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THE DIGITAL REVOLUTION IN INDIA LEVERAGING DIGITAL INDIA PROGRAM (DIP) FOR SUSTAINABLE DEVELOPMENT

Dr. Anand M[1], Mr.Ganesh H. N Pai[2]
[1]Assistant Professor, Department of Commerce, G F G C Tarikere
[2]Assistant Professor, Department of Commerce, G F G C Tarikere

Abstract:
India's digital economy is expected to grow nearly twice as fast as its overall economy, contributing almost a fifth of the nation's income by 2029–30. Rapid advancements in mobile connectivity and digital payments have transformed industries ranging from e-commerce to financial services. Government initiatives like Digital India and the expansion of 5G infrastructure have further accelerated the adoption of digital services, bringing more businesses and consumers into the digital fold. The booming e-commerce and quick-commerce industries have redefined the country's retail landscape. Digital growth is primarily facilitated by the ease and ubiquity of the Unified Payment Interface (UPI) system. In 2024, India recorded a massive 208.5 billion digital payment transactions. Apart from retail, urban India also uses digital infrastructure for learning and healthcare needs. Bridging the urban-rural digital divide in India is not just a challenge; it is an opportunity to unlock the country's true potential. By harnessing the power of innovation, collaboration, and inclusive policies, we can create a digitally equal India that empowers its citizens, fosters entrepreneurship, and drives sustainable economic growth. India Replicating the successful model of Common Service Centers, with the establishment of solar-charged Rural Digital Centers operated by local village youth, can drive large-scale quality internet adoption. These centres can serve as hubs for delivering government and private e-services, Therefore, this paper aims to examine the recognition and adoption of technological innovations offered by the Indian government among citizens in rural areas, as well as the factors influencing their adoption and utilization. these studies aim to provide valuable insights for policymakers and stakeholders to develop effective strategies and policies
Keywords: Digital Infrastructure, Augmented Reality, Virtual Reality, Stakeholders

The Digital India initiative

Digital technology has emerged as a crucial catalyst for India's economic growth and the pursuit of social and economic equity by enhancing access to information, public services, and markets, thus addressing the country's infrastructure deficit. The potential of digital technology to transform India into a just and equitable society while propelling it to the forefront of nations is evident, particularly considering the country's young population's adaptability and innovative spirit In line with this vision, the 'Digital India' initiative was launched on July 1, 2015, by Prime Minister Narendra Modi, aiming to create a tech-empowered and knowledgeable society where government services are easily accessible to all citizens, fostering digital and economic empowerment

Review of literature

The review of the literature section of this paper delves into the existing academic research and expert opinions on the digitization of public services in India. It examines the gaps and challenges identified in previous studies, focusing on the digital divide, digital literacy, and the

adoption of ICT in rural areas. The section also highlights the need for innovative solutions and strategic approaches to bridge the gaps and promote inclusive development in the country.

India's vision for a digital future is deeply rooted in the integration of technology into governance processes (Malodia et al., 2021). Developed nations have already embraced digital transformation in various sectors, there is a growing recognition in India of the need to digitize collections and enhance information management practices (Mukherjee & Narang, 2022).

In India, the increasing adoption of technology and the government's emphasis on digitalization is shaping the changing landscape of information management (Malodia et al., 2021).

Digitalization efforts are driven by the vision to improve governance processes, enhance access to information, promote transparency, and empower citizens through digital platforms (Holl & Rama, 2023). By leveraging technology and embracing digitalization, India can drive economic growth, enhance access to information and services, and create a more inclusive and empowered society (Barrutia & Echebarria, 2021).

Digital technologies, such as cloud computing and mobile applications, have become catalysts for economic growth and citizen empowerment worldwide (Tripathi & Dungarwal, 2020). India has made remarkable progress in technology and science, positioning itself as one of the leading economies in the developing world (Lema et al., 2021).

Recognizing the potential for economic growth through information and communication technology (ICT), the Indian government is positioning itself as a global digital transformation partner for businesses (Ghobakhloo & Iranmanesh, 2021). As technological innovations continue to rise, India aims to become one of the digitally transformed nations, offering evident benefits to the government, citizens, professionals, and corporate investors (Manda et al., 2019).

