disadvantaged castes is indeed very complex (often dismal), and not as sleek, neat and tidy, or 'liberating' as policy and popular perceptions around technologies imagine it to be.

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Notes

1 Dalits, or formerly untouchable castes, are placed at the very bottom of the Indian caste system and for centuries have been subject to severe deprivation and often even intimidation and violence. The term 'Dalit', according to Prakash (2015, 23), has come to signify the political identity of people who have been called scheduled castes in the official vocabulary of the colonial and post-colonial state.
2 World Bank (2016).
3 These are characteristics that were deliberately sought, to avoid those households and settlements that are abysmally poor. This study wishes to understand those households and families who may benefit from living conditions that are generally above the average for a similar caste status elsewhere in India, but for whom intense ICT engagement may not have translated into positive outcomes.
4 The entire data collection of recording oral information was conducted in Kannada with the help of an assistant and was then translated and transcribed by this assistant.
5 Jeffrey and Doron (2013) also show how mobile phones are usually the first devices bought by individuals in deprived social groups in India, sometimes even before a bicycle.
6 For a very recent instance of collective political organisation around the Dalit cause in northern and central India, see Daniyal (2018). Platforms such as WhatsApp and Facebook were employed not only to spread messages, poetry and infographics, but also to exhibit solidarity by replicating profile photos (or display pictures) that had strong messages on them.
7 This appeared to contrast with the responses in Cohort A, of which the majority reported that there was little contact with members of Cohort C in the local area.
8 See Rashmi (2017) on how other segments of the underclass in Bangalore experience the mobile phone in rather similar ways; these would come under the 'information have-less', a concept this chapter discusses in the following sub-section.
9 Prakash (2015) has elaborated greatly on the stifling of economic upward mobility among Dalits, especially those who wish to engage in entrepreneurial ventures. He provides a strong argument on how perversions in state, civil society, and market at their intersection bring about rigidity in credit access, network information access, and other resources for Dalits in urban India.
10 Bell (2006).
11 This is similar to a Kunhian technological paradigm; the difference however, being that a technological frame structures the interactions among the members of social groups (beyond scientists and engineers) that are associated with this technology (with the possibility of varying degrees of inclusion among individuals

within one technological frame, as well as that of an individual participating in multiple technological frames), while a Kuhnian paradigm is intended for understanding scientific communities. That is, this is a frame with respect to the technology in question, and not a technologist's frame. See Bijker et al. (1987) and Bijker (2010).

12 As Akrich (1997) argues further, designers often tend to accuse the users of having 'misused' a device, in the event that the device is not technically successful.

References

Ahmed, H., Qureshi, O. M., & Khan, A. (2014). Reviving a ghost in the history of technology: The social construction of the recumbent bicycle. *Social Studies of Science*, *45*(1), 30–136.

Akrich, M. (1997). The description of technical objects. In W. Bijker & B. Law (Eds.), *Shaping technology/building society: Studies in socio-technical change* (pp. 205–224). Cambridge/London: The MIT Press.

Arthur, W. B. (1989). Competing technologies, increasing returns, and lock-in by historical events. *The Economic Journal*, *99*(394), 116–131.

Bell, G. (2006). Satu Kelugara, Satu Komputer (one home, one computer): Cultural accounts of ICTs in South and South East Asia. *Design Issues*, *22*(2), 35–55.

Bijker, W. E. (1997). *Of bicycles, bakelites, and bulbs*. Cambridge/London: The MIT Press.

Bijker, W. E. (2010). How is technology made? That is the question! *Cambridge Journal of Economics*. *34*(1), 63–76.

Bijker, W. E., Hughes, T. P., & Pinch, T. (1987). *The social construction of technological systems*. Cambridge/London: The MIT Press.

Bosi, L., & Reiter, H. (2014). Historical methodologies: Archival research and oral history social movement research. In D. D. Porta (Ed.), *Methodological practices in social movement research* (pp. 117–143). Oxford, England: Oxford University Press.

Castells, M., Ardevol, M. F., Qiu, J. L., & Sey, A. (2004). *Mobile communication and society: A global perspective*. Cambridge, MA and London: The MIT Press.

Chalam, K. S. (2011). *Economic reforms and social exclusion: Impact of liberalisation on marginalised groups in India*. Thousand Oaks, CA: Sage.

Cowan, R. (1991). Tortoises and hares: Choice among technologies of known merit. *The Economic Journal*, *101*(407), 801–814.

Daniyal, S., (2018, April 7). *The WhatsApp wires: How Dalits organized the Bharat bandh without a central leadership*. Scroll.in. Retrieved from https://scroll.in/article/874714/the-whatsapp-wires-how-dalits-organised-the-bharat-bandh-without-a-central-leadership.

Das, M. (2008). *Minority status and labour market outcomes: Does India have minority enclaves?* (Policy Research Working Paper No. 4653). The World Bank, South Asia Region. Retrieved from https://openknowledge.worldbank.org/handle/10986/6868?locale-attribute=en.

Duncombe, R. (2006). *Analysing ICT applications for poverty reduction via micro-enterprise using the livelihoods framework* (IDPM Working Paper No. 27). University of Manchester.

Faulkner, P., Lawson, C., & Runde, J. (2010). Theorising technology. *Cambridge Journal of Economics*, *34*(1), 1–16.

Fortunati, L. (2008, July 12). *Re-thinking e-inclusion* [Conference Presentation]. Prati CIRN 2008 Community Informatics Conference: ICTs for Social Inclusion.

Guy, S., & Karvonen, A. (2011). Using sociotechnical methods: Researching human-technological dynamics in the city. In J. Mason & A. Dale (Eds.), *Understanding social research: Thinking creatively about method* (pp. 120–133). London: Sage Publications https://doi.org/10.4135/9781446287972.n8.

Halford, S., & Mike, S. (2010). Reconceptualising digital social inequality. *Information, Communication, and Society*, *13*(7), 937–955.

Hammersley, M., & Atkinson, P. (2007). *Ethnography* (3rd ed.). Routledge.

Harriss-White, B. (2004). *India working: Essays on society and economy*. Cambridge, England: Foundation Books; Cambridge University Press.

Harriss-White, B., Basile, E., Dixit, A., Joddar, P., Prakash, A., & Vidyarthee, K. (2014). *Dalits and Adivasis in India's business economy: Three essays and an atlas*. Three Essays Collective.

Heitzman, J. (2004). *Network city: Planning the information society in Bangalore*. Oxford, England: Oxford University Press.

IT for Change. (2015). *Annual report 2014–2015*. Bangalore, India: Itforchange .net.

Janesick, V. (2014). Oral history interviewing: Issues and possibilities In P. Leavy (Ed.), *The Oxford handbook of qualitative research* (pp. 300–314). Oxford, England: Oxford University Press.

Jeffrey, R., & Doron, A. (2013). *: How mobile phones have revolutionized business, politics and ordinary life in India*. Hachette UK.

Kamath, A. (2015). *Industrial innovation, networks, and economic development in India*. London and New York: Routledge.

Kamath, A. (2017, November 24). *In India, accessible phones lead to inaccessible opportunities*. The Wire. https://thewire.in/caste/india-accessible-phones-still-lead-inaccessible-opportunities.

Kamath, A. (2018). 'Untouchable' cell phones? Old class exclusions and new digital divides in peri-urban Bangalore. *Critical Asian Studies*, *50*(3), 375–394.

Kapur, D., Babu, S., & Prasad, C. B. (2014). *Defying the odds: The rise of Dalit entrepreneurs*. New Dehi: Random House.

Lupton, D. (2015). *Digital sociology*. London & New York: Routledge.

Madsen, A. (2010). Dalits in South India – Stuck at the bottom, or moving upward? *Social Skriftserie No.10*. Department of Social Work, University of Aarhus, Denmark.

Morozov, E. (2016). The net delusion: How not to liberate the world. In *Democracy: A Reader* (pp. 436–440). Columbia University Press.

Morozov, E. (2014). *To save everything, click here: Technology, solutionism, and the urge to fix problems that don't exist*. Penguin.

Natrajan, B. (2012) *The culturization of caste in India: Identity and inequality in a multicultural age*. London & New York: Routledge.

Oudshoorn, N., & Pinch, T. (2003). Introduction: How users and non-users matter. In T. Pinch & N. Oudshoorn (Eds.), *How users matter* (pp. 1–25). The MIT Press.

Prakash, A. (2015). *Dalit capital: State, markets and civil society in urban India*. London & New York: Routledge.

Prins, G. (2001). Oral history. In P. Burke (Ed.), *New perspectives on historical writing* (pp. 120–158). Pennsylvania, USA: The Pennsylvania State University Press.

Qiu, J. L. (2009). *Working-class network society: Communication technology and the information have-less in urban China*. Cambridge/London: MIT Press.

Rashmi, M. (2017). The digital others. *Seminar*, *694*, 40–43.

Ritchie, D. A. (2003) *Doing oral history: A practical guide* (2nd ed.). Oxford, England: Oxford University Press.

Saith, A. (2008). ICTs and poverty alleviation: hope or hype? In A. Saith, M. Vijayabaskar, & B. Gayathri (Eds.), *ICTs and Indian social change: Diffusion, poverty, and governance* (pp. 113–159). New Delhi, India: Sage Publication.

Schilderman, T. (2002). *Strengthening the knowledge and information systems of the urban poor*. Intermediate Technology Development Group (ITDG), Department for International Development. UK. Available online at https://assets.publishing.service.gov.uk/media/57a08d21e5274a31e000167c/kis_urban_poor_report_march_2002.pdf. Date of Access June 11, 2022

Silverstone, R., & Leslie, H. (1996). Design and the domestication of information and communication technologies: Technical change and everyday life. In R. Mansell & R. Silverstone (Eds.), *Communication by design: The politics of information and communication technologies* (pp. 44–74). Oxford, England: Oxford University Press.

Silverstone, R., Hirsch, E., & Morley, D. (1992). Information and communication technologies and the moral economy of the household. In R. Silverstone & E. Hirsch (Eds.), *Consuming technologies: Media and information in domestic spaces* (pp. 15–31). London & New York: Routledge.

Stehr, N. (1994). *Knowledge societies*. Thousand Oaks, CA: Sage.

Thorat, S., & Attewell, P. (2007). The legacy of social exclusion: A correspondence study of job discrimination in India. *Economic and Political Weekly*, *42*(41), 4141–4145.

Thorat, S., & Newman, K. (Eds.). (2010). *Blocked by caste: Economic discrimination in modern India*. Oxford, England: Oxford University Press.

Toyama, K. (2015). *Geek Heresy: Rescuing social change from the cult of technology Perspectives on Science and Christian Faith*. (Vol. 67, Issue 4) American Scientific Affiliation.

Upadhya, C. (2007). Employment, exclusion, and merit in the Indian IT industry. *Economic and Political Weekly*, *42*(20), 1863–1868.

Upadhya, C., & Vasavi, A. R. (2006). *Work, culture, and sociality in the Indian IT industry: A sociological study report submitted to the Indo-Dutch programme for alternatives in development*. Bangalore: National Institute of Advanced Study (NIAS).

Verma, V. (Ed.). (2015). *Unequal worlds: Discrimination and social inequality in modern India*. Oxford, England: Oxford University Press.

Wajcman, J. (2004). *Techno feminism*. Cambridge, UK: Polity Press.

Wajcman, J. (2010). Feminist theories of technology. *Cambridge Journal of Economics*, *34*(1), 143–152.
Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide*. Cambridge/London: The MIT Press.
World Bank. (2016). *World development report 2016: Digital dividends*. New York: The World Bank.

9

IMPROVING FARMER INCOME THROUGH DIGITISATION

Analysing e-Markets

Abhisheik Vishwakarma and Amrita Chakraborty

9.1 Introduction

It is believed that agriculture emerged in human history nearly 13,000 years ago. Despite its gradual beginnings, agriculture quickly gained momentum and had a profound impact on shaping human societies. With active management of the food supply, farmers brought more food than their hunter-foragers counterparts, which, in turn, helped balloon the human population (Johns Hopkins, 2016). Fast forwarding to recent times, with the help of improved agricultural science, techniques, and complex tools, farmers could change the cropping pattern and bring crop diversity into various regions – ultimately bringing a wide variety of crops which were unconducive for specific agrarian climates and landscapes previously.

Today, there are complex challenges in the agrarian domain for public policymakers to overcome: one of the significant challenges include food security for an ever-growing population of 1.3 billion, providing a better livelihood for farmers and protecting the environment (Brooks, Deconinck, & Giner, 2019). India has taken a giant leap in producing various agricultural commodities, which have helped make it a food-secure country even after the population boom.

> Since 1951 and until 2017, production of food grain grew by five times, fish by 12.5 times, milk 7.8 times, eggs 39 times and horticultural crops by 9.5 times. Grain crops registered about 59% gross cropped area. (Committee for Doubling Farmers' Income, 2018).

