

Digital Transformation in India: Perspectives, Challenges, and Future

Saurabh Sharma^{*1}, K. K. Jha² and Bidyapati Thangjam³

¹⁻³ Department of Agricultural Extension Education, Nagaland University, School of Agricultural Science, Medziphema Campus - 797 103, Nagaland, India

Received: 20 Oct 2023; Revised accepted: 12 Dec 2023; Published online: 04 Jan 2024

Abstract

Digital India marks the start of a digital revolution, envisioned by the Indian government. The goal is to make government services accessible to citizens through digital means, even in urban and rural areas. These key factors involve improving digital infrastructure and increasing internet connectivity in remote areas. The primary objective of the program is to propel the nation forward in both digital and economic aspects. By fostering innovation, the initiative aims to engage people in processes crucial for economic advancement. However, implementing this vision poses significant challenges, including digital illiteracy, inadequate infrastructure, slow internet speeds, lack of coordination among departments, and taxation issues. Overcoming these hurdles is essential to unlock the program with full potential. Successful implementation demands concerted efforts and commitment from both government and private sector industries for the societies. If executed effectively, Digital India has the potential to create numerous opportunities for the nation building.

Key words: Agriculture, Digital, Infrastructure, Opportunities, Transformation

The Digital India programme, launched in 2015 with the goal of transforming India into a digitally equipped society, would provide the Indian populace with access to digital infrastructure, e-governance, and digital empowerment [1-2]. In an effort to transform the country into a knowledge economy and a digitally empowered society, the Indian government introduced Digital India, a ground-breaking initiative [3-4]. This project aims to improve digital literacy and provide digital government services while giving every person access to digital infrastructure and connection. Furthermore, the goal of the Digital India programme is to encourage the use of technological advancements across a range of industries, such as banking services, retail, higher education, healthcare, and agriculture [5-9].

The programme faces obstacles in areas including internet uptake, availability, and the requirement for an innovation-driven environment, despite its potential futuristic advancements [1]. In order to improve the health system through workforce capacity building and the use of health data, India is piloting the National Digital Health Mission [10]. In addition, the Digital India initiative faces obstacles such as cybercrime, digital instruments, and infrastructure in addition to offering prospects for economic and technological progress [11-12]. The breadth and difficulties of the programme are thoroughly examined, with a focus on its benefits—such as the elimination of paperwork and the integration of government services—as highlighted [13]. With the help of this programme, society should flourish quickly and there will be a lot of jobs in the IT and electronics manufacturing sectors. Its ultimate goal is to provide intelligent e-governance, digital services that are available anytime, well-equipped digital infrastructure, and digital citizen empowerment. A schematic framework that

combines the purpose of Digital India, its administrative organization, approach, and structural pillars is offered. The article further elaborates on the plan's state-of-the-art and outlines its features from fifteen distinct angles [1].

As an objective process, digitalization affects every aspect of the socioeconomic structure. Contemporary information technologies have a profound impact on society and the economy, transforming both the existing economic system and people's daily lives. According to McKinsey Global Institute (MGI), with every second person on the planet having access to the Internet, the digital revolution has reached a turning point. The 2017 Report on the New Digital Economy and Development by UNCTAD recognizes the difficulties in estimating the contribution of digital growth to development because of its dynamic nature and intricate web of interconnected areas impacted by the expansion of the ICT industry. Nonetheless, the study looks at a wide range of effect areas, including employment, economic performance, innovation (including R and D), privacy and security, health, education, and citizen, individual, and community engagement, as well as the environment.

Numerous research works have explored the incorporation of digital work in government environments. According to [14] research, the use of digital standardization systems, such as personnel and documentary management systems, greatly improves public servant productivity and communication. [15] stressed the need for Russian civil personnel to acquire digital competency, especially in light of the country's transition to a digital economy. The difficulties in integrating digital skills in the Indonesian public sector were examined by [16]. The research emphasized how important it is to improve technology infrastructure and change work practices

***Correspondence to:** Saurabh Sharma, E-mail: saurabhmrts@gmail.com; Tel: +91 7355733393

Citation: Saurabh Sharma, Jha KK, Thangjam B. 2023. Digital transformation in India: Perspectives, challenges, and future. *Res. Jr. Agril. Sci.* 15(1): 31-37.

in order to enable successful integration. Ortiz-Bejar [17], focusing on Mexico, described in detail the development and application of an electronic government platform. This study focused on issues including transparency and data interoperability. When taken as a whole, these studies demonstrate the vital role that digital work plays in government operations and the constant need for advancement and development in this field. [14] emphasized that the European Union is aggressively promoting digital sovereignty through the Gaia-X initiative, which is being led by Germany and France. An important step towards enhancing the region's digital capabilities is this programmed.