Digitalization, as exemplified by India's Digital India Program (DIP), is explicitly linked to inclusiveness. The DIP's efforts to provide digital access, resources, and services to all citizens, especially those in rural areas, emphasize inclusivity (Nedungadi et al., 2018). Furthermore, DIP has spurred innovation and entrepreneurship in the technology sector (Vijayan, 2019).

Initiatives such as Startup India and Standup India have provided a supportive ecosystem for the growth of startups and small businesses, driving job creation and economic development. The program has also encouraged the development of indigenous technologies, promoting self-reliance and positioning India as a global player in the digital space (Godha et al., 2019). Moreover, DIP has focused on bridging the digital divide by ensuring internet connectivity and digital literacy across the country (Asrani, 2022).

However, despite the progress made, challenges remain in fully realizing the vision of a digital India. One persistent challenge is the last-mile connectivity in remote and rural areas, where infrastructure development is more challenging due to geographical and logistical constraints (Hassan & Rather, 2020). Additionally, the affordability of internet services and digital devices remains a barrier for certain sections of society, limiting their access to the benefits of digital technologies (Reddick et al., 2020).

Objectives

This study investigates the factors that influence the adoption of digital technology in rural areas of India, with a focus on the Digital India Program (DIP)

Technology adoption rates, and utilization patterns among rural populations

Research Questions

How and to what extent are people accessing digital information and technology innovation in rural areas?

What are the factors influencing the adoption and utilization of digital information and technology innovation among rural populations in India?

The first research question focuses on the extent to which rural populations are able to access digital information and benefit from technological advancements. This question aims to provide insights into the level of digital penetration and the effectiveness of government initiatives in bridging the digital divide. The second research question delves into the factors influencing the adoption and utilization of digital information and technology innovation among rural populations. By exploring these factors, such as infrastructure availability, affordability, digital literacy levels, and cultural and social barriers, this research can identify the key determinants that hinder or facilitate the adoption of digital technologies in rural areas.

Research Design

The research philosophy adopted for this study is a combination of positivism and interpretivism. Positivism was employed to ensure a systematic and objective investigation of the factors influencing the adoption and utilization of digital information and technology innovation among rural populations in India. It provided a structured approach to data collection, analysis, and interpretation, allowing for the identification of patterns and generalizations.

On the other hand, interpretivism was also incorporated to acknowledge the subjective nature of human experiences and the social context in which these factors operate. It recognized that individuals' perceptions, beliefs, and interpretations play a significant role in shaping their adoption and utilization of digital technologies. Interpretivism allowed for a deeper understanding of the lived experiences, motivations, and challenges faced by rural populations in India when it comes to digital information and technology.

To fulfill the objectives, the subsequent sections of this paper are structured as follows: following a concise introduction, the subsequent section provides an extensive account of the literature review, outlining the critical themes and concerns explored within this study. Subsequently, the findings derived from this investigation will offer valuable insights into the extent of digital technology utilization within rural areas. Lastly, the concluding section summarizes the key findings, implications, and recommendations for future research.

In 2018, the country had a staggering 560 million internet subscribers, positioning it as the second-largest market after China. Notably, Indian mobile data users exhibit high monthly data consumption, averaging 8.3 gigabits (GB). This surpasses the average of 5.5 GB in China and falls within the range of 8.0 to 8.5 GB observed in South Korea, a technologically advanced digital economy This growth can be attributed to the substantial improvements in internet infrastructure and increased internet access, providing opportunities for public and private stakeholders to deliver digital services. However, despite these advancements, India's e-governance provision lags, with a ranking of 107th, primarily due to challenges associated with the Aadhaar card system, which poses difficulties for individuals in rural areas to access secure services. Concerns regarding data protection efficiency and effectiveness have also arisen in relation to Aadhaar.

By bridging the digital divide, offering digital literacy, and promoting cashless transactions, digitalization contributes to a more inclusive and empowered society by ensuring that even marginalized communities can benefit from digital technologies. To achieve this vision, the Indian government has implemented strategies to transform the nation and create opportunities for its citizens through the utilization of ICT tools, leading to the launch of the Digital India

Program (DIP) initiative. The program aims to empower India digitally and generate prospects for its citizens through the harnessing of digital technologies The vision of the Digital India program, as highlighted by Kumar is to transform India into a digitally empowered society and knowledge economy.