Time and again, it has been established that the economic value captured by farmers reflects the growth story in agricultural operations. The value of

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marketable surplus no more merely represents it. These challenges require interventions at a macro-level through technology leading to planned and sustainable farming practices.

Among the world's poor, nearly 80% live in rural areas and mainly depend on farming for their livelihood (Food and Agriculture Organisation, 2019). Productivity growth in the agriculture sector is indicated to have the most sweeping impact on poverty reduction, approximately twice that of manufacturing (Maloney, 2019). Agriculture remains the primary livelihood for 58% of the Indian population, and the government has declared its goal to double the farmer's income by 2022 (India Brand Equity Foundation, 2021). The creation of interoperable digital platforms provides real-time market access to farmers and can potentially increase farmers' income and resolve various logistical limitations. To work both within and outside the agricultural sector, the significant sources of growth can be identified through an increase in crop and livestock productivity, cropping intensity, market price discovery and reduced cost of production, better price discovery, and a shift from farm to the non-farm occupation (Committee for Doubling Farmers' Income, 2018).

The government has taken conscious initiatives to increase farmers' share in the final consumer paid the price by decreasing the cost of marketing, transaction cost and other intermediaries as the key to increase farmers' income at the expected rate (Nuthalapati, Bhatt, & Beero, 2020). The government aims to increase the share of contribution from better price realisation to 13% based on the experience of electronic marketing schemes in Karnataka (Chand, 2017). The Indian policy landscape has historically been focused on increasing cultural productivity but has not successfully transformed the agricultural marketing domain. The Agricultural Produce Marketing (Regulation) Acts (APMC), 2017, carries the marketing of agricultural commodities in India by utilising a vast network of regulated markets. The objective of these markets is to ensure an effective price discovery through the interplay of supply and demand force and ultimately have a positive impact on farmer income and the efficiency of the food system (Nuthalapati, Bhatt, & Beero, 2020). The APMC Act, 2017, which applies to most commodities in most states, compels farmers to sell their produce in government-controlled marketing yards. These controls restrict transactions to a few local players who can tilt the balance against the farmers. The APMC market yards are subject to vast technical and marketing inefficiencies that undermine the prices received by the farmers.

The introduction of agricultural reforms in India has made it critical for digital market agents to better coordinate product supply and demand, strengthen existing trade networks, facilitate the assembly of products to reach a critical mass, and enable products to be delivered cost-effectively to new markets (Kamble, Gunasekaran, & Sharma, 2020). Blockchain-based

data management can help manage information related to land and resource use, purchase and use of pesticides and other harmful agents, traceability, and even the flow of finance across the value chain.

While the farmers' income stays positively correlated to input costs, cost of cultivation, and cost of production, their ability to monetise through effective market linkages remains a significant concern. Demand-driven agricultural logistics with aggregation, transportation, and warehousing can buttress the possibility of enhancing farm income. The next step should focus on integrating the agricultural value system of the supply chain with the sector-wide supply chain, i.e. connecting individual-level value chain systems with district, state, and national-level value chains. It can only be furthered through a farmer-centric national agricultural marketing system. With a better network of agricultural and wholesale markets across the country and developed marketing architecture, the chances of farmers gaining better bargaining power increase. The steps in the initiatives were to establish a Hub and Spoke System (AVCS) in both front and back end to facilitate every stakeholder involved in the production and marketing chain.

The activities that can help identify the price discovery through policy-level initiatives are:

i. Aiding price stabilisation and risk management with supply and demand-led forecasting for decision-making and establishing Marketing Intelligence System.
ii. Optimum land usage and water management to enhance income and diversification for higher-value farming.
iii. The near-farm and off-farm revenue-generating opportunities become prominent and enable farm-linked secondary and tertiary sector activities with higher market value and higher production.
iv. Drought management, animal risk management, weather forecast, access to long-term credit and post-production finance, and crop insurance to be mechanised in a way to preclude distress sale of crops by farmers.
v. Structural and governance reforms for development in agriculture at each spatial level are needed and make the best use of Panchayati Raj institutions for coordination, convergence, and as key delivery channels.

This study explores the recent focus on the adoption of technological tools to improve agricultural marketing in India and analyses the process and impact of the National Agricultural Market (e-NAM) platform introduced by the Central government. The objective of this scheme is to achieve one price in one market in one nation. The step has been taken after realising the urgent need to improve India's existing agricultural marketing system. This

chapter also covers aspects of the policy-level changes that are required to increase the effectiveness of digital intervention.

9.2 Digitisation of Agriculture in India

Globally, the agriculture sector is adopting new technology like digitisation, AI, IoT, biotechnology, etc. These technological tools ensure reliable and sustainable farming practices by increasing productivity and decreasing risks. The technological tools employed to assist agriculture include automated steering systems, data-driven targeted application of fertilisers, climate and pesticides, special hybrid seeds, field robots and drones, soil analysis sensors, autonomous driving, etc., (Giesler, 2018). These technologies support current practices like precision farming and enable agriculture to be part of the Global Value Chains (GVC) (Maloney, 2019). GVCs offer a way to expand markets and an alternative means of remedying market failures other than direct government interventions. Under the right conditions, GVCs render credit, insurance, product markets, etc.

A paradigm shift has happened in the Indian farm sector through prioritising science and technology for farmers, which has established them in the agricultural value system as a critical economic stakeholder. Unless the farmers can derive value from the crop per drop approach, planning for sustainable economic growth becomes futile. Prioritising and extending science and technology-related services can disseminate knowledge for capacity building and skills for using agricultural best practices. There is also an independent need to test several other aspects starting from the quality of soil, water, and input materials to optimise yield. Advancement of science and technology can contribute to many other facets of the crop portfolio, subsistence crops, and cultivating climate-resilient crops as part of the sustainability plan.

Mitigating risk in various aspects helps in the price discovery process – starting from forecasting agricultural commodity prices, which is invariably dependent upon the weather, production, pest control, and access to crop insurance. Meanwhile, in the post-production scenario, farmers want to minimise production loss once the harvesting takes place. There arises a simultaneous need for modern storage and warehousing space and facilities for managing inventory and transportation in the long run. The final and foremost need is for a strong market or mandi network at the national level, developing and mapping farmers' needs with delivery management and establishing a performance monitoring system through dashboards for the product and outcomes.

A few global examples of technological interventions in agriculture are as follows:

i. **AgMarket in Hungary:** This mobile application has been developed to allow the user to find producers and healthy agricultural products easily. The programme aims to improve direct market access for small farms, increase sales opportunities and enable customers to evaluate producers and products, providing feedback to the farmers and other customers. The contact data and the description and location of the local markets and products are searchable and can be displayed in detail.
ii. **Govi Nena in Sri Lanka:** This comprises a real-time mobile-based information system and a management dashboard. The mobile application is the front-end for farmers to monitor the aggregate production level in real time. The management dashboard is a graphical terminal, customisable according to value chain participants, such as banks, government agencies, agrochemical companies, etc. The Govi Nena platform aims to consolidate linkages in the value chain by eliminating coordination failure and uncertainty (Sugathadasa, Ginige, Wikramanayake, Goonetillake, & De Silva, 2016).
iii. **AIR in Canada:** Built by Canada's National Agricultural Information Services (NAIS), the Agro-climate Impact Reporter (AIR) is an application. It collects climate data from volunteers, farmers, and media reporting by using AIR. The data is anonymised and mapped by NAIS. These maps can then be used by anyone interested in the information stored. The tool is intended to help producers mitigate weather-related risks (Bronson & Knezevic, 2016).
iv. **Ethiopia's '80-28' hotline:** A farmer advisory service with about four million users, the highest on the continent. The success is mainly due to the delivery of services in local languages. Aligning services to local circumstances encourages farmers to subscribe willingly (Abdulai, Duncan, & Fraser, 2019).
v. **Early Warning Systems:** The creation of an Early Warning System (EWS) for agriculture has been one of the significant areas of technology adoption in the global agricultural industry.

As described in Figure 9.1, the critical components of a farmer's cost include the input costs, quality and quantity produced, and the value added to the crop before it reaches the market. Public policies influence input costs. For instance, the government subsidy given to farmers for procurement of seeds/electricity/pesticides/fertilisers would impact the cost of production. Thus, the value added to the crop and access to the market will likely increase the farmer's income to a greater extent.

Farmers' income is based on factors like the onset of monsoon, soil quality, changes in the agrarian pattern, quantity of crop produced, and demand for the same. A Crop Simulation Model (CSM) uses a computerised representation of crop growth, development, and yield to be simulated through

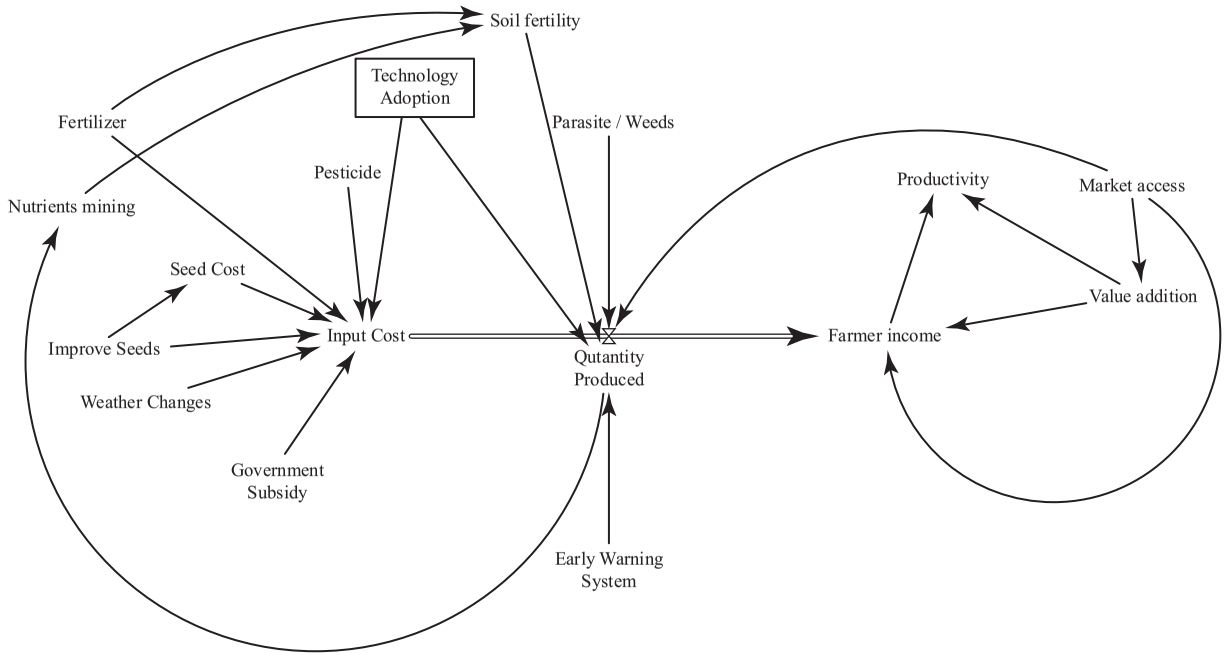

FIGURE 9.1 Causal Loop Showcasing Interplay of Various Aspects, Focusing on Early Warning Systems, Impacting Farmer Income
Source: Author's compilation

mathematical equations and functions of soil conditions, weather, and management practice. The strength of the CSM lies in its ability to extrapolate the variances in input parameters to simulate the crop growth and yield pattern beyond a single experimental site (Hoogenboom, White, & Messina, 2004). The creation of a CSM is key to the creation of an EWS. The availability of an EWS helps the farmer to make delta changes in agrarian practices, leading to improvement in the quantity and quality of the product and thus ultimately decreasing risks to farmer income (Taiwan Agriculture Research Institute, 2018).

Thus, digitising various aspects of agriculture is a global trend with many advantages. India has also recently adopted technology tools in various sectors to enhance productivity and keep pace with the world economy. The agriculture sector in India is also witnessing the adoption of technological interventions to improve yield and enhance the overall food system.

9.2.1 Agriculture Marketing: Digitisation to Increase Farmer Income

Indian policymakers have prioritised self-sufficiency in agriculture since the droughts of the mid-1960s (Nuthalapati, Bhatt, & Beero, 2020). Numerous prominent institutions such as the Agricultural Prices Commission (APC), which is now known as CACP, the Food Corporation of India (FCI), and the National Dairy Development Board (NDDB) were established, along with significant investments in agricultural R&D to support this endeavour. Due to these policies, India became virtually self-sufficient in producing food grains. Further, the production of milk and sugar also improved. These factors played a vital role in ensuring productivity increase for the farmers. However, there are certain limits to increasing farmer income through productivity increase. In India, the farm mechanisation level also ranges from 40 to 45%, which is very low compared to developed economies, where mechanisation has reached beyond 90% (PWC, 2019). Thus, Indian policymakers have simultaneously shifted their focus to improve agricultural marketing in India. The improvement in agricultural marketing is expected to increase farmers' income by increasing price realisation and improving access to resources, like warehousing and data-driven farming.