Challenges faced by digital India

Despite to ambitious goal, Digital India still has a number of obstacles to overcome before it can reach its full potential [18-21]. The digital gap is one of the main issues since a substantial section of the Indian population still does not have access to basic digital infrastructure and connectivity. Their capacity to use digital services and engage fully in the digital economy is hampered as a result [22-26]. The problem of digital literacy is an additional challenge. The problem of digital literacy is an additional challenge. Inadequate digital literacy could make it difficult for people to use digital goods and services efficiently, which would be detrimental to the success of the Digital India project as a whole [20-23], [28]. It is imperative to address digital literacy as it is a critical requirement for the use of digital products. In rural areas, Digital India presents a variety of difficulties. [29] draws attention to how the provision of government services is hampered by a lack of online infrastructure and internet connectivity. In addition to highlighting the digital divide between urban and rural areas, [30] offers examples of effective

digital technology-enabled governance projects in Gujarat's Sabarkantha district. [31] challenges the notion that e-governance requires ubiquitous digital literacy, arguing that the goals of the Digital India Programme can be achieved even in the absence of this requirement. [32] highlights how digital transformation can benefit rural India, especially when it comes to granting access to public services and programme. Further research is necessary to determine the causes of marginalized citizens' poor use of digital resources. All of these studies highlight how important it is to have better internet access, integrate digital technology into government, and look into other ways to help rural India become more digitally inclusive [18-19].

Digital India growth prospects and key points

The government's extensive Digital India initiative is to make India a digitally empowered nation [30]. Infrastructure development, digital literacy, digital services, and digital entrepreneurship are some of the major topics that the programme works on [33]. The Indian government's goal with the Digital India programme is to close the digital divide, advance digital inclusion, and provide internet services to all residents, particularly those living in rural regions [5], [7], [34-35]. The Digital India programme creates avenues for innovation, entrepreneurship, and economic growth by granting access to digital infrastructure and encouraging digital literacy. Additionally, it makes it easier for public services to be delivered in a transparent and efficient manner, which enhances governance and raises citizen participation. In addition, the digitization of government services facilitates resource optimization and cost reductions, which improves the distribution of funding for vital public initiatives. Potential growth areas and possibilities in Digital India include:

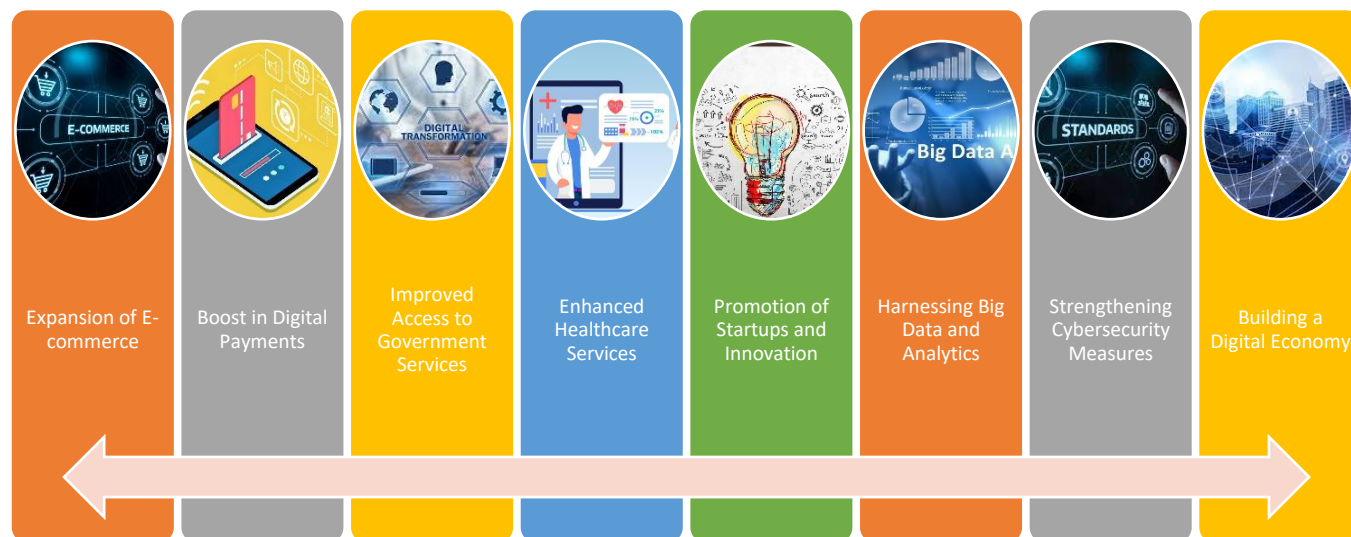


Fig 1 Digital India growth prospects and key points

1. *Expansion of e-commerce:* The Indian e-commerce industry has a great deal of room to grow owing to rising digital literacy and connection. In addition to increasing customer access to a greater choice of goods and services, this may result in an increase in online businesses and job possibilities.
2. *Boost in digital payments:* A notable rise in digital payments has been brought about by the government's encouragement of digital transactions and the execution of programme like the Unified Payments Interface. Fintech firms and online payment systems now have more room to

expand and develop in the Indian industry. Adoption of Digital Education: Now that the pandemic has brought attention to the value of digital education, there is a stronger focus on the potential for the expansion and improvement of digital education platforms in India.

3. *Increase access to government services:* By digitizing government functions, people can now use the internet to obtain a range of services, including welfare programme access, bill payment, and document applications. This lowers corruption and bureaucratic barriers in addition to making it more convenient for the populace.

4. *Enhanced healthcare services:* India's digital revolution holds immense promise for expanding access to healthcare, particularly in rural and isolated areas. Electronic prescriptions, remote consultations, and the provision of healthcare services to underprivileged areas can all be made possible by digital platforms and telemedicine products.
5. *Promotion startups and innovation:* India now has a flourishing startup ecosystem as a result of the government's attempts to encourage innovation and entrepreneurship in the digital sector. These businesses have the ability to boost employment, promote technology across a range of industries, and stimulate economic growth. Increased e-commerce, increased digital payments, digital education acceptance, better access to government services, better healthcare, and support for startups and innovation are all examples of the opportunities and potential growth in Digital India.
6. *Harnessing big data and analytics:* India is becoming more and more connected, and this has led to the generation of a large amount of data. Numerous industries, including business, healthcare, agriculture, and urban planning, can benefit from the utilization and analysis of this data in order to make well-informed decisions.
7. *Strengthens cybersecurity measures:* Robust cybersecurity measures are increasingly necessary as India grows more digitally connected. Cyber dangers must be avoided, sensitive data must be safeguarded, and digital infrastructure must be secured.
8. *Building a digital economy:* By opening up new business opportunities, drawing in foreign investment, and providing jobs for young people, India's digital revolution has the potential to accelerate economic growth.

In general, Digital India offers a plethora of prospects and growth potential. These consist of encouraging startups and innovation, leveraging big data and analytics, bolstering cybersecurity measures, developing a digital economy, and enhancing access to government services, e-commerce, and healthcare services. Conclusively, India's digitization initiatives hold the potential to revolutionize multiple economic areas, such as healthcare, education, finance, and governance. All things considered; India's growing digital environment offers a lot of potential for advancement. The expansion of e-commerce is one of the primary factors contributing to the opportunities and potential growth in Digital India. An increase in digital payments; the use of digital learning; and better access to public services Improved medical services Encouraging new businesses and creativity; Using analytics and big data; Boosting cybersecurity precautions.