The program focuses on three key areas of vision

(1) Digital infrastructure as a core utility to every citizen: Under the vision of digital infrastructure as a core utility for every citizen, the program aims to provide high-speed internet access, mobile phones, and bank accounts to enable citizen participation in the digital and financial space.

(2) Governance and services on demand: The vision of governance and services on demand entails making citizen entitlements portable and available on the cloud, promoting electronic and cashless financial transactions, integrating services seamlessly across departments, and providing real-time availability of services through online and mobile platforms.

(3) Digital empowerment of citizens: Digital Empowerment of Citizens involves promoting universal digital literacy, collaborative digital platforms for participative governance, the availability of digital resources and services in Indian languages and eliminating the need for physical submission of government documents or certificates (Kumar, 2019).

DIP aims to ensure that all government services are available electronically through an enhanced and effective online infrastructure. A digital identity is a secure and unique representation of an individual or entity in the digital world, used for online authentication and access to digital services (Laurent et al., 2015). The use of geospatial information systems (GIS) for decision support systems and development is also emphasized (Kumar, 2019). Through the implementation of digital platforms and services, the government has streamlined administrative processes, reduced bureaucratic red tape and improved the efficiency of public service delivery (Ingrams et al., 2022). Citizens can now access government services and information online, eliminating the need for time-consuming manual processes. This has resulted in increased transparency, reduced corruption, and enhanced accountability in government.

The DIP's core objectives, such as electronic service delivery, digital resources, and cashless transactions, are inherently linked to the reduction of transaction costs. By enabling citizens to access government services with ease through digital platforms, the program minimizes the need for time-consuming manual processes and paperwork. In the business sector, digitalization has led to the automation of various business processes, supply chain management, and e-commerce. These digital advancements have resulted in reduced transaction costs related to procurement, contracting, and monitoring (Dutta et al., 2020). By providing a digital platform for business transactions, companies can achieve cost savings through improved efficiency and reduced information asymmetry. This reduction in transaction costs is particularly significant for startups and small businesses, contributing to economic development and job creation, as evident in initiatives like Startup India and Standup India.

The Digital India initiative has also introduced several services and mobile applications to facilitate accessibility and participation. For instance, the Accessible India Campaign Mobile App aims to create equal opportunities and inclusivity for people with disabilities, allowing them to participate fully in all aspects of life in an inclusive society (Agrawal et al., 2022).

The Agri Market App provides farmers with crop price information within a 50 km radius, discouraging distress sales and empowering farmers with market insights (Deininger, 2017).

The Beti Bachao Beti Padhao campaign focuses on eliminating gender discrimination and ensuring equal opportunities for girls in education and society (Parmar & Sharma, 2020). The Crime and Criminal Tracking Network & Systems (CCTNS) aims to enhance policing efficiency and effectiveness through the integration of e-governance principles and nationwide networking infrastructure for crime investigation and criminal detection (Sharma, 2021).

Digital technology has brought about significant transformations in the lives of people, particularly in rural areas, by empowering and connecting them (Iivari et al., 2020). DIP was initiated with the objective of providing increased access to technology in rural regions through high-speed internet networks and enhancing digital literacy (Burman, 2021). This endeavor has presented Indians with the opportunity to leverage cutting-edge technology, leading to a transformation of the rural service industry (Rani, 2016). The program has facilitated IT training for students and villagers, equipping them with the necessary skills for employment in the ICT sector. Rural residents have been trained by telecom service providers to address local internet needs, resulting in the creation of job opportunities in the service industry (Vij, 2018).

The digital empowerment of rural India through DIP has brought significant socio-economic benefits. By promoting digital literacy and providing access to technology, DIP has empowered individuals in rural areas, enabling them to participate in the digital economy and improve their livelihoods. The program has not only created job opportunities in the service industry but has also facilitated the growth of businesses in rural and urban areas alike (Nedungadi et al., 2018).