The agriculture sector in India is expected to generate momentum in the next few years due to increased investment in infrastructures like irrigation facilities, warehousing, and cold storage. The growing use of genetically modified crops will likely improve the yield for Indian farmers. Thus, it is essential to study various policies introduced by the government over time and pinpoint the areas in need of improvement. According to NITI Aayog, Uttar Pradesh accounts for the largest share by area and production and contributes to almost one-fifth of the country's food grain production. Meanwhile, Punjab and Haryana have traditionally been significant

contributors to food grain production. Further, Madhya Pradesh, Andhra Pradesh, Rajasthan, and West Bengal have emerged as significant producers in recent years (NITI Aayog, 2015).

A point to note here is that yield and the proportion of area irrigated vary widely across states, and there is a strong correlation between these two variables. In terms of both these variables, Punjab ranks first and Haryana second. Among larger producers, Madhya Pradesh, Rajasthan, and Maharashtra show relatively low yields. Rajasthan and Maharashtra have less area under irrigation. In Bihar, the area under irrigation is above the national average, but it is not the same as the yield. This might be because of the frequent floods that destroy standing crops. Thus, geographical differences and resource accessibility have played a significant role in determining the farmer's produce and income.

One reason is the lack of assurance of remunerative prices. While there is MSP for food grain, fresh fruits and vegetable prices are vulnerable to seasonality and perishability. Inadequate cold storage facility discourages farmers from opting for these crops. On top of this, the inefficiencies of APMC have been highlighted in various research works. Thus, agricultural marketing has not seen any immediate reforms or modernisation attempts for decades. The supply chain remains fragmented, the scale of operations is low, and there is a preponderance of intermediaries. The advent of the global trend to adopt technology in all aspects of agriculture has also introduced the concept of e-markets. The benefits of an e-market and its potential impact on farmers' income and the entire agriculture industry are highlighted in the next section.

9.2.2 e-Markets

As described in Figure 9.2, an electronic trading platform for agriculture will bring all participants – farmers, traders/aggregators, public procurement units, and private companies – to come onto a single platform. The setup replicates physical mandis in an electronic format where buy/sell orders can be executed. Shipment of goods would be managed with the physical infrastructure available with the mandis. Further, this digital trading can improve the efficiency and availability of digital finance by utilising verified digital transaction data to enable easy finance options for the farmers. Further, such platforms can reduce the cost of transactions and enable data-driven decision-making in agricultural marketing (Dabbara, 2019).

9.3 Digital Interventions – e-NAM

After the success of ReMS in Karnataka and other states, the Central government of India acknowledged the need to digitalise the agriculture

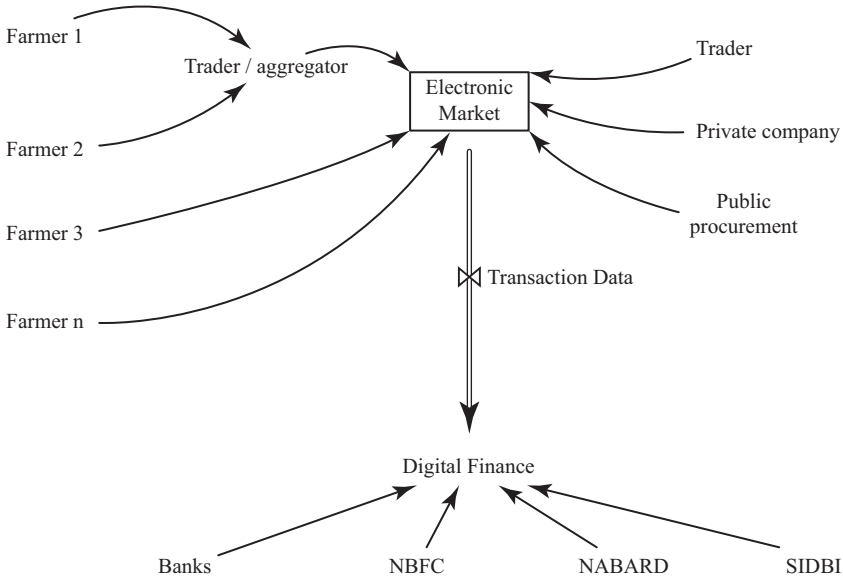

FIGURE 9.2 Showcasing the Impact of e-Markets

Source: Authors' compilation

marketing sector of India. Subsequently, the government has introduced a Central Sector Scheme through a common electronic market platform for the promotion of the National Agriculture Market. It is called the electronic National Agricultural Market or e-NAM (Department of Administrative Reforms and Public Grievances, 2017). It aims to integrate all agricultural markets of the country to build a common national market for agricultural commodities. It will offer seamless movement across state boundaries providing a solution to marketing issues of all stakeholders. The NAM Portal gives a single-window service for all APMC-related information and services, including commodity arrivals, prices, bids, and offers (Nuthalapati, Bhatt, & Beero, 2020). Currently, the physical movement of agricultural production takes place at the mandis, while online trading is expected to reduce transaction costs and information asymmetry. A trading platform for transparent sales and price discovery is initiated in regulated markets and later followed in Kisan mandis, warehouses, and private markets.

From the study of e-NAM, this chapter is trying to bring out answers to the following questions:

i. Find e-NAM's performance and implementation process through case studies.

ii. e-NAM's impact on farmers' income will be based on official data relating to procurement increase via mandis and other vital aspects.
iii. The research will also reach out to sectoral experts for telephonic interviews. These interviews will seek information regarding the current trends and also consider their recommendations.

9.3.1 Objectives of the e-NAM scheme

The main objectives of the scheme, as mentioned in the official operational guidelines documents for e-NAM, includes:

i Integrating markets first at the level of the states and eventually across the country through a common online market platform – to facilitate pan-India trade in agricultural commodities.
ii Streamline marketing/transaction procedures and make them uniform across all markets to promote the efficient functioning of the markets.
iii Promotion of better marketing opportunities for farmers/sellers through online access to more buyers/markets.
iv Removal of information asymmetry between farmer and trader.
v Better and real-time price discovery based on actual demand and supply of Agri-commodities.
vi Transparency in the auction process, prices commensurate with the quality of produce, online payment, etc. contribute to marketing efficiency.
vii Establishing quality assaying systems for quality assurance to promote informed bidding by buyers.
viii Promoting stable prices and availability of quality products to consumers.

9.3.2 Infrastructure

Five hundred eighty-five regulated APMC wholesale markets in 16 states and two UTs are integrated with e-market (e-NAM) after carrying out requisite reforms in State APMC Act in January 2019. The Union Ministry of Agriculture and Farmers' Welfare (MoA&FW) will bear the expenses of software and its customisation for the states. The Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW) is additionally giving grants as a one-time fixed cost (subject to the ceiling of INR30.00 lakh per mandi) for related equipment/infrastructure and installation of the e-market platform. The list of selected APMCs to be included in the 585 markets is to be produced by the state governments (Department of Agriculture, Cooperation and Farmers' Welfare, 2016).

Some key administrative aspects for the implementation of the e-NAM platform were as follows:

i. The states must enact the following provisions in their APMC Acts for the promotion of e-trading:
   - One license for a trader valid across all markets in the State.
   - Single point levy of market fees, i.e. on the first wholesale purchase from the farmer.
   - 100% online trading of the agri-produce selected for each mandi.

ii. Harmonisation of quality standards of agricultural produce and provision for assaying (quality testing) infrastructure in every market to enable informed bidding by buyers.

iii. Provision of Soil Testing Laboratories in/or near the selected mandi to facilitate visiting farmers to access this facility in the mandi itself.

On the platform, local traders can bid for the product and simultaneously connect with traders on the electronic platform while sitting in another state/ mandi. A farmer may choose to accept either the local offer or the online offer. In both cases, the transaction will be on the books of the local mandi, and they will continue to earn the market fee. The volume of business is expected to increase significantly as there will be greater competition for specific produce, resulting in higher market fees for the mandi (Ministry of Agriculture and Farmer Welfare, n.d.). Online registration for farmers, mandi, and FPOs is relatively easy, and assistance for registration is also available at the mandi. The Small Farmers Agribusiness Consortium (SFAC) is the lead implementing agency of e-NAM. The SFAC operates and maintains the e-NAM platform in collaboration with a strategic partner, presently Nagarjuna Fertilizers and Chemicals Ltd/ Ikisan Division (NFCL).

9.3.3 Other Features

Thus, the focus areas of the implementation of the e-NAM are: notifying and trading commodities on e-NAM; increasing the participation of traders on e-NAM; increasing the quantity and value of commodities being traded on e-NAM; and increasing the number of bids quoted by traders. Further, it also includes promoting cashless transactions like online payments to farmers; promoting inter-market trade between mandis, and providing access to soil testing laboratories for farmers; organising awareness and farmer orientation programmes; providing basic amenities and facilities for cleaning, sorting, and packing to farmers in mandi; providing logistics and building infrastructure to promote inter-market trade on the e-NAM platform; and assaying lab facilities to farmers to grade the produce. The key focus area is ensuring transparency and accountability in implementing the scheme.

9.4 Methodology

This research uses both quantitative and qualitative data and adopts interpretivism for analysis. The proposed methodology will focus on analysing

secondary data collected from various books, national and international journals, government reports, academic reports, UN reports, and submissions made to the government by industry bodies who continuously monitor and maintain progress reports around the emerging trends in agriculture. The analysis of e-NAM will further be compared with the successful ReMS model of Karnataka to highlight the differences between the two schemes. The comparative analysis will enable this study to provide critical policy insights and actionable recommendations for policymakers.

Market feedback from industry experts was also taken as part of the research. To select these industry experts, criteria like experience and expertise in agriculture, technology interventions, and being an active participant in the e-NAM market were some of the factors considered.

9.5 Findings

9.5.1 Performance of e-NAM

The performance of e-NAM can be analysed by utilising the data and results collected and analysed in various reliable research works. Here are a few case studies to showcase the impact of e-NAM in specific mandis. The chapter analyses select case studies to observe the impact of e-NAM on farmers and the community. These case studies are extracted from best practices published by the Government of India on utilising this digital initiative and give a holistic picture of the initiative and its impact on farmers.

Case Study 1: Dhalli Shimla (Department of Administrative Reforms and Public Grievances, 2018)

Dhalli Mandi has been selected as a pilot mandi under the e-NAM scheme as it is the 'Principle Market Yard' of APMC Shimla. Commodities traded in the mandi include apples, peas, and cauliflower. The infrastructure built for the schemes included: the creation of entry and exit gates, installation of e-weighing facilities at gates, IT infrastructure, and assaying labs, which were set up to help farmers with the quality testing of products.

The key outcomes of the initiative between April 1, 2015, and December 31, 2016, were as follows: one commodity, out of three proposed in DPR, is being traded on the e-NAM platform; 100% of the registered traders (47) participated in the trade on the e-NAM platform; total value traded on the e-NAM platform has been approximately 2.77 crores; and total volume traded on e-NAM is 4299.2 quintals.

Case Study 2: Rajkot, Gujarat (Department of Administrative Reforms and Public Grievances, 2018): Rajkot is one of the largest APMCs in the country, with state-of-the-art facilities and services on 90 acres of the plot. To implement e-NAM, a comprehensive framework including infrastructure up-gradation, capacity-building initiatives, monitoring, and grievance redressal mechanism was put in place. Infrastructure was significantly

upgraded, and new facilities, such as farmers' training hall, soil testing laboratory, grading centres, weighbridges, warehouses, banks, and fully equipped e-NAM centres, were established. The key outcomes of the initiatives are as follows: all commodities proposed in DPR (3) have been traded on the e-NAM platform; all registered traders (80) have participated in trade on the e-NAM platform. The total value traded on the e-NAM platform is INR 101 crores, and 100% of transactions at APMC Rajkot are done on the e-NAM platform and are cashless. The revenue generated by mandi has increased by 10%.

Case Study 3: Madanapalli, Andhra Pradesh (Department of Administrative Reforms and Public Grievances, 2018): Madanapalli is a single commodity market for tomatoes, with arrivals of 2.5 lakh tonnes per year. Amenities like an open auction platforms, digital electronic weighing machines, high-speed broadband, and link roads are provided, along with workshops and awareness programmes. The key outcomes of the initiative during the period are: one commodity, out of three proposed in DPR, traded on the e-NAM platform; 86% of the registered traders participated in trade on the e-NAM platform. Further, the total value traded on the e-NAM platform is INR6.8 crores while total volume traded on e-NAM amounts to 23,155 quintals.