The role of digitization in the agricultural economy

According to [33] agriculture in India has seen significant development and revolution due in large part to digitization. Digital technology has transformed agriculture, greatly boosting production and efficiency while also revolutionizing agricultural operations [36]. With the availability of real-time weather, soil, and market pricing, farmers can now make well-informed decisions on crop selection, irrigation methods, and marketing tactics [38-41]. Digital networks have also made it easier for farmers and customers to communicate directly, cutting out middlemen and

guaranteeing fair prices for agricultural goods. [39] Furthermore, digitization has made it possible to apply precision agricultural methods that minimize environmental effect and optimize resource allocation, such data analytics and remote sensing. Additionally, digitization has been instrumental in improving farmers' access to financial services.

Through digital platforms, they can now readily obtain loans and insurance, doing away with the need for laborious paperwork and shortening processing times [34-44]. All things considered, digitalization has fundamentally changed India's agricultural industry by providing farmers with the knowledge and resources they need to boost production and make wise decisions [42-46], and eventually enhance their standard of living [47]. It is impossible to overstate the effect of digitalization on India's agricultural industry. It has the capacity to completely transform the industry by providing farmers with information, increasing production, and eventually enhancing their standard of living. In addition to increasing agricultural productivity in India, digitization has promoted a more just and sustainable agricultural economy [43-47], [48].

The benefits of agricultural digitization: Increased efficiency and sustainability

For agricultural enterprises, digital agriculture offers a host of advantages, including better farm productivity, more transparent markets, and more affordable logistics [43] Farmers may use digital technology to get up-to-date information on market trends and demand, which helps them plan their production and marketing plans [7], [5], [49]. By guaranteeing that resources are distributed efficiently and cutting down on waste, this raises agricultural productivity overall. Furthermore, precision agricultural methods that optimize resource usage and reduce environmental impact—like remote sensing and variable rate input application—are made possible by digital technology for farmers [45]. Overall, digital agricultural adoption in India has a lot of potential to alter the industry and provide farmers with the skills, resources, and chances they need to prosper in a world that is becoming more and more digital. India's agricultural industry may undergo a transformation thanks to digitization, which will increase farmer income and reduce damage [47].

Key challenges in implementing digital India

The execution of digital India encounters several critical obstacles, specifically in remote area. One of the requirements is the growth of a comprehensive digital literacy framework that encompasses many literacies and is specifically designed for low-resource environments especially rural region [50-51]. The programme necessitates efficient collaboration among diverse government ministries and divisions, along with the establishment of instantaneous IT platforms for endeavors like digital health [52]. Furthermore, the programme encounters obstacles in remote regions, such as the absence of internet access and online infrastructure [29]. These problems emphasize the need of customized approaches to tackle the distinct requirements of diverse people and areas. The adoption of digital payments in rural India is impeded by issues such as restricted choices for electronic transactions, insufficient knowledge, and limitations of point-of-sale transactions [28], [46]. The digital India programme encounters obstacles in some rural regions, such as the Karunabari block in Assam, where the absence of digital infrastructure and internet access poses a significant issue [29]. Notwithstanding these obstacles, the programme presents opportunities for substantial advancements and prospective development. While challenges persist, the Digital India program's comprehensive approach aims to bridge

the digital divide and create an inclusive digital ecosystem. Ongoing efforts to address infrastructure gaps, promote digital literacy, and tailor solutions to the unique needs of rural communities can contribute to overcoming obstacles and realizing the program's potential for substantial advancements and development.

Barriers in digital transformation

The barriers to digital transformation in various sectors, including higher education and business, are well-documented. [49] highlight the challenges faced in these areas, such as technical, logistical, and pedagogical issues in education, and the need for multi-actor coordination and understanding of digital information economics in business. Further emphasizes the complexity of the digital transformation process and the need for strategic design. Comprehensive taxonomy of these barriers, including organizational, technological, and human factors. These studies collectively underscore the need for a holistic approach to overcoming barriers in digital transformation, encompassing both technical and human elements.

