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FROM INNOVATION TO INCLUSION: AN OVERVIEW OF TECHNOLOGY'S ROLE IN SOCIAL DEVELOPMENT IN INDIA

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Abstract

The intersection between technology and social development has been a subject of interest for researchers and policymakers worldwide. India, with its rapidly growing economy and large population, with a complex social and economic landscape. Over the past decade, there has been a significant increase in the adoption of technology in various sectors, including healthcare, education, agriculture, industry, and governance services. This paper examines the role of technology in promoting social development in India, with a particular focus on the journey from innovation to inclusion.

The paper reviews the existing literature on technology and social development in India, identifies key themes and trends, and explores the role of government policies and initiatives in promoting technology-based development in the country. It highlights the challenges and potential drawbacks associated with technology adoption, such as growing inequality and job displacement. The paper also analyses the impact of technology on the social fabric of India, including changes in communication, socialization, and cultural norms. The paper argues that technology can play a transformative role in promoting social development in India, but only if it is implemented inclusively and equitably. It emphasizes the need for a comprehensive approach in which technology is deployed. The paper also underscores the importance of public-private partnerships and collaboration among Stakeholders to ensure that technology is accessible and affordable for all.

The paper concludes by suggesting that policymakers should focus on promoting inclusive growth and addressing the digital divide to ensure that the benefits of technological advancements reach all segments of society.

Keywords *– social development, inclusion, digital divide, technology, adaptation and accessibility.*

Introduction and Background

The rapid advancements in technology over the past few decades have revolutionized every aspect of our lives. From communication to healthcare and education, technology has significantly impacted our daily routines and transformed the way we interact with the world around us. In particular, the emergence of digital technologies has opened up new opportunities for social development in developing countries like India. India, with a population of over 1.3 billion people, has one of the fastest-growing economies in the world. Despite this, the country faces numerous social challenges, including poverty, inequality, and inadequate access to basic services such as healthcare and education. In this context, technology has the potential to play a crucial role in addressing these challenges and promoting social development in India.

India has been a hub of technological innovation and development for decades. From the early days of the IT revolution to the current boom in start-ups, the country has been at the forefront of technological advancements. However, the impact of these advancements on social development has been uneven, with large swathes of the population still struggling with basic needs like education, healthcare, and livelihoods. It is essential to ensure that the benefits of technology are not limited to a select few but are accessible to all sections of society (Hamelink , 1997). This is where the concept of inclusive technology comes into play - the idea that technology can be used to create more equitable and inclusive societies by addressing the needs of marginalized communities (Rao S. S., 2008).

Against this backdrop, it is essential to examine the role of technology in social development in India and explore ways to make technology more inclusive and accessible. This article will provide an overview of the current state of technology in social development in India and

examine some of the key challenges and opportunities for promoting inclusive technology in the country.

Overview and Significance of Technologies' Role in Social Development in India

There has been an eminent contribution of technology in social development in India specifically in the past few decades. The internet and mobile phones are spreading and thus people even in remote areas can enjoy information, education, and communication.

Technology is contributing quite a lot to the advancement of the social sector in the category of education. Digital teaching platforms and learning technology tools have made education more available for those distant and far away as the cost of getting quality education is reduced. Technology too has brought about changes in the way Indians used to seek healthcare. On the other hand alongside that technology has had far-reaching effects on the Indian economy by creating new jobs in the technology sector and businesses as well. This has consequently led to better economic performance, which then has had many other social benefits, including the struggle with poverty and getting the chance to have more access to resources and opportunities (Chandra , 2004). Though, the fact of the matter remains that, it is a two-edged sword and the fast rate of technology adaptation in India is not only a good thing but also has some challenges and disadvantages too. For instance, the issues about the influence on mental health through social media, the capability of technology to increase existing differences, and the need for higher digital literacy and data privacy are among the problems that have been raised.

Eventually, technology was key in the modernization process of the Indian society, since it increased the level of information, education, the health care system, and the economic chances. While it is true that several aspects need to be worked on, technology has the opportunity to turn this into an impetus for social progress in India shortly.

Methodology

To delve into the complex interplay between technology and social development in India, this study adopts a comprehensive methodology rooted in secondary data analysis and a review of

existing literature. Through systematic examination of scholarly articles, reports, and relevant documents, this research aims to construct a nuanced understanding of the transformative journey from innovation to inclusion within the Indian context. The methodology involves synthesizing insights from diverse sources to elucidate the multifaceted impacts of technology adoption on various sectors of Indian society, including but not limited to education, healthcare, governance, and economic empowerment. To ensure the credibility and rigor of the study, relevant theoretical frameworks and conceptual models were employed.