Case Study 4: Nizamabad, Telangana (Department of Administrative Reforms and Public Grievances, 2018): The implementation of e-NAM was carried out through a three-phased reform action plan. It included the automation of weighing, cleaning, and grading systems for better price realisation, electronic weighing machines integrated to the point of sale (POS), built assaying lab, etc. Further, a direct purchase centre (DPC) platform was set up to facilitate trading without a commission agent, and a farmers' help desk was provisioned on the DPC platform. The helpdesk received particular attention as it comprised the Deputy Tehsildar, Agricultural Officer, and AMC supervisor. The key outcomes of the initiative are: five commodities traded on the e-NAM platform, which is 100% of the proposed commodities, and the participation of 103 traders on the e-NAM platform. The total value traded on the e-NAM platform is INR77 crores.

Case Study 5: Six States (Nuthalapati, Bhatt, & Beero, 2020): Further, an extensive study collecting primary data from six states was conducted to analyse the overall impact and to document the progress achieved by e-NAM. This case study analyses procurement, price volatility, and other aspects along with primary data collected from 856 farmer households. The six states include Gujarat, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, and Haryana. The majority of farmers in Gujarat (82%), Haryana (79%), Maharashtra (64%), and Telangana (89%) noticed better prices and facilities for transaction costs after the implementation of e-NAM. Around 100% of farmers from Madhya Pradesh and 84% from Uttar Pradesh find

e-NAM worse than manual mandi. Most of the farmers, almost 90%, in all states except Madhya Pradesh are satisfied with the introduction of e-NAM facilities like cleaning, sorting, drying, grading, weighing, assaying, bid management, e-auction, grain storage, soil testing, and cold storage. Across all states, 86% of respondents reported a lack of guidance or help desk as the major problem, followed by problems in grading, sorting, refrigeration, testing, and online payments problems.

The case study indicates the realisation of higher prices, transparent procedures, lower cost of marketing, lesser complications in the sale process, soil testing, and other facilities for farmers of all states except Madhya Pradesh, where farmers were denied any advantage of e-NAM. The realisation of these facilities was lower in Uttar Pradesh. Overall, 48% of farmers reported labour problems for loading/unloading, and 46% of farmers reported a lack of trained workforce to help with e-NAM. About 50% of stakeholders from the given states reported better facilities for knowing the quality of products, higher price realisation, transparent procedures, and lower marketing costs. After the overall survey and secondary data analysis, this study indicates that farmers have realised better prices and profits after implementing e-NAM. In totality, the study indicates a difference in the realisation of positive impacts of e-NAM across states. These differences are indicated to originate due to implementation gaps and a lack of other facilities across states.

Thus, these case studies highlight the positive impact of e-NAM and subsequently bring focus to the various gaps in the implementation and process of e-NAM. The study showcases farmers' differences in satisfaction and price realisation across various states. This difference must be explored further to find concrete solutions to bridge these gaps. These findings will assist this research in producing actionable insights and recommendations for policymakers.

9.5.2 Sectoral Experts

To dive deeper into the functional issues clouding e-NAM, this study reached out to three sectoral experts to seek their feedback on e-NAM. The participants have been kept anonymous, and their response has been summarised underneath.

The first participant requested policymakers to focus on using the trade data collected by e-markets. Since once such data is available in an electronic format and is validated, financial institutions could use it to provide formal credit to the farmers, and other intermediaries can utilise it for various productive purposes. This could provide a sustainable solution to the historical problem of informal credit in Indian agriculture. Further, this data will

improve the traceability of price changes, further improving the investment opportunities in agriculture and enabling farmers to take informed decisions.

The second participant questioned the farmers' accessibility to the facilities provided by e-NAM. This concern was linked to mass digital illiteracy and the lack of helpdesk success in similar digital schemes. The participant raised questions about the adaptability of e-NAM as a pan-India platform for all mandis. The fear of the rise of a new powerful intermediary utilising such gaps for their gains was also highlighted.

The third participant raised concerns over the lack of interoperability achieved and aimed by the e-NAM platform. The participant raised questions about the lack of interoperability across platforms and schemes promoted by the Centre and other states. For example, the e-NAM platform is not synced with National Agricultural Cooperative Marketing Federation (NAFED), Food Corporation of India (FCI), NCDEX e-markets Limited (NeML), and various other state-operated ReMS-like models. In addition, the participant highlighted how this multiplies operational problems across the administrative wings of these schemes, as there is no coordination among all these schemes/platforms.

All participants agreed that digital markets were essential for the future of Indian agriculture. Stressing the necessity of infrastructure and investments to realise the goal of a thriving digital market for agriculture, these interviews also highlighted the need to adopt sustainable technology solutions aiming for long-term goals and vision.

9.6 Conclusion and Recommendations

The e-NAM platform has showcased its capacity for a positive impact on agricultural marketing. There is clear evidence of effectively lowering transaction costs for farmers on multiple levels. However, these positive results depend on various aspects like efficient implementation and feedback response. The platform should be adaptable to the future needs of agricultural marketing at the global level. The prime issues highlighted in the case studies above require immediate attention. The e-NAM process must be inclusive and should empower all stakeholders to utilise and develop this platform.

The study finds interoperability in the Indian food systems, a central potential area to be explored by future research. The scope of a uniform platform for Indian agriculture requires the immediate attention of policymakers to ensure the desired impact on farmers' income across India. The market disruption caused by the COVID-19 pandemic has increased the urgency to build a digital ecosystem for agricultural operations in India. Thus, this study proposes digital platforms like e-NAM be explored as potential public goods. This will allow transparency, build accountability,

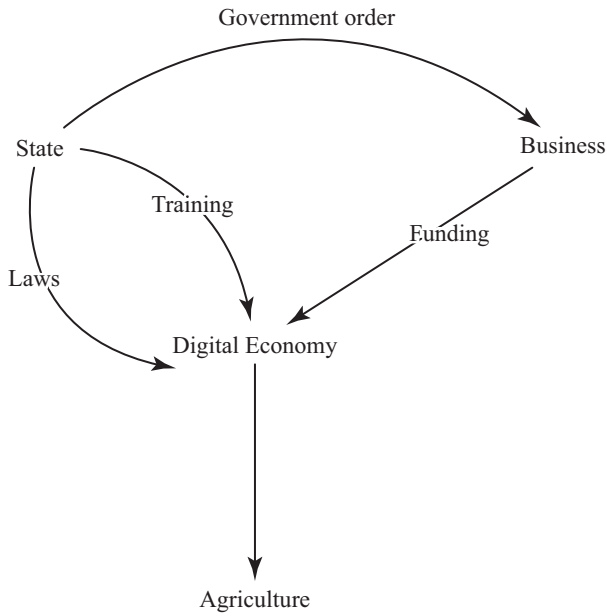

FIGURE 9.3 Digital Platforms as Public Goods

Source: Author's compilation

enable entrepreneurship, and even ease the flow of investments in the agricultural sector.

As described in Figure 9.3, states and private businesses should come together to stimulate the development and use of digital technologies in agriculture. The mechanism of interaction between state structures and private businesses can be synergised when the government encourages businesses to invest in digital interventions introduced and developed by the government. Further, the active use of geographic information system (GIS) technologies in forming digital agriculture is promising, especially in connection with changing climatic conditions and the opportunities offered by GVCs. The data produced by such GIS information-enabled marketing platforms can improve the Indian agriculture sector. It will provide the capacity to be true leaders in the future of digital agriculture by simultaneously utilising ICT, IoT, and other technological tools.

9.7 Recommendations

This section provides actionable points proposed by the study. It is essential to address the current dissatisfaction across individual mandis. This study has highlighted the implementation gaps like the lack of helpdesks

and problems in grading, sorting, refrigeration, testing, and online payments. These issues require mandi-specific action. Thus, a periodic assessment of various services required for the e-NAM platform is essential. This assessment should invite feedback and aim to include all stakeholders. Simultaneously, an impact of evaluation on the success of e-NAM, through a study exploring the correlation between various infrastructural services available in different mandis. This might assist in finding area-specific solutions to ensure the success of e-NAM. Recognising e-NAM's future as a public good and enabling data accessibility for climate changes and other aspects of agriculture through the platform will require a long-term commitment to building infrastructure and transforming India's agricultural sector. The multiple existing authorities in the Indian food system should enable interoperability by recognising the platform as a common point. This will also ensure coordination among the administrations of these authorities and ultimately increase the overall efficiency of agricultural marketing in India.

References

Abdulai, B.-R., Duncan, E., & Fraser, E. (2019, August 29). *How digital technologies can help Africa's smallholder farmers*. FAO. Retrieved from http://www.fao.org/e-agriculture/node?page=1.

Bronson, K., & Knezevic, I. (2016). Big data in food and agriculture. *Big Data & Society*, *3*(1), 2053951716648174.

Brooks, J., Deconinck, K., & Giner, C. (2019, June 6). *Three key challenges facing agriculture and how to start solving them*. OECD. Retrieved from https://www.oecd.org/agriculture/key-challenges-agriculture-how-solve/.

Chand, R. (2017, March). Doubling farmers income: Strategy and prospects. *Indian Journal of Agricultural Economics*, *72*(1), 1–23.

Committee for Doubling Farmers', Ministry of Agriculture & Farmers' Welfare. (2018). *Science for doubling farmers' income: Focusing scientific development and technological applications on doubling farmers' income*. Retrieved from http://farmer.gov.in/imagedefault/DFI/DFI%20Vol-12A.pdf.

Dabbara, R. (2019). *Study on Digital Agricultural Marketing Services- A Detailed Review [PowerPoint* Slides]. Tamil Nadu Agricultural University, 10.13140/RG.2.2.33668.07049

Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare, The Committee for Doubling Farmers' Income. (2017). Report of the Committee for Doubling Farmers' Income: Production Enhancement through Productivity Gains (Volume VIII). Ministry of Agriculture & Farmers Welfare https://agricoop.nic.in/Documents/DFI%20Vol-8C.pdf

Department of Administrative Reforms and Public Grievances. (2017). *e-National agriculture market (eNAM) - Manual for district level functionaries*. Government Scheme Implementation, Government of India.

Department of Administrative Reforms and Public Grievances. (2018, July 16). *e-National agriculture market*. DARPG. Retrieved from https://darpg.gov.in/sites/default/files/eNAM%20Best%20Practices_0.pdf.

Department of Agriculture, Cooperation and Farmers' Welfare. (2016). *Operational guidelines for promotion of national agriculture market (NAM) through agri-tech infrastructure fund (ATIF)*. Ministry of Agriculture and Farmers' Welfare. New Delhi: Government of India.

Food and Agriculture Organisation. (2019, February 22). *The role of agriculture and rural development in achieving SDG 1.1*. UN.org. Retrieved from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2019/03/FAO-ending-extreme-rural-poverty-1.pdf.

Giesler, S. (2018, April 9). *Digitisation in agriculture – From precision farming to farming 4.0*. Bio-economy BW. Retrieved from https://www.biooekonomie-bw.de/en/articles/dossiers/digitisation-in-agriculture-from- precision-farming-to-farming-40.

Hoogenboom, G., White, J., & Messina, C. (2004). From genome to crop: Integration through simulation modeling. *Field Crops Research*, *90*(1), 145–163.

Hopkins, J. (2016, May 6). *History of agriculture* (J. H. Future, Producer). Food System Primer. Retrieved from http://www.foodsystemprimer.org/food-production/history-of-agriculture/.

India Brand Equity Foundation. (2021, June 2). *Agriculture in India: Information about Indian agriculture & its importance*. IBEF. Retrieved June 2021, from https://www.ibef.org/industry/agriculture-india.aspx.

Kamble, S. S., Gunasekaran, A., & Sharma, R. (2020, June). Modeling the blockchain enabled traceability in agriculture supply chain. *International Journal of Information Management*, *52*, 101967.

Maloney, W. (2019). *This is why technology is the future of agriculture*. Retrieved May 2021, from https://www.weforum.org/agenda/2019/10/agriculture-africa-asia-poverty-innovation.

Ministry of Agriculture and Farmer Welfare. (n.d.). *FAQs of e-NAM*. (G. O. India, Producer). NAM. Retrieved May 2021, from https://enam.gov.in/web/resources/FAQs-of-eNam.

NITI Aayog. (2015). *Raising agricultural productivity and making farming remunerative for farmers*. Delhi: Niti Ayog.

Nuthalapati, C. S., Bhatt, Y., & Beero, S. K. (2020, June 1). *Electronic national agricultural market (e-NAM) a review of performance and prospects*. New Delhi: Institute of Economic Growth. https://www.iegindia.org/ardl/AERC_studies_2020_NCRao.pdf.

PWC. (2019). *Farm mechanisation: Ensuring a sustainable rise in farm productivity and income*. FICCI. Delhi: PWC.