Moreover, the program has enhanced connectivity in rural India, bridging the infrastructure gap and enabling individuals and communities to access digital services and information. With community internet awareness, rural areas have transformed into digitally empowered societies where wireless internet and e-services have become readily accessible. This has led to increased efficiency, reduced costs, and improved access to essential services for rural communities, ultimately contributing to their overall development (Banu, 2017).

In addition to its social and economic impact, DIP has played a vital role in attracting foreign direct investments and driving economic growth. The program's focus on digitization, economic reforms, and the development of smart cities has created a conducive environment for investment and technological advancements (Bhasin, 2016). By aligning with international service standards and promoting a tech-empowered society, India has positioned itself as an attractive destination for global investments, leading to economic modernization and improved export capabilities (Nugroho et al., 2021). Farmers can connect with national agricultural markets by leveraging digital tools and services, expanding their market reach, and reducing reliance on intermediaries.

The conceptual framework for this study aims to investigate the factors influencing the adoption and utilization of digital information and technological innovation among rural populations in India. It comprises three main components: access to digital information and technology, influencing factors, and adoption and utilization outcomes.

1. Access to digital information and technology:
2. Availability of digital infrastructure (e.g., internet connectivity, mobile networks)
3. Availability of digital devices (e.g., smartphones, computers)
4. Accessibility of digital platforms and services
5. Influencing factors:
6. Demographic factors (e.g., age, gender, occupation)
7. Perceived usefulness and ease of use of digital technology

8. Digital literacy and skills
9. Socio-economic factors (e.g., income level, education level)
10. Government initiatives and support
11. Adoption and utilization outcomes:
12. The extent of digital information access and utilization
13. Engagement in online activities and communication
14. Socio-economic impact and empowerment

Issues

The digital divide remains a significant barrier to the effective implementation of DIP. The divide refers to the disparity in internet connectivity and access between those who have it and those who do not. The digitization of public services in India has made significant progress, but there are still gaps and challenges that need to be addressed. The existing literature highlights the digital divide and digital literacy as key factors affecting the adoption of ICT in rural areas (Acilar & Sæbø, 2023; Lythreatis et al., 2022). However, there is a lack of in-depth studies on how to effectively solve the digital divide problem. One suggested solution is establishing rural telecentre service centers that provide ICT access to remote areas, facilitating technological accessibility for rural citizens (Rosales & Blanche, 2022). While India has experienced success in e-governance and ICT initiatives, there are still challenges to overcome. Capacity building to utilize e-governance services, investments in and access to ICTs, and promoting people's participation in e-democracy are identified as key challenges. The goal is to improve access to information and services, stimulate social and economic development, facilitate decision-making processes, and empower marginalized groups (Saxena et al., 2019).

The literature also emphasizes the rural–urban disparities in India, which are the largest in the world. Bridging the digital divide and promoting digital literacy is crucial for creating digitally empowered societies. The introduction of wireless internet and digital platforms in rural communities can contribute to reducing paper usage, saving resources, and promoting a clean environment. Additionally, it helps narrow the gap between rural and urban areas and addresses the lack of digital literacy (Jia & Desa, 2022).

Findings

•The findings reveal a predominantly young population in rural India, indicating a workforce with significant economic potential and a higher likelihood of embracing digital technologies.

•Moreover, the study highlights the high levels of education among respondents, indicating a population well-equipped to understand and benefit from digital initiatives.

•Unexpectedly, the research shows a higher rate of digital technology adoption among female respondents, challenging the perception of gender disparities in technology access.

•This finding suggests that the DIP has played a vital role in bridging the gender gap and empowering women in rural areas.

•The findings from this research will inform policymakers and stakeholders about the current situation and challenges faced by rural communities in accessing and utilizing digital information and technology innovations. This knowledge can guide the development of targeted strategies and policies to overcome barriers, improve digital infrastructure, enhance digital literacy programs, and promote widespread adoption of digital technologies in rural India. Ultimately, these research efforts contribute to the sustainable and inclusive development of the Digital India campaign, ensuring that rural populations are empowered to participate fully in the digital economy.

Additionally, the study uncovers a trend towards mobile-based services over computer-based services, signaling a shift in technology utilization patterns. This emphasizes the need to prioritize mobile technology and improve connectivity in rural areas to ensure wider access to digital platforms.