Additionally, this methodology integrates a comparative approach, drawing parallels and distinctions between various technological interventions and their impacts on different segments of Indian society. By leveraging secondary data and existing literature, this overview aims to offer valuable insights and contribute to the discourse on leveraging innovation for inclusive social development in India.

Theoretical Framework

Amartya Sen's Capability Approach and Joseph Schumpeter's Theory of Innovation can be drawn upon as a suitable theoretical framework for this study. This is because the Capability Approach offers a perspective through which technology affects an individual's ability to live the life that they value, with a particular focus on technology access and its impact on improving education, health care, and community involvement among other human capabilities (Frediani , 2010). Schumpeter's Theory of Innovation would help understand how technologies drive economic growth and change in societies; it emphasizes entrepreneurial spirit, creative destruction as well as diffusion of innovations in shaping social development paths (Ziemnowicz , 1942). Within such a framework, we can therefore discuss India's technological innovation in terms of its contribution to economic growth and social inclusion by specifically focusing on the realized capabilities and resultant socio-economic dynamics.

Technological Innovation in India

Historical Overview of Technological Innovation in India

India has a long history of technological innovation, dating back to ancient times when it was renowned for its expertise in fields such as mathematics, astronomy, metallurgy, and architecture. However, during the colonial period, India's technological progress was stifled, and it became a net importer of technology. After India gained independence in 1947, the government launched a series of initiatives aimed at promoting technological innovation and modernizing the country. The establishment of the Indian Institutes of Technology (IITs) in the 1950s was a significant step towards this goal, In the 1960s, India began to focus on developing indigenous capabilities in strategic sectors such as space, defence, and nuclear energy. The establishment of the Indian Space Research Organization (ISRO) in 1969 was a major milestone in space technology, leading to the launch of India's first satellite in 1975.

During the 1980s and 1990s, India's economy began to liberalize, leading to a surge in entrepreneurship and innovation in the private sector. Companies such as Infosys, Wipro, and Tata Consultancy Services emerged as leaders in the global IT industry, driving India's growth as an information technology hub. In recent years, India has focused on developing technologies that address its unique challenges, such as low-cost healthcare solutions, renewable energy, and agriculture. The government's Digital India initiative, launched in 2015, aims to transform the country into a digitally empowered society and knowledge economy.

Overall, India's history of technological innovation is rich and diverse, spanning centuries and encompassing a wide range of fields. Today, India is a major player in the global technology industry, with a growing number of start-ups and a strong focus on innovation and entrepreneurship.

Impact of Technological Innovation on Social Development

Technological innovation has become a driving force in the modern era, revolutionizing the way we live and interact with one another. This transformative power has had a profound impact on social development, accelerating progress across various sectors (Piachaud, 2019).

With the advent of cutting-edge technologies like artificial intelligence, machine learning, and robotics, India has seen unprecedented growth in industries such as healthcare, education, and agriculture (Marwaha, 2021). For instance, telemedicine has enabled doctors to reach remote areas and provide healthcare services to millions of people who were previously underserved. Similarly, online education platforms have democratized access to education, enabling students to learn from anywhere and at any time (Piachaud, 2019).

Moreover, technological innovation has fostered social inclusion and economic growth, particularly in rural areas. The proliferation of mobile phones and digital payments has facilitated financial inclusion, empowering individuals and small businesses to participate in the formal economy (Easwaran1, 2022). Additionally, initiatives like Digital India and Make in India have created new opportunities for entrepreneurship and employment, driving economic development and reducing poverty. However, despite these positive developments, technological innovation also poses challenges, particularly with regard to privacy, security, and equity (Piachaud, 2019). As India continues to embrace technological innovation, it is important to ensure that its benefits are shared equitably and that its risks are mitigated effectively.

Thus, the impact of technological innovation on social development in India has been transformative, accelerating progress and fostering inclusion. As India continues to chart its path towards a more prosperous and equitable future, it must leverage technological innovation to build a more resilient and sustainable society.

Digital Divide and Inclusion

Overview of the Digital Divide in India.

The OECD defines the digital divide as the gap between individuals, households, businesses, and geographic areas that have access to information and communication technologies (ICTs) and those that do not. In India, the digital divide is a significant issue, with large segments of the population lacking access to technology and the internet. The Standing Committee on Information Technology in January 2019 concluded that the digital literacy efforts of the government are far from satisfactory.