Sugathadasa, L., Ginige, A., Wikramanayake, G., Goonetillake, J., & De Silva, L. (2016). Digital knowledge ecosystem to reduce uncertainty and coordination failure in agricultural markets – Study of "Govi Nena" mobile-based information system. *Agribusiness and Information Management*, *8*(1), 11–16.

Taiwan Agriculture Research Institute. (2018). *Strengthening the prevention strategies and early warning systems of agricultural disasters through information and communication technology (ICT)*. Taiwan Agricultural Research Institute. Taiwan: Council of Agriculture.

Appendix: Interview Format

These interviews were conducted telephonically or on zoom calls. The purpose and scope of the study were explained to the interviewees in advance.

1. Is the e-NAM platform beneficial for the Indian agriculture sector? (Yes/No)
2. What benefits, gaps, or disadvantages of e-NAM need to be highlighted?
3. What are your recommendations for the e-NAM platform?

10

TECHNOLOGY AND FINANCIAL INCLUSION

A Study of Technology's Role in the Continuity of Banking Agents

Sanal Gupta and Puran Singh

10.1 Introduction

Financial inclusion is vital to the growth strategy of developing economies due to its ability to reduce poverty, enhance financial resilience, and smoothen consumption patterns (Demirgüç-Kunt et al., 2017). Its importance can be gauged by the fact that the United Nations acknowledged financial inclusion as an enabling condition for achieving eight of the 17 Sustainable Development Goals (UNCDF, n.d.). The challenge of financial inclusion rises as the banks, despite possessing an unmatched social capital in these areas, cannot reach rural populations due to a lack of financial viability (Ananth & Oncu, 2014).

Over the past several years, technological innovations have played an important role in devising new ways of delivering financial services (Demirgüç-Kunt et al., 2017). New technology-based operating models enable several stakeholders involved in the design and delivery of financial services (Staschen & Meagher, 2018). Consequently, banks are able to remotely interact with their customers at a low cost in a trusted manner and still cover the banking risks effectively (Mas & Siedek, 2008). Such operating models lower the cost of financial services – the most cited reason for not owning a bank account (Demirguc-Kunt et al., 2018). Further, banks are able to achieve geographical diffusion of their services as technology increases their operational proximity to rural customers (Diniz et al., 2012). Some studies claim that by making financial services more viable, technology can play a significant role in improving financial access to the rural poor (Stegman et al., 2005; Claessens, 2006).

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Agent banking model (also known as the Business Correspondent Model in India) is one such technology-based branchless banking model that enhances banking outreach in the remotest areas at a low cost (Assunção, 2013; Carabarín et al., 2018; Kumar et al., 2006; Mas et al., 2012; PwC, 2015; Singh & Naik, 2017). In this model, the banking agents facilitate real-time banking transactions in remote and rural areas using customers' biometric authentication or debit card. The agents use technological platforms to provide a wide range of banking products and services specially designed for rural populations, making the agent banking model more relevant at the grassroots level. For these reasons, the agent banking model has been acknowledged to be the most suitable way to achieve universal financial inclusion (Assunção, 2013; Mas et al., 2012).

While technology has the potential to amplify the effectiveness of the agent banking model, it can also have the reverse effect if not properly set up and managed. There is literature to suggest that the agents often face challenges related to technology and infrastructure (Sharma & Chatterjee, 2017). Technical complaints relate to equipment breakdown or malfunction, server downtime, software glitches, lack of technical know-how, and lack of quality technical support (Centre for Digital Financial Inclusion, 2019; Microsave, 2014; Ujjawal et al., 2012; Ballem et al., 2013). Also, the availability of power supply and telecommunications coverage in the area are other important factors (Mas & Siedek, 2008). In fact, heavy dependence on technology was among the significant reasons for the model's lack of success early on (Mas et al., 2012).

This struggle with technology makes banking a high-effort business for the banking agents who have an alternative business to heed to. Over time, it can discourage a banking agent to continue the banking operations which hampers the supply of financial services in the local area, and the banks have to incur time and resources to identify a replacement. Overall, it has a negative impact on the financial inclusion efforts of the banks.

In this chapter, we evaluate the impact of technological challenges on banking agents' intention to continue the banking operations. We hypothesise that the friction resulting from the lack of proficiency in handling technology and challenges in resolving hardware/software issues discourage the banking agents, affecting their likelihood of continuing the operations. We use an ordered logistic regression model to evaluate agents' intention to continue, based on agents' exposure to technology, perceived quality of equipment, perceived quality of infrastructure, and perceived quality of support. The data comes from an extensive field survey of 301 banking agents operational in the state of Himachal Pradesh. We find evidence that exposure to financial technology, issues with biometric devices, lack of internet connectivity, and dissatisfaction with available technical support discourage banking agents from continuing agent banking business.

This chapter contributes to the rare empirical work on the agent banking model. The lack of large public datasets and varying local conditions pose a challenge to the academic research and to state generalisable conclusions in this area. Our work, therefore, provides a fresh perspective on agent banking in a rural setting. To our knowledge, this is the first study that provides empirical evidence of banking agents' intention to continue and the role of technology therein. Also, most of the available literature on the agent banking model addresses mobile money agents, while evidence on the bank-led agent banking model is limited. Our research setting provides insights into a completely bank-led ecosystem of agent banking in a unique geographical area.

The chapter progresses in the following manner: A discussion on the agent banking ecosystem in India (Section 10.2), followed by details on the literature studied to elaborate upon the paper's analytical framework (Section 10.3). The researchers then provide details on the research methodology in Section 10.4 and present the findings of the analysis in Section 10.5, followed by the conclusion of the study (Section 10.6).

10.2 Indian Agent Banking Model and Technology

In India, the agent banking model (also known as Business Correspondent Model) was notified in 2006 by the Reserve Bank of India (RBI), the country's apex bank. The model faced several difficulties in scaling up. The RBI, from time to time, introduced several regulatory changes to ensure the model's viability. However, the viability outlook of the agent model changed significantly in the past decade as a result of three major government interventions: Aadhaar Enabled Payment Services (AePS) in 2010, Direct Benefit Transfer (DBT) scheme in 2013, and Pradhan Mantri Jan Dhan Yojana (PMJDY) in 2014. The AePS made it possible to access bank accounts using biometric technology which completely changed how banking is experienced in remote areas. The DBT incentivised the use of bank accounts by the masses. The PMJDY ensured account ownership and availability of suitable products for the rural populations. Further, in 2015, the Indian government launched the Jan Dhan-Aadhaar-Mobile (JAM) trinity initiative that linked an individual's Jan Dhan banking account with the Aadhaar number and phone number. The above initiatives onboarded large sections of vulnerable populations onto the technology-based banking ecosystem. The technology environment eased the access and use of banking products and services by providing solutions, such as e-KYC for account opening, biometric-based transactions that eliminated paperwork, and interoperable transactions that ensured service to the customer of any bank.

Currently, India follows a bank-led agent banking model, i.e. banks lead the implementation of the model. Other players include business correspondent

network manager (BCNM) or corporate business correspondent, technology service providers (TSP), and the agents. The apex bank is responsible for policy formulation and regulation, and the banks are responsible for implementing the model on the ground. Banks partner with BCNMs to set up agent networks across under-served or unserved geographical locations. The TSPs provide technical support in setting up and maintaining the banking agent outlet. In several cases, BCNM and TSP are the same organisation. The BCNMs identify, recruit, train, and regularly support the network of banking agents.

The banking agents use handheld micro ATMs, biometric devices, a computer system that uses a banking software, and function like a customer service point. An account holder can access the bank account using a finger impression on the biometric device and Aadhaar number, or a debit card and PIN on a micro ATM. The details of the implementation vary by the bank and BCNM. Figure 10.1 provides an overview of the technology-based setup required for agent banking operations, while Figure 10.2 and Figure 10.3 summarise the transaction mechanism for cash-in or cash-out transactions.

10.3 Literature and Analytical Framework

10.3.1 Agents' Intention to Continue

Two theoretical models, namely, Technology Acceptance Model and Expectation Confirmation Theory, can explain the role of technology in shaping banking agents' intention to continue. According to the Technology Acceptance Model (Davis, 1989), in the information systems literature, the acceptance of a technology and the attitude to use it depends upon its perceived ease of use and perceived usefulness. Few subsequent studies provide evidence of the role of user training, computing and managerial support, prior experiences, education, and users' role with regard to technology, for

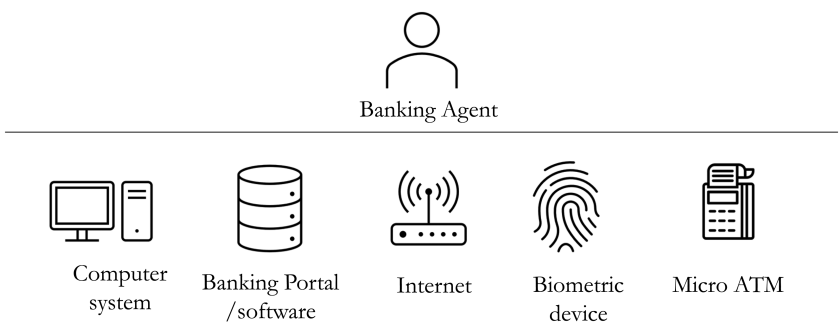

FIGURE 10.1 Technology Setup Required for Banking Agents

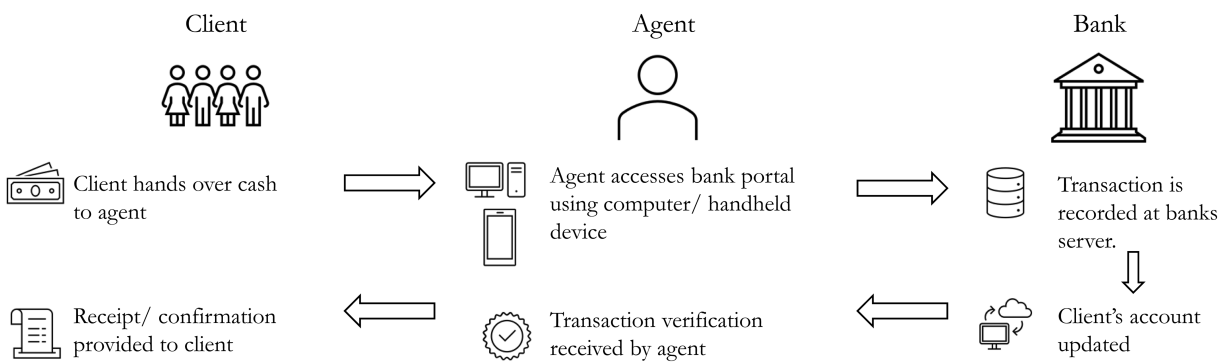

FIGURE 10.2 Cash-In Transaction Mechanism

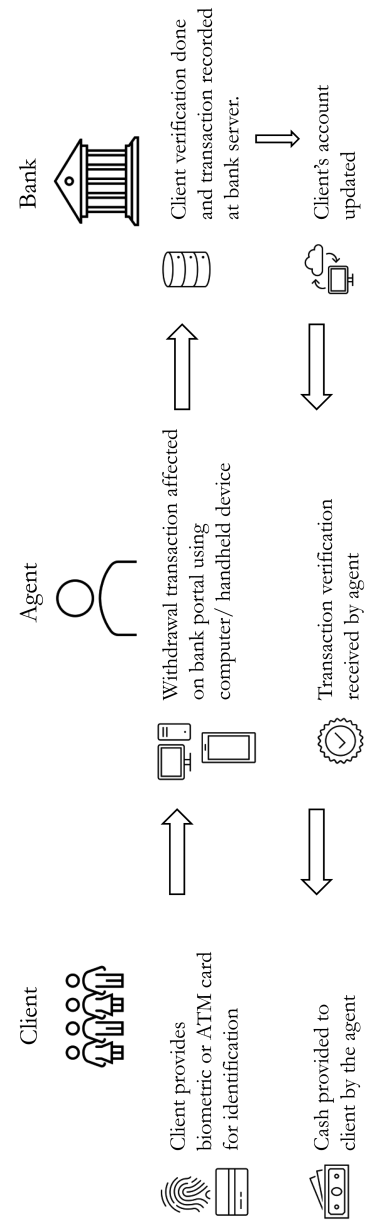

FIGURE 10.3 Cash-Out Transaction Mechanism

enhancing the acceptance of a technology (Igbaria et al., 1995; Agarwal & Prasad, 1999; Lee et al., 2003). Second, the Expectation Confirmation Theory explains the role of consumer satisfaction in repurchase or continued use of a product or service (Oliver, 1980). According to this theory, consumers form initial expectations from the product prior to the purchase and form a perception regarding its performance. After using the product, if the expectation matches the actual performance of the product, it creates confirmation which leads to customer satisfaction and subsequently, to the continued use of the product. This theory has been used to understand continuance in information systems literature (Bhattacherjee, 2001).