A range of challenges, issues, barriers, and problems have been identified in the literature on digital transformation. Emphasizes the complexity of the process, while provides a taxonomy of barriers and a specific focus on the manufacturing industry. [52] further highlights the dilemmas faced by managers in this context, proposing a decision support guide to address these challenges. These studies collectively underscore the multifaceted nature of the obstacles to successful digital transformation. The digital transformation in India, particularly in the retail sector, has been accelerated by the COVID-19 pandemic, leading to a shift from traditional to modern technology [53]. However, the implementation of the Digital India program faces challenges such as gaps in initial investment planning and the need for effective methods to address these challenges [33]. The digitalization initiative in India, while offering opportunities, also presents challenges such as the lack of a legal framework and data protection laws. In the digital health sector, India's progress is recognized globally, with a focus on workforce capacity building and the use of health data for research and development [10].

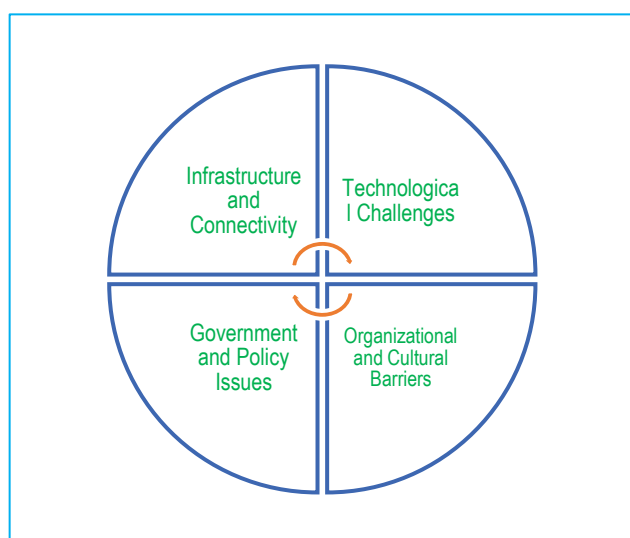


Fig 2 Barriers in digital transformation

Future direction of digital India

The future direction of Digital India in the agricultural sector holds immense potential. With continued advancements in digital technologies and increased connectivity, there are

several areas where digitization can make a significant impact [42-48]. The Digital India initiative by the Government of India aims to create a robust digital ecosystem that fosters innovation, entrepreneurship, and better citizen services [30]. This initiative is designed to transform India into a global digitized hub by reviving the digital sector, improving digital connectivity, and enhancing digital skills [54]. It focuses on restructuring existing schemes to transform the country into a digitally empowered society and knowledge economy through infrastructural reforms, such as providing high-speed internet in all gram panchayats and ensuring lifelong digital identification for all citizens [3]. Furthermore, the initiative aims to promote SME/MSME sectors for inclusive and sustainable digital economic growth through the Open Network for Digital Commerce (ONDC) infrastructure [55].

The "Digital India" initiative has also led to the acceleration of digital payment adoption in India, particularly after the demonetization in 2016, which resulted in the low circulation of cash in the economy [56]. Additionally, it has opened new avenues of innovation to promote the digital economy, positioning India as the third largest startup entrepreneurial ecosystem in the world [57]. The initiative has also played a crucial role in addressing equity issues in the digital health sector, providing opportunities for improving service quality, efficiency, and equity in access to care [24] and has been instrumental in the digitalization of diabetes care in India [20]. However, the initiative has faced challenges, such as the digital divide, which has been exacerbated by the lack of awareness of appropriate solutions for digital connectivity in India [58]. The COVID-19 pandemic further highlighted the importance of digital tools for vaccine allocation and registration, while also exposing the disruption in children's education due to the lack of access to digital education and school closures [59-61].

Action taken by digital India

To ensure the success of the "Digital India" initiative, several actions have been taken to promote digital entrepreneurship, innovation, and economic growth. The government has launched the Open Network for Digital Commerce (ONDC) infrastructure to promote the growth of small and medium-sized enterprises (SMEs) and micro, small, and medium enterprises (MSMEs) for inclusive and sustainable digital economic growth [57]. Additionally, the implementation of digitalization has been emphasized, particularly in rural areas, to enhance the execution of different schemes and ensure the availability of resources [62]. Furthermore, the government has introduced initiatives such as Udyam registration and Zero Defect and Zero Effect (ZED) certification to make SMEs more competitive, sustainable, and transformative, thereby contributing to a digital connective ecosystem [59]. The success of Digital India also hinges on the adoption of digital payment infrastructure and digital banking channels. Critical success factors, such as integrated cultural and organizational changes at the bank level, have been identified to improve digital banking acceptance in India [63-65]. Achieving widespread acceptance of digital banking in India requires a holistic approach that considers cultural nuances, organizational readiness, technology infrastructure, and customer education.