According to a report by the Internet and Mobile Association of India (IAMAI), there were 504 million active internet users in India as of November 2019, which represents only 36% of the total population. This leaves a significant portion of the population without access to the internet, which limits their ability to access online services, education, and employment opportunities. The lack of digital inclusion is particularly acute in rural areas, where infrastructure is inadequate, and people have limited access to smartphones, computers, and internet connectivity (‘India Inequality Report 2022: Digital Divide’., 2022).

The government has taken several steps to address this issue, including launching the Digital India program, which aims to provide digital infrastructure and services to every citizen. The government has also launched several initiatives, such as the National Digital Literacy Mission, which aims to provide digital literacy training to individuals in rural and remote areas. Additionally, the government has launched several programs to increase internet connectivity, including the Bharat-Net initiative, which aims to provide high-speed broadband connectivity to over 250,000 gram panchayats (village councils) in India (Chandola , 2022).

Addressing the digital divide in India requires a multifaceted approach that includes improving digital infrastructure, promoting digital literacy and skills development, and ensuring equitable access to digital technologies and services for all citizens. Without addressing these issues, the digital divide in India is likely to persist, exacerbating existing inequalities and hindering the country's overall development and growth (Warschauer , 2004).

Factors Contributing to the Digital Divide in India

Infrastructure: In many parts of India, particularly rural areas, there is a lack of basic infrastructure like reliable electricity, internet connectivity, and telecommunications facilities. This makes it difficult for people in those areas to access and use digital technologies.

Economic Disparities: The digital divide is also fuelled by economic disparities. Many people in India do not have the financial resources to purchase or maintain digital devices, such as smartphones or laptops, or to pay for internet services.

Illiteracy and Lack of Technical Skills: Many Indians lack the technical skills required to use digital technologies effectively. This is especially true in rural areas, where illiteracy rates are high, and people may not have had access to formal education or training.

Language Barriers: India has a diverse linguistic landscape, and many people do not speak English or Hindi, which are the dominant languages used in digital media. This makes it difficult for them to access online information, communicate with others, or use digital services.

Regional disparities: There are significant regional disparities in India when it comes to access to digital technologies. Urban areas are more likely to have access to digital infrastructure, while rural areas are often left behind (Chandola , 2022).

Gender Inequality: Women in India face additional challenges in accessing digital technologies due to societal barriers such as cultural norms, lack of education, and rural urban gender divide (Chandola , 2022).

Overall, addressing the digital divide in India requires a comprehensive approach that addresses the multiple factors that contribute to it, including infrastructure, economic disparities, literacy and technical skills, language barriers, gender inequality, and government policies**.**

Technology and Major Areas of Social Development in India.

Education

The role of technology in the field of education is four-fold, it is included as a part of the curriculum, as an instruction delivery system, as a means of aiding process. Thanks to technology; education has gone from passive and reactive to interactive and aggressive (Raja & Nagasubramani, 2018). India has a complex and diverse education system, with both public and private institutions offering a range of academic programs. The system is divided into several levels, including primary, secondary, higher secondary, undergraduate, and postgraduate education. Technology has played a significant role in bridging this gap and providing access to education for all students. The use of educational technology and information communication technologies (ICTs) in education is the need of the hour (Kozma , 2005). It can reach out to every nook and corner of the country and bridge the digital divide by providing teaching, learning, assessment, and continuous professional development solutions anytime anywhere coupled with achieving scale and speed (Simon , 2015). It is with these perspectives that the National Education Policy (2020) lays great emphasis on the use of educational technology to enhance access to educational opportunities, improve the quality of education, address concerns of inclusion and diversity, and improve access, quality, equity, affordability and accountability of the educational system in the country (Kumar).

The Role of Technology in Improving Access to Education in India:

Digital Infrastructure: The GOI has launched several initiatives to improve digital infrastructure, including the Digital India and National Broadband Mission. These initiatives aim to provide broadband connectivity to all citizens, including those in remote and rural areas. Digital infrastructure has also enabled the development of e-learning platforms, mobile learning, and virtual reality applications.

E-Learning Platforms: E-learning platforms such as E-PG Pathshala, Swayam Portal, NPTL, Coursera, Un-academy, and Khan Academy have made education accessible to students from all backgrounds. These platforms offer a wide range of courses and study materials that students can access online. E-learning platforms have also enabled the development of Massive Open Online Courses (MOOCs), which provide access to education to students from all over the world.