The dynamics of the agent banking model have several similarities to the above-mentioned theoretical models. The banking agents, over time, form a first-hand perception of technology's usefulness in banking operations. A continuous struggle with technology creates a friction in the operations and makes agent banking a high effort-low reward business opportunity. Since continuity in services is highly valued among the users of financial services (Dias & Mckee, 2010), the disruption due to technical challenges results in loss of business, dissatisfied customers, and a bad reputation for the banking agents (Sharma & Chatterjee, 2017; Ujjawal et al., 2012). Each event of technology breakdown adds to a negative perception about the banking operations. The agents incur an opportunity cost due to time spent in meeting technological challenges which reduces agents' perceived economic gain from banking operations. After a while, an agent decides to pursue alternative business opportunities.

10.3.2 Technological Challenges Facing Agents

Banking agents face several technical issues and infrastructure barriers in their operations (Sharma & Chatterjee, 2017). First, the equipment used by the agents has inherent limitations that vary with BCNM, TSP, and bank (Sharma et al., 2016). These issues include breakdown of the micro ATM (Calderone et al., 2018) and non-detection of fingerprints of the elderly as noted by Centre for Digital Financial Inclusion (CDFI, 2019) and Sharma and Chatterjee (2017). Second, technical issues from the bank's side inhibit transactions by the banking agent (PwC, 2015). These include server downtime (CDFI, 2019), non-availability of the network, and software glitches (Ujjawal et al., 2012). Third, infrastructural issues beyond the control of banks and BCNM include poor internet connectivity in rural areas and power cuts (Ahmed & Ahmed, 2018; CDFI, 2019). Fourth, the technical support system is not robust. Lack of field staff training leads to an unsatisfactory solution to agents' problems (Microsave, 2014b). Although BCNMs in some countries are beginning to invest in monitoring tools to gauge the

quality of support provided by their field staff, more work is required to make it effective (Patel et al., 2018).

10.3.3 Analytical Framework: Technological Factors Affecting Agents' Intention to Continue

Figure 10.4 presents the theoretical framework that outlines the technical aspects of the agent banking model that influence agents' intention to continue. We propose four categories of predictors: agents' exposure to technology, quality of equipment, quality of infrastructure, and quality of support.

i. **Exposure to technology –** Banking operations require the agent to work with a set of software and hardware equipment. The tech-savvy agents can be expected to handle technical issues more efficiently and run banking operations smoothly (Thorat et al., 2010). Typically, the agents have an alternative business (Cull et al., 2018). The agents with alternative businesses which involve computer systems, mobile phones, printers, and the internet, have more exposure and experience in handling technology.
ii. **Quality of equipment –** During our fieldwork, we noted that the micro ATMs of several banking agents were not functional and they had to rely on the AePS transaction mechanism. The account holders made multiple attempts to access bank accounts. This can be time-consuming and irritating for both the account holder and the banking agent. Sometimes, the banking server can be unstable leading to a service outage. These issues lead to poor customer experience and adversely affect agents' business (Ananth & Oncu, 2014). The agent must spend time to resolve technical issues incurring opportunity costs for the banking agent who has to manage multiple business lines. Therefore, with an increase in such issues, agents' intention to continue may be negatively affected.
iii. **Quality of infrastructure –** Availability of power and connectivity plays a major role in the smooth functioning of the banking agent. Without continuous access to both power and the internet, an agent will be unable to provide continuous service (Palaon et al., 2020). Such inconsistency

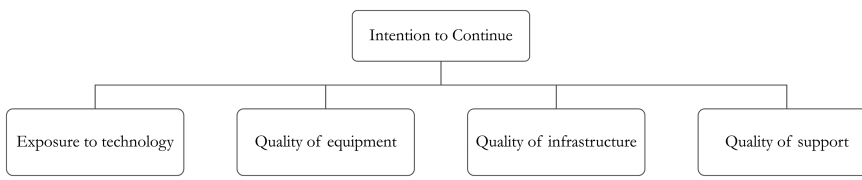

FIGURE 10.4 Technological Factors Affecting Agents' Intention to Continue

in the service not only erodes the trust of the clients in banking, but also hampers the goodwill of the agent (Mas & Siedek, 2008).

iv. **Quality of support –** The quality of support is critical to the continued operations of a banking agent (Sharma et al., 2016). The support provided by the BCNMs helps resolve day-to-day technical issues faced by the agents (Ahmed & Ahmed, 2018). These include software updates, transaction errors, software issues, device malfunction, device breakdown, and maintenance. Over the time, the banking agents form a perception of the quality of support available to them for hardware- and software-related issues.

10.4 Methodology and Estimation

10.4.1 Study Area

In Himachal Pradesh, four public sector banks lead the agent banking network. These banks have deployed at least seven BCNMs to cover the geographical area in the state. The state-level bankers' committee (SLBC) assigns specific target areas to each bank based on banks' branch presence. The banks differ in their breadth and depth of agent network, incentive structure, technology and devices, and agent relationship management. As of 2019, there were about 1753 agents in the state, reports the State-level Bankers' Committee Himachal Pradesh (SLBCHP, 2019). The state is peculiar in many ways due to its mountainous topography and sparse population spread, which poses challenges to the banking outreach. However, the state has performed relatively better on the financial inclusion indicators (CRISIL, 2018). The state has seen a steep growth in the number of banking agents in the past few years, and banks are continuously innovating to improve the model's functioning.

10.4.2 Sample and Data

We use data from a primary survey of 301 banking agents operational in Himachal Pradesh. The survey was conducted in the months of September to November in 2019, as part of a large study sponsored by Omidyar Network through the Digital Identity Research Initiative at the Indian School of Business. Agents of four leading public sector banks were included in the sampling frame, out of which a random sample of 300 agents was drawn for the study. The agents were contacted in advance on the phone and interviewed at their location on a day convenient to the agent. The questionnaire contained sections on demographic characteristics, operational practices, the scale of operations, and challenges faced by the agents. The survey of an agent took about two to three hours to complete. Eventually, 301 banking

agents were surveyed as one additional agent became available during the field visit.

10.4.3 Estimation

We estimate the following econometric model using ordered logistic regression to identify the determinants of banking agents' intention to continue:

$$\text{Agent's intention to continue} = \beta_1 + \beta_2 \text{ Exposure to technology} + \beta_3 \text{ Quality of equipment} + \beta_4 \text{ Quality of infrastructure} + \beta_5 \text{ Quality of technical support} + \beta_6 \text{ Control} + \varepsilon_i \quad (1)$$

where β_1 is the intercept, and β_2 to β_6 are the coefficients of vectors and ε_i is the error term associated with the regression equation.

Table 10.1 provides the list of variables. Banking agents' intention to continue is captured using an ordinal variable. Agents were asked to indicate their intention to continue on a 5-point Likert scale where 1=Highly unlikely and 5=Highly likely. Since the response variable is not continuous and not normally distributed, we prefer ordered logistic regression (Long & Freese, 2001).

Exposure to technology was captured using two variables. *Dpay* is an indicator variable that takes value 1 if the agent uses a mobile-based payment app and 0 otherwise. It indicates an agent's exposure to financial technology. The variable *Tech occupation* takes value 1 if an agent's alternative business line requires the use of a computer or software and 0 otherwise. It indicates agents' general technical exposure. Quality of equipment was proxied by the reported frequency of issues with hardware and software. Three variables, namely, *Micro ATM*, *Biometric*, and *Portal*, indicate the reported frequency of issues with the micro ATM, biometric device, and the banking portal, respectively. Agents' responses were recorded on a 5-point Likert scale where 1=never faced the issues and 5=always face the issue. These responses were transformed to obtain dichotomous variables. Accordingly, the response values 4 and 5 were recorded as *high* frequency of issues and the remaining values were recorded as *low* frequency of issues. Similarly, the quality of infrastructure was indicated by variables *Internet* and *Power* that indicated either a *high* or *low* frequency of issues with internet connectivity or power availability. The quality of technical support was indicated by variables *Hardware* and *Software* that indicates agents' *high* or *low* satisfaction with the available support to resolve issues. Satisfaction was also originally measured on a 5-point Likert scale where 1=highly unsatisfied and 5=highly satisfied. The response values 4 and 5 were recorded as *high* satisfaction and the remaining values were recorded as *low* satisfaction.

TABLE 10.1 Variable Definition and Descriptive Statistics

Variable	*Definition*	*N*	*Mean*	*SD*	*Min*	*Max*	*Variance*	*Kurtosis*	*Skewness*
Dependent variable									
Intention to continue	Agents' intention (1= Very Unlikely, 2= Unlikely, 3= Neutral, 4= Likely, 5= Very Likely)	300	4.183	1.049	1	5	1.100	4.091	-1.294
Independent variables									
Exposure to technology									
Dpay	Agent uses a mobile-based payment app (0= No, 1= Yes)	299	0.505	0.501	0	1	0.251	1.000	-0.020
Tech occupation	Agent's alternative occupation requires computer (0= No, 1= Yes)	301	0.754	0.431	0	1	0.186	2.394	-1.180
Quality of equipment									
Micro ATM	Frequency of micro ATM issues (0=Low, 1=High)	294	0.262	0.440	0	1	0.194	2.173	1.083
Biometric	Frequency of fingerprint detection issues (0=Low, 1=High)	299	0.318	0.466	0	1	0.218	1.613	0.783

(*Continued*)

TABLE 10.1 Continued

Variable	*Definition*	*N*	*Mean*	*SD*	*Min*	*Max*	*Variance*	*Kurtosis*	*Skewness*
Portal	Frequency of portal connectivity issues (0=Low, 1=High)	301	0.319	0.467	0	1	0.218	1.604	0.777
Quality of infrastructure									
Internet	Frequency of internet connectivity issues (0=Low, 1=High)	298	0.151	0.359	0	1	0.129	4.800	1.949
Power	Frequency of power supply issues (0=Low, 1=High)	298	0.117	0.322	0	1	0.104	6.647	2.376
Quality of technical support									
Hardware	Level of satisfaction with BCNM's equipment support (0=Low, 1=High)	297	0.444	0.498	0	1	0.248	1.050	0.224
Software	Level of satisfaction with BCNM's software support (0=Low, 1=High)	296	0.561	0.497	0	1	0.247	1.060	-0.245
Control									
Age	Agent's age (years)	301	38.030	7.144	19	65	51.042	4.381	0.743
Gender	Agent's gender (0= Female, 1= Male)	301	0.894	0.309	0	1	0.095	7.525	-2.554

(*Continued*)

Graduate	Agent is at least Graduate (0= No, 1= Yes)	301	0.515	0.501	0	1	0.251	1.004	-0.060
Experience	Duration of banking operations (months)	301	41.365	26.207	3	156	686.786	5.205	1.165
Occupations	Agent's occupation count	301	2.671	0.767	1	4	0.588	2.408	0.147
Investment	Agent's investment for banking operations (INR)	301	29510.430	29047.900	0	147300	844000000	3.844	0.948
Commission	Agent's monthly commission (INR)	300	3486.740	3538.978	0	28333	12500000	19.020	3.169
Bank	Agent's bank (1=Bank A, 2=Bank B, 3=Bank C, 4=Bank D)	301	2.741	0.894	1	4	0.799	2.433	-0.366

We control for agents' demographic characteristics and business characteristics. Demographic characteristics are indicated by variables *age*, *gender*, and *graduate*. Demographics can influence an individual's business acumen and knowledge. Business characteristics are indicated by four variables: *experience*, *occupations*, *investment*, and *commission*. *Experience* indicates the number of months of banking experience of the agent. More experienced banking agents can be expected to command more respect in the locality, consequently having a better hold on the clientele. *Occupations* reports the number of business lines of an agent. *Investment* reports the natural log of investment by an agent in setting up the banking operations. Commission is the average monthly commission earnings of the agent. Agents' commitment to banking operations can be an important predictor of agents' intention to continue. The agents that are occupationally more dependent on agent banking and have put in initial investment can be expected to continue despite some challenges. It can be expected that the agents involved in multiple business lines will divide operating hours, attention, and resources across their business lines. Financial incentive is critical to any business. Accordingly, agents earning a significant amount can be expected to continue despite challenges. Finally, we introduce the dummy variable *Bank* to control for bank-level variations in the agent's intention to continue. There are variations in the technology and the commission structure offered by the banks.

10.4.4 Descriptive Statistics

Table 10.1 provides the descriptive statistics for the response and predictor variables. Intention to continue has an average score of 4.18. Figure 10.5 provides the breakdown of agents' responses. While 51% of agents reported that they were very likely to continue, 27% of agents were likely to continue, and while 14% agents were neutral, 4% were unlikely, and the remaining 3% of agents were very unlikely to continue.