Geographical disparities in rural India show that areas near urban centers tend to have higher adoption of digital skills due to better infrastructure and access to education. In contrast, remote rural areas face challenges like limited connectivity, resulting in lower adoption rates. Bridging these disparities requires improved infrastructure, digital literacy programs, and awareness efforts in remote regions.

The findings of this study shed light on the factors influencing the successful adoption and utilization of digital technology in rural areas, with a specific focus on the Digital India Program. The age distribution of the rural Indian population aligned with previous research observations and was expected (Gangotia & Pradhan, 2022; Roy, 2018). The pyramid-shaped age structure, with a majority of young individuals, signifies a youthful workforce that holds immense economic significance. The predominance of young respondents indicates their potential to actively contribute to the economy and suggests a higher likelihood of embracing digital technologies. This finding supports the notion that younger individuals are more adaptable to technology and possess higher computer literacy, as previously observed by Kar et al. (2018) and Soja (2017). Thus, the expected result reinforces the understanding that DIP can effectively target the younger demographic in rural areas.

Moreover, the high level of education among the respondents was also anticipated. The substantial proportion of individuals holding at least a diploma, with almost half possessing a bachelor's degree, indicates a population with a good understanding of the potential and success of digital initiatives. These education levels in rural areas surpass expectations and underscore the prevalence of education and knowledge in the rural Indian population. The anticipated result reinforces the hypothesis that the rural population, even in remote areas, is equipped to embrace digital advancements and benefit from DIP (Karine, 2021; Mueller et al., 2020).

The analysis of variance and regression analysis further supported the influence of demographic factors on the adoption rate of digital technology. Age group, gender, and occupation were found to be significant predictors of the adoption rate, suggesting that these factors play a role in influencing the likelihood of adopting digital technology among the population.

The correlation analysis indicated positive relationships between perceived usefulness, ease of use, and adoption/utilization of digital technology. Individuals who perceive digital technology as useful and easy to use are more likely to adopt and utilize it.

The regression analysis confirmed the importance of perceived usefulness and ease of use as predictors of the adoption/utilization of digital technology. Higher levels of perceived usefulness and ease of use were associated with increased adoption/utilization rates.

Overall, these findings contribute to the existing body of knowledge and emphasize the significance of digital literacy, demographic factors, and perceived usefulness and ease of use in bridging the digital divide and fostering the adoption and utilization of digital technology in rural areas. The study highlights the importance of enhancing literacy rates, addressing demographic variations, and emphasizing user-centric design and usability in promoting the adoption and utilization of digital technology in rural communities.

Managerial implications

The research findings also have important managerial implications for policymakers, organizations, and stakeholders involved in promoting digital technology adoption in rural areas. Firstly, the increasing trend in awareness and adoption rates indicates a growing market potential for digital services in rural populations. Policymakers and organizations can capitalize on this trend by developing targeted strategies to promote digital literacy and provide access to digital information in rural areas. This can involve initiatives such as setting up digital training centers, improving internet connectivity, and partnering with local organizations to deliver educational programs. Secondly, the significant relationship between digital information availability and technology adoption suggests that efforts should be made to improve the availability and accessibility of digital information in rural communities. Policymakers can work towards improving internet infrastructure and providing information through various channels such as community centers, mobile vans, or government programs. Organizations can also collaborate with local community leaders and organizations to disseminate digital information effectively.

Conclusion

The existing literature on digital information access and technological innovation in rural areas of India has some notable gaps that need to be addressed. Firstly, there is a scarcity of empirical studies specifically focused on rural areas, hindering a comprehensive understanding of the extent of digital information access and technology innovation among rural populations. Existing research predominantly concentrates on urban areas or provides a broader overview of the digital landscape in the country. Secondly, there is a need for comprehensive frameworks that can systematically analyze the factors influencing the adoption and utilization of digital information and technological innovation in rural areas. To discern the existing gaps in ICT strategies and policies associated with DIP in India, the research specifically focuses on the Kalahandi rural district of Odisha state. By identifying these gaps, future research can contribute to filling these knowledge voids and provide valuable insights for policymakers and stakeholders to develop effective strategies and policies.

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