Online Tutoring: Online tutoring has made quality education accessible to students. They can access online tutoring services from expert teachers from anywhere in the world. This has helped in bridging the gap between urban and rural education and provided equal opportunities for all students. Online tutoring has also enabled personalized learning, where students can receive individual attention from their tutors.

Mobile Learning: Mobile learning has become increasingly popular in India due to the increasing use of smartphones. Mobile learning apps such as Byju's, Toprankers, physics walla, studyIQ and Vedantu have made education accessible to students who do not have access to computers or laptops. These apps offer interactive content, video lectures, quizzes, and assessments that students can access on their smartphones. Mobile learning has also enabled gamification of learning, where students can learn through games and simulations (Dar & Lone , 2022).

The integration of technology in education has brought about both challenges and opportunities. The proliferation of digital devices and tools has opened up a world of possibilities for educators and learners alike, but it has also presented significant Obstacles. Such as Digital infrastructure, access to technology, digital divide, cost, acceptance in rural people, lack of digital literacy and geographical barriers (Nimodiya & Ajankar, 2021).

Healthcare

Healthcare in India is a complex system with both public and private sectors providing medical services to a population of more than 1.3 billion people. The Indian healthcare system is currently undergoing significant reforms to improve access, quality and affordability of healthcare services. Over the past few decades, India has made remarkable strides in health parameters like immunisation, mortality rates, life expectancy and others. It has successfully eradicated numerous diseases, including polio, smallpox and guinea worm disease. On top of that, the country has also emerged as the largest provider of generics globally (Gupta, 2022). In recent years, the Indian has taken several initiatives to improve healthcare services in the country. These include the launch of the Ayushman Bharat scheme, digitisation of health

records, the establishment of new medical colleges and hospitals, and the promotion of telemedicine and e-health initiatives (Gupta, 2022). Telemedicine technology, which might be incorporated into the current healthcare delivery system, might be used to lessen the disparity in access to healthcare between rural and urban locations (Maroju, Choudhari, & Mendhe, 2023). Despite these efforts, significant challenges remain in ensuring universal access to quality healthcare for all Indians, such as Health infrastructure or access, Affordability, Accountability, Quality, and Lack of awareness (Kasthuri, 2018)

India is a vast and diverse country with a large population, and healthcare access and quality can vary significantly depending on the region. However, technology has the potential to play a significant role in improving healthcare access and quality in India.

Agriculture

The agriculture sector in India is a primary source of livelihood for a majority of the population. Low and stagnant income in the sector remains a focal point of policy debate in India. The most prominent pathway to enhance farmers' income is the adoption of improved agricultural technologies (Joshi & Varshney, 2022). The advent of technology in Indian agriculture has brought about a revolution in the way crops are cultivated and harvested. The impact of this technological boom has been nothing short of remarkable, with several positive changes being witnessed across the agricultural landscape. It has been empirically demonstrated that agricultural growth is significantly beneficial for reducing poverty and increasing per capita income. Besides inclusive growth, agriculture matters for health and nutrition, sustainability, climate change, and quality of life in the country. All these factors underscore the need for a new vision for agriculture as we move forward in the 21st century (Chand, 2019).

Agricultural Technologies in India:

Biotechnology: Biotechnology involves the use of genetic engineering to produce crops with desirable traits such as resistance to pests and diseases. This technology has the potential to increase crop yields and improve food security (Joshi & Varshney, 2022).

Farm mechanization: Farm mechanization involves the use of machines and equipment to perform agricultural tasks. This technology helps increase efficiency and productivity on farms, reducing the need for manual labour (Joshi & Varshney, 2022).

Precision farming: Precision farming uses technology such as GPS, remote sensing, and computer modelling to optimize crop yields and reduce waste. This technology helps farmers make informed decisions about the use of fertilizers, water, and other resources.

Organic farming: Organic farming is a sustainable agricultural practice that uses natural methods to produce crops. This technology helps reduce the use of chemical fertilizers and pesticides, which can have negative impacts on the environment.

Soil Testing: By analysing soil samples, farmers can determine which nutrients their crops need and apply the right amount of fertilizer for optimal growth.

Agriculture technologies have the potential to transform Indian agriculture and increase productivity. However, their inclusion and adoption face significant challenges, including lack of awareness, affordability, infrastructure, and regulation. Addressing these challenges is crucial to ensuring that agriculture technologies can reach their full potential in India (Jain, 2022).