Also, 50.5% of agents used mobile phone-based payment applications, and 75.4% of agents owned a tech-related alternative business. While 69.4% of the agents reported facing micro ATM issues at a high frequency, 95.3% reported facing issues with the biometric device at a high frequency, and 95% reported facing issues with the banking portal at a high frequency. Also, 70.5% of agents reported facing high frequency of internet issues, and 66% reported high frequency of power interruptions. With regard to technical support, 44.4% of agents were highly satisfied with the hardware support, and 56.1% of agents were highly satisfied with the software support. Figure 10.6 presents the distribution of predictor variables.

It must also be noted that 89% of agents surveyed were male, with an average age of 38 years. 51.5% of agents were graduates. The agents reported an average banking experience of 41 months. On average, an agent

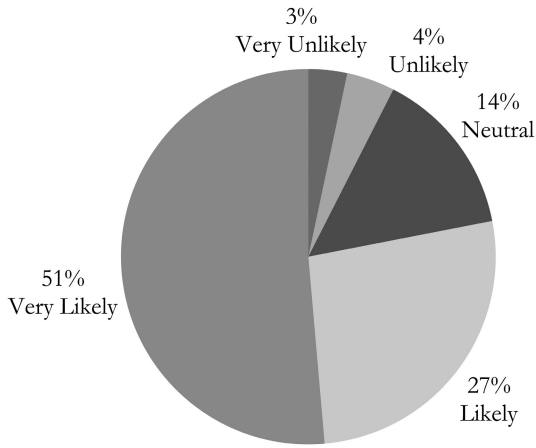

FIGURE 10.5 Distribution of Response Variable

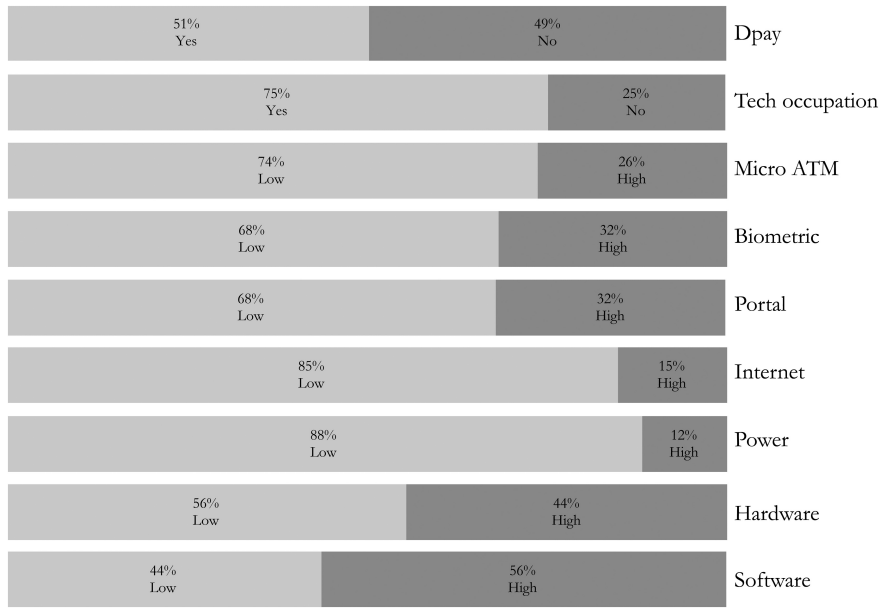

FIGURE 10.6 Distribution of Predictor Variables

was engaged in 2.6 occupations. The average investment by the agents was INR29,510, and the average monthly commission was INR3,487 with a median of about INR2,900. 11% of agents were associated with bank A, 24% with bank B, 46% with bank C, and the rest with bank D.

10.5 Results and Discussion

Table 10.2 presents the results of the ordered logistic regression analysis. We sequentially regress each group of proposed predictors with and without controls and present the results in Models 1–8.

Model 1 and 2 regress intention to continue on agents' exposure to technology. *Dpay* has a positive coefficient of 0.425 in Model 1 which is the ordered log-odds estimate of comparing intention to continue of agents that reported using digital payment applications with the rest. The coefficient means that the ordered logit for having stronger intention to continue is 0.425 higher for agents who use digital payment applications. In simpler words, banking agents who use *Dpay* can be expected to report a higher likelihood of continuing banking operations. *Dpay* loses significance in Model 2, but it continues to be significant in the rest of the models. The use of payment applications indicates agents' familiarity with financial technology and helps their confidence in handling banking products and services. *Tech occupation* does not have a significant coefficient. It seems that the exposure to financial technology is a better predictor of agents' intention to continue than the general technology exposure.

In Models 3 and 4, we test for the role of quality of equipment by regressing the frequency of equipment-related issues on agents' intention to continue. The regression coefficients are negative, but not significant for any of the three variables. This is an intriguing outcome since the banking agents, during our field visits, repeatedly reported unhappiness over the equipment breakdown. However, it does not seem to predict agents' attrition. This could indicate that the support available for equipment maintenance compensates for a possible decline in agents' intention to continue due to equipment breakdowns. Another possible explanation could be that 75% of agents had technology-based alternative business lines due to which they were able to resolve minor issues themselves.

Models 5 and 6 examine the role of infrastructure quality. *Internet* has a regression coefficient of –0.86, indicating that agents who report more frequent issues with internet connectivity can be expected to report a weaker intention to continue banking operations. Since the banking transaction mechanism is completely internet based, its unavailability or frequent disruption can cause strong dissatisfaction among the banking agents. *Power* does not have a significant regression coefficient. Himachal Pradesh is a power surplus state and has adequate distribution infrastructure. This was

TABLE 10.2 Ordinal Logistic Regression Results for Intention to Continue (5-Point Scale)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Variables	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*
Exposure to technology	Dpay = 1, Yes	0.425*	0.369	0.449**	0.434*	0.477**	0.493**	0.593**	0.629**
	Tech Occupation = 1, Yes	0.186	−0.005	0.207	−0.015	0.109	−0.085	0.137	−0.206
Quality of equipment	Micro ATM = 1, High			−0.299	−0.323	−0.336	−0.361	−0.171	−0.313
	Biometric = 1, High			−0.036	−0.111	−0.053	−0.117	−0.028	−0.026
	Portal = 1, High			0.100	0.155	0.136	0.161	0.379	0.315
Quality of infrastructure	Internet = 1, High					−0.866***	−0.824**	−0.864***	−0.838***
	Power = 1, High					0.402	0.402	0.128	0.118
Quality of support	Hardware = 1, High							0.446	0.537
	Software = 1, High							0.992***	1.115***
Control	Age		−0.021		−0.024		−0.020		−0.026
	Gender = 1, Male		−0.417		−0.425		−0.526		−0.405
	Graduate = 1, Yes		0.106		0.135		0.131		0.031
	Experience		0.003		0.004		0.004		0.006
	Occupations		0.219		0.203		0.219		0.341*
	Investment (log)		−0.020		−0.029		−0.023		−0.021
	Commission (log)		0.104*		0.127**		0.101		0.104
	Bank = B		−0.405		−0.165		0.027		−0.053
	Bank = C		−0.385		−0.332		−0.190		−0.618
	Bank = D		−0.344		−0.240		0.037		−0.185

(Continued)

TABLE 10.2 Continued

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Variables	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*	*Intention to continue*
Constant cut1	−3.029***	−3.369***	−3.047***	−3.325***	−3.255***	−3.357***	−2.507***	−2.654**
Constant cut2	−2.150***	−2.486***	−2.166***	−2.439**	−2.367***	−2.464**	−1.591***	−1.729*
Constant cut3	−0.923***	−1.251	−0.993***	−1.257	−1.196***	−1.287	−0.364	−0.495
Constant cut4	0.282	−0.021	0.214	−0.019	0.055	−0.012	0.997***	0.904
Observations	298	297	290	290	288	288	282	282

supported by our experience in the field as the agents did not report long or frequent power cuts. Agents also reported that prior information about power cuts was usually disseminated by the government authorities which help them plan better. Therefore, power does not seem to be a severe limitation for banking agents in the state.

In Models 7 and 8, we test for the role of quality of technical support. We find that agents' satisfaction with technical support for software-related issues has a significant and positive coefficient of 0.992. It indicates that the banking agents who report high satisfaction with software-related support have 0.992 higher odds of reporting a stronger intention to continue. Satisfaction with hardware-related support, on the other hand, does not have a significant coefficient. It supports our earlier finding that the equipment breakdown is not a major factor that shapes banking agents' intention to continue.

Among the control variables, most of the personal and business characteristics of the agents were found to be consistently insignificant. The *commission* is the only variable that has a positive and significant coefficient in some models. It indicates that a higher earning potential positively influences agents' intention to continue despite other challenges, as identified in the above discussion.

In Table 10.3, we reconstruct the response variable to test the robustness of the results discussed above. Only 3% and 4% of the banking agents reported their intention to continue as 1=highly unlikely and 2=unlikely, respectively. In the reconstructed variable, we combined the response categories 1=highly unlikely, 2=unlikely, 3-neutral, to create a new response category 'unlikely' to indicate a weak or undecided intention to continue banking operations. The new variable has 22% responses for unlikely. The regression results are the same as before.

10.6 Conclusion

This chapter contributes to the scant literature on agent banking by examining the role of technological friction in shaping banking agents' intention to continue. To the best of our knowledge, this is the first study that examines banking agents' intention to continue banking operations. Given that agent banking is a critical intervention to achieve financial inclusion and is completely technology driven, the findings of this study assume significant importance.

Our empirical investigation used a primary dataset of banking agents from the rural state of Himachal Pradesh in India. This research setting facilitated enquiry into a unique bank-led agent banking ecosystem in the country. Based on literature and understanding from the field survey, we categorise the technology-related factors into four categories, namely, exposure

TABLE 10.3 Ordinal Logistic Regression Results for Intention to Continue (3-Point Scale)

	Variables	*(1)* *Intention to continue*	*(2)* *Intention to continue*	*(3)* *Intention to continue*	*(4)* *Intention to continue*	*(5)* *Intention to continue*	*(6)* *Intention to continue*	*(7)* *Intention to continue*	*(8)* *Intention to continue*
Exposure to technology	Dpay = 1, Yes	0.445**	0.390*	0.474**	0.460*	0.497**	0.517**	0.616**	0.645**
	Tech Occupation = 1, Yes	0.168	−0.025	0.190	−0.029	0.097	−0.099	0.133	−0.226
Quality of equipment	Micro ATM = 1, High			−0.272	−0.288	−0.302	−0.317	−0.109	−0.230
	Biometric = 1, High			−0.060	−0.127	−0.080	−0.130	−0.064	−0.052
	Portal = 1, High			0.097	0.144	0.121	0.136	0.381	0.306
Quality of infrastructure	Internet = 1, High					−0.869***	−0.822**	−0.850***	−0.815**
	Power = 1, High					0.386	0.382	0.093	0.061
Quality of support	Hardware = 1, High							0.448	0.562
	Software = 1, High							1.001***	1.093***
Control	Age		−0.018		−0.022		−0.017		−0.021
	Gender = 1, Male		−0.392		−0.405		−0.501		−0.386
	Graduate = 1, Yes		0.105		0.133		0.133		0.042
	Experience		0.003		0.005		0.005		0.007
	Occupations		0.228		0.208		0.230		0.384**
	Investment (log)		−0.020		−0.028		−0.021		−0.020
	Commission (log)		0.105*		0.130**		0.105		0.099
	Bank = B		−0.514		−0.287		−0.115		−0.180
	Bank = C		−0.439		−0.389		−0.253		−0.651
	Bank = D		−0.431		−0.318		−0.029		−0.278
	Constant cut1	−0.925***	−1.164	−0.994***	−1.161	−1.197***	−1.138	−0.337	−0.233
	Constant cut2	0.279	0.067	0.213	0.078	0.051	0.138	1.020***	1.165
	Observations	298	297	290	290	288	288	282	282

to technology, quality of equipment, quality of infrastructure, and quality of technical support.

The findings point to the role of technical exposure, technology infrastructure, and support from BCNM. Specifically, we identify three factors which have a significant role in enhancing banking agents' intention to continue: agents' familiarity with financial technology, good internet connectivity, and quality technical support. The transaction mechanism in the agent banking model is completely technology driven. Therefore, the agents' performance depends on how efficiently the agents are able to handle the technology. The internet connectivity is a critical factor. Several agents maintained more than one source for internet connectivity. However, some rural parts of the state experienced weaker or intermittent connectivity that interrupted banking operations. The quality of technical support provided by BCNMs is of primary importance since the model is completely technology-based, and any downtime due to technical issues results in loss of business for the agent and poor experience for the customer. Therefore, banking agents require strong support from BCNM in dealing with technical issues. A direct communication line with the technical expert to resolve such issues could improve agent performance.

These findings corroborate our observations during the field visits. Active BCNMs ensured continuous engagement with agents through IM channels, phone, and field staff. Agents attached with such BCNMs were generally more confident. One counterintuitive finding is that the equipment breakdown-related issues do not seem to shape agents' intention to continue. We attribute this to the support provided by the BCNMs to handle such issues. But this finding is in contrast with our field observation, wherein it was noted that the equipment breakdown was a severe issue which hampered the banking operations of the agents. Another explanation could be that the availability of multiple modes of transactions (micro ATM, biometric, IMPS) provides agents with backup in case an equipment goes out of order.

The findings pave way for further investigation into agent banking ecosystems prevalent across developing countries. The findings can be contrasted with agent banking models that involve different levels of dependency on technology and nature of ecosystem players. The topography, area-specific factors, and cultural factors may influence the interaction between the agents and technology and can be taken up as a research inquiry.

References

Agarwal, R., & Prasad, J. (1999). Are individual differences Germane to the acceptance of new information technologies? *Decision Sciences*, *30*(2), 361–391. https://doi.org/10.1111/j.1540-5915.1999.tb01614.x.

Ahmed, J. U., & Ahmed, A. (2018). Agrani Doer banking: Agent banking business in Bangladesh. *Business Perspectives and Research*, *6*(2), 154–164. https://doi.org/10.1177/2278533718765532.

Ananth, S., & Oncu, T. S. (2014). A critical look at the expansion of banking services through the business correspondent model: Observations from Andhra Pradesh. *Economic & Political Weekly*, *49*(8), 49–58. http://www.ssrn.com/abstract=2326841.

Assunção, J. (2013). Eliminating entry barriers for the provision of banking services: Evidence from 'banking correspondents' in Brazil. *Journal of Banking & Finance*, *37*(8), 2806–2811. https://doi.org/10.1016/j.jbankfin.2013.03.016.

Ballem, A., Jos, A., Mohammad, G. A., & Srivastava, R. (2013). *Making the business correspondent model work for self-help groups: A case study of Shri Kshetra Dharmasthala rural development project, India*. Microsave. Retrieved from https://www.microfinancegateway.org/sites/default/files/mfg-en-case-study-making-the-business-correspondent-bc-model-work-for-self-help-groups-shgs-a-case-study-of-shri-kshetra-dharmasthala-rural-development-project-skdrdp-india-mar-2013.pdf.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, *25*(3), 351. https://doi.org/10.2307/3250921.

Calderone, M., Fiala, N., Mulaj, F., Sadhu, S., & Sarr, L. (2018). Financial education and savings behavior: Evidence from a randomized experiment among low-income clients of branchless banking in India. *Economic Development and Cultural Change*, *66*(4), 793–825. https://doi.org/10.1086/697413.

Carabarín, M., Garza, A. de la, González, J. P., & Pompa, A. (2018). Banking correspondents and financial inclusion in Mexico. In M. J. R. García & D. Mejía (Eds.), *Financial decisions of households and financial inclusion: Evidence for Latin America and the Caribbean* (pp. 389–427). CEMLA. Retrieved from https://scioteca.caf.com/handle/123456789/1189.

Centre for Digital Financial Inclusion. (2019). *Assessment of self-help group – Business correspondents (SHG-BCs)* (pp. 1–94). Retrieved from http://www.cdfi.in/assets/images/CDFI-NRLM-SHG-Report.pdf

Claessens, S. (2006). Access to financial services: A review of the issues and public policy objectives. *The World Bank Research Observer*, *21*(2), 207–240. https://doi.org/10.1093/wbro/lkl004.

CRISIL. (2018). *CRISIL Inclusix: Financial inclusion surges, driven by Jan-Dhan Yojana* (Vol. 4, Issue February). Retrieved from https://www.crisil.com/content/dam/crisil/our-analysis/reports/Research/documents/2018/march/crisil-inclusix-financial-inclusion-surges-driven-by-Jan-Dhan-yojana.pdf.

Cull, R., Gine, X., Harten, S., Heitmann, S., & Rusu, A. B. (2018). Agent banking in a highly under-developed financial sector: Evidence from democratic Republic of Congo. *World Development*, *107*, 54–74. https://doi.org/10.1016/j.worlddev.2018.02.001.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319. https://doi.org/10.2307/249008.

Demirgüç-Kunt, A., Klapper, L., & Singer, D. (2017). *Financial inclusion and inclusive growth: A review of recent empirical evidence* (Policy Research

Working Paper Series No. 8040). World Bank. Retrieved from http://hdl.handle.net/10986/26479.

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The global Findex database 2017: Measuring financial inclusion and the Fintech revolution*. Washington, DC: World Bank. Retrieved from https://doi.org/10.1596/978-1-4648-1259-0.

Dias, D., & Mckee, K. (2010). *Protecting branchless banking consumers: Policy objectives and regulatory options*. CGAP. Retrieved from https://www.cgap.org/sites/default/files/CGAP-Focus-Note-Protecting-Branchless-Banking-Consumers-Policy-Objectives-and-Regulatory-Options-Sep-2010.pdf.

Diniz, E. H., Birochi, R., & Pozzebon, M. (2012). Triggers and barriers to financial inclusion: The use of ICT-based branchless banking in an Amazon county. *Electronic Commerce Research and Applications*, *11*(5), 484–494. https://doi.org/10.1016/j.elerap.2011.07.006.

Igbaria, M., Guimaraes, T., & Davis, G. B. (1995). Testing the determinants of microcomputer usage via a structural equation model. *Journal of Management Information Systems*, *11*(4), 87–114. https://doi.org/10.1080/07421222.1995.11518061.

Kumar, A., Parsons, A., Urdapilleta, E., & Nair, A. (2006). *Expanding bank outreach through retail partnerships* (*World Bank Working Paper Series*). The World Bank. https://doi.org/10.1596/978-0-8213-6702-5.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems*, *12*(December). https://doi.org/10.17705/1cais.01250.

Long, J. S., & Freese, J. (2001). Models for Ordinal Outcomes. In *Regression models for categorical dependent variables using Stata*. (pp. 137–170). Texas: Stata Press.

Mas, I., & Siedek, H. (2008). *Banking through networks of retail agents*. Washington, D.C.: CGAP.

Mas, I., Tiwari, A. J., Jos, A., George, D., Thacker, K. U. M., Garg, N., Kapoor, R. V. S., Mehta, S., & Shukla, V. (2012). Are banks and microfinance institutions natural partners in financial inclusion? SSRN Electronic Journal, May. https://doi.org/10.2139/ssrn.2084159.

Microsave. (2014a). *Assessment of Bank Mitr's under Pradhan Mantri Jan Dhan Yojana (PMJDY)*. Microsave. Retrieved from https://www.microsave.net/files/pdf/Assessment_of_Bank_Mitrs_under_PMJDY.pdf.

Microsave. (2014b). *Business correspondent models in Bihar – Constraints and way forward* (p. 134). SIDBI. Retrieved from http://www.microsave.net/files/pdf/1417590028_Business_Correspondent_Models_in_Bihar_Constraints_and_Way_Forward.pdf.

Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, *17*(4), 460–469. https://doi.org/10.1177/002224378001700405.

Palaon, H., Wiryono, S. K., & Faturohman, T. (2020). Branchless banking agents: Business satisfaction, continuity, and viability. *Cogent Business & Management*, *7*(1), 1–19. https://doi.org/10.1080/23311975.2020.1823585.

Patel, D. S., Frydrych, J., & Kiarie, N. (2018). *Agent network accelerator research: Democratic Republic of the Congo regional report*. Nairobi: Helix Institute of

Digital Finance. Retrieved from https://www.microsave.net/wp-content/uploads/2019/02/Final-Report-PDF.pdf

PwC. (2015). *Compilation of drill-down case studies of existing business correspondents and business correspondent models in MP*. SIDBI. Retrieved from https://www.sidbi.in/files/article/articlefiles/SIDBI-Updated Draft Report-MP-BC Study-.pdf.

Sharma, M., & Chatterjee, S. (2017). *Agents of change: How the human touch is bringing digital financial services to new customers in India*. Center for Financial Inclusion.

Sharma, M., Giri, A., & Chadha, S. (2016). *Pradhan Mantri Jan Dhan Yojana wave III assessment*. Microsave. Retrieved from https://www.microsave.net/wp-content/uploads/2018/10/PMJDY_Wave_III_Assessment_MicroSave.pdf.

Singh, C., & Naik, G. (2017). Financial inclusion in India: A case study of Gubbi. SSRN Electronic Journal, May, 1–69. https://doi.org/10.2139/ssrn.2973741.

SLBCHP. (2019). *152nd SLBC Agenda*. State Level Bankers' Committee Himachal Pradesh. Retrieved from http://www.slbchp.com/Slbcmeetingspage/agenda-minutes.aspx.

Staschen, S., & Meagher, P. (2018). *Basic regulatory enablers for digital financial services* (Issue 109). CGAP. Retrieved from https://www.cgap.org/sites/default/files/researches/documents/focus-note-basic-regulatory-enablers-for-dfs-may-2018.pdf.

Stegman, M. A., Rocha, M., & Davis, W. (2005). The role of technology in serving the unbanked. In *The Frank Hawkins Kenan institute of private enterprise, University of North Carolina, 2005* (Issue January).

Thorat, Y. P., Srinivasan, N., Santhanam, S., & Rathore, N. S. (2010). *Agency network management: Feasibility of engaging corporate retail networks as business correspondents of banks – A study*. IFMR. Retrieved from https://www.findevgateway.org/sites/default/files/publications/files/mfg-en-paper-feasibility-of-engaging-corporate-retail-networks-as-business-correspondents-of-banks-a-study-sep-2010.pdf.

Ujjawal, A., Champatiray, A. K., Sadhu, S., & Mendiratta, T. (2012). *Business correspondent model: An analysis of the financial viability of customer service providers and client satisfaction*. Centre for Microfinance, IFMR. Retrieved from http://ifmrlead.org/wp-content/uploads/2015/05/BC Model – An Analysis of the Financial Viability of Customer Service Providers and Client Satisfaction.pdf.

UNCDF. (n.d.). *Financial inclusion and the SDGs*. Retrieved December 20, 2020, from https://www.uncdf.org/financial-inclusion-and-the-sdgs.

ANNEXURE- 1

Section 9: Restriction on retention of personal data:

1. 9. (1) The data fiduciary shall not retain any personal data beyond the period necessary to satisfy the purpose for which it is processed and shall delete the personal data at the end of the processing.
2. 9. (2) Notwithstanding anything contained in sub-section (1), the personal data may be retained for a longer period if explicitly consented to by the data principal, or necessary to comply with any obligation under any law for the time being in force.

Section 4: Prohibition of processing of personal data:

1. 4. No personal data shall be processed by any person, except for any specific, clear and lawful purpose.

Section 28: Maintenance of records:

1. (3) Every social media intermediary which is notified as a significant data fiduciary under sub-section (4) of section 26 shall enable the users who register their service from India, or use their services in India, to voluntarily verify their accounts in such manner as may be prescribed.
2. (4) Any user who voluntarily verifies his account shall be provided with such demonstrable and visible mark of verification, which shall be visible to all users of the service, in such manner as may be prescribed

Section 91: Act to promote framing of policies for digital economy, etc.

1. (1) Nothing in this Act shall prevent the Central Government from framing of any policy for the digital economy, including measures for its growth, security, integrity, prevention of misuse, insofar as such policy does not govern personal data.
2. (2) The Central Government may, in consultation with the Authority, direct any data fiduciary or data processor to provide any personal data anonymised or other non-personal data to enable better targeting of delivery of services or formulation of evidence-based policies by the Central Government, in such manner as may be prescribed. Explanation – For the purposes of this subsection, the expression "non-personal data" means the data other than personal data.
3. (3) The Central Government shall disclose annually the directions, made by it under sub-section (2), in such form as may be prescribed.

ANNEXURE- 2

Recommendation No. 31:

8 (4) A data fiduciary may share, transfer or transmit the personal data to any person as part of any business transaction in such manner as may be prescribed:

Provided that the provisions of this subsection shall not apply where such sharing, transfer or transmission of personal data prejudices the purpose of processing of personal data under section 12.

Recommendation No. 40:

Clause 19(2)(b) to be amended as follows:

(2) The provisions of sub-section (1) shall not apply where –

(a) processing is necessary for functions of the State or in compliance of law or any judgement or order of any court, quasi-judicial authority or Tribunal under Section 12;
(b) compliance with the request in sub-section (1) would not be technically feasible, as determined by the data fiduciary in such manner as may be specified by regulations.

Limitations of the Study: During the time of submission of this study, the topic of DPB (2021) (Section 4) is still in its embryonic form. The time-paucity further constrained the authors to be deprived of any intense review of literature of the same.

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Note: Page locators in *italics* refer to figures and **bold** refer to tables; Page locators followed by 'n' refer to notes.