Public Service Delivery

Technology has played a significant role in transforming public service delivery in India, enabling the government to provide better and more efficient services to its citizens and their social development (India, Government of, 2019). The Indian government has been using technology to streamline public service delivery processes and provide citizens with access to various services in a timely and efficient manner. India has been a leader in the digitization of public services since the launch of the Digital India initiative in July 2015, as the government fine-tuned its focus on the country's future by improving ICT governance and policy making, expanding internet access, and emphasizing digital public service delivery to facilitate good governance that leads to inclusive growth and better access to services for all citizens (Flynn

& Basu, 2022). The digitization of public service delivery has seen the achievement of numerous laudable milestones. The availability of high-speed internet as a core utility continues to increase in scale and reliability across the country. Rural, last-mile gaps in service areas are being bridged through Common Service Centres and physical office facilities where citizens can use public computers and internet connections to engage digital services to which they otherwise might not have access (Pareek & Sole , 2022).

Major initiatives related to public service delivery are as follows;

Common Services Centres – CSCs are offering government and business services in digital mode in rural areas through Village Level Entrepreneurs (VLEs). Over 400 digital services are being offered by these CSCs. So far, 5.31 Lakh CSCs are functional (including urban & rural areas) across the country, out of which, 4.20 Lakh CSCs are functional at the Gram Panchayat level (PIB, 2022).

Unified Mobile Application for New-age Governance (UMANG) – for providing government services to citizens through mobile. More than 1,570 government services and over 22,000 bill payment services are made available at UMANG (PIB, 2022).

e-District Mission Mode Project (MMP): e-District project has been implemented at district and sub-district levels of all States/UTs, benefitting all citizens by delivering various e-Services such as Certificates (Birth, Caste, Death, Income and Local Resident), Pension (Old Age, Disability and Widow), Electoral, Consumer Court, Revenue Court, Land Record and services of various departments such as Commercial Tax, Agriculture, Labour, Employment Training & Skill Development etc. Presently 4,671 e-services have been launched in 709 districts across India (PIB, 2022).

DigiLocker: It facilitates the paperless availability of public documents. Digital Locker has more than 11.7 crore users and more than 532 crore documents are made available through DigiLocker from 2,167 issuer organisations (PIB, 2022).

MyGov – It is a citizen engagement platform that is developed to facilitate participatory governance. More than 2.48 crore users are actively using MyGov (PIB, 2022).

Direct Benefit Transfers – 315 Schemes across 53 Ministries are offering Aadhaar-enabled direct benefit transfers to citizens. So far, Rs 24.3 lakh crore has been disbursed through the DBT platform (PIB, 2022).

Diksha – Diksha is a national level educational platform that helps students and teachers to participate, contribute and leverage a common platform to achieve learning goals at scale for the country. As on 27th July 2022, 7,633 courses are available and more than 15 crore enrolments have been done (PIB, 2022).

National Agriculture Market (e-NAM): The government of India has launched the National Agriculture Market (e-NAM) Scheme to create an online transparent competitive bidding system to facilitate farmers with remunerative prices for their produce. More than 1.73 crore farmers & 2.26 lakh traders have been registered on the e-NAM platform. Also, 1000 Mandis of 18 States and 3 UTs have been integrated with the e-NAM platform (PIB, 2022).

At the same time that these achievements were being made, however, there have also been instances of digital theft and fraud, mishandling of sensitive data, and security breaches, and there remain last-mile challenges around internet speed, smartphone affordability, and digital literacy as well (Flynn & Basu, 2022) (Mallika , 2023).

Conclusion

The Technology's Role in Social Development in India" highlights the transformative impact of technological innovation across various sectors, including education, healthcare, agriculture, and public service delivery. India's rich history of technological innovation, coupled with recent initiatives such as Digital India, has propelled the country towards a digitally empowered society and knowledge economy. However, despite significant progress, challenges such as the digital divide persist, particularly in rural areas where access to technology and digital literacy remain limited. To address these challenges and ensure inclusive growth, it is imperative to

adopt a multifaceted approach that focuses on improving digital infrastructure, promoting digital literacy, bridging economic disparities, and addressing regional and gender inequalities. Furthermore, effective regulation and policy interventions are essential to harness the full potential of technology for social development while mitigating risks such as privacy breaches and digital fraud. Moving forward, collaboration between the government, private sector, civil society, and international partners will be crucial in leveraging technology as a catalyst for sustainable and equitable development in India.

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