Moreover, the government has aimed to increase the share of the manufacturing sector in the country's GDP to 25% by 2025, as part of the "Make in India" initiative, which is crucial for the success of the digital economy [64]. In addition, the government has focused on addressing challenges and opportunities in the IT transformation of public service delivery, emphasizing factors beyond technology for successful

digitization in the Indian context [65]. Furthermore, to ensure the success of the initiative, governments need to fulfill the basic infrastructure needs of citizens, raise more revenue, construct clear regulatory frameworks, develop human capital, ensure digital inclusivity, and promote environmental sustainability [66]. The focus on creating a digital address program and the comprehensive set of initiatives demonstrate a commitment to positioning India as a leading nation in terms of advanced digital facilities and inclusive development.

The success of “Digital India” also relies on the development of a digital address program, which can position India as a leading nation in terms of developed and advanced facilities [65]. Moreover, the government has taken steps to foster the MSME ecosystem through digital technology, requiring joint buy-in from the government, solution providers, and users [66]. Additionally, the government has undertaken various projects and initiatives, such as Digital India, SWAN, BharatNet, and PM-WANI, to bridge the digital divide and improve rural internet connectivity [67]. These initiatives collectively reflect the government's commitment to leveraging technology for inclusive development. By focusing on digital

infrastructure, connectivity, and literacy, these projects aim to ensure that the benefits of the digital revolution reach even the remotest parts of the country. The successful implementation of these initiatives can empower individuals, drive economic growth, and enhance overall quality of life in rural areas.

CONCLUSION

The analysis provided proof of the impact of digitalization on the Indian economy. It has not been proven that the unemployment rate rises when users connect to broadband. Smartphone use has an impact on digital transactions and raises the financial system's openness and accountability. We reiterate the significance of financial literacy, which has the power to alter the course of development in developing nations like India. It's crucial to pay dedicated and consistent attention to each aspect of this program to ensure it doesn't fail. We all need to mentally prepare ourselves for the upcoming changes and be willing to tackle the challenges associated with implementing this policy. Only with this mindset can we turn this vision into a reality

LITERATURE CITED

1. Sharma R, Kumar A, Pandey P, Himanshu H, Gupta M, Kapur S, Jain AK. 2018. Krishikosh: A digital repository to disseminate agricultural knowledge. *The Indian Journal of Agricultural Sciences* 88(5): 757-765. <https://doi.org/10.56093/ijas.v88i5.80073>
2. Kumar S. 2019. Feasibility study of effective usage of available agricultural information system for various village boundaries of India. *Journal of Robotics and Mechanical Engineering Research* 3(2): 1-7. <https://doi.org/10.24218/jrmer.2019.30>
3. Kapur R. 2019. Digitalization of rural communities. *Acta Scientific Agriculture* 3(9): 159-164. <https://doi.org/10.31080/asag.2019.03.0627>
4. Dutta D, Sarma MK. 2021. Internet skills as an influencer for adoption of digital innovations in a technologically emerging nation: India. *Vilakshan - XIMB Journal of Management* 20(1): 25-41. <https://doi.org/10.1108/xjm-12-2020-0259>
5. Lazanyuk I, Modi S. 2021. Digitalization and Indian economy: Patterns and questions. *SHS Web of Conferences* 114: 01010. <https://doi.org/10.1051/shsconf/202111401010>
6. Kar A, Bhugra D, Mukherjee S, Mondal A, Kumar AS. 2020. Prep in India's hiv prevention policy in the era of social media and sex positivity. *Central Asian Journal of Global Health* 9(1): e407. <https://doi.org/10.5195/cajgh.2020.407>
7. Bhat V, Nagarkar J, Singh A. 2022. Prospects of digital currency in India- a way forward. *Cardiometry* 24: 486-497. <https://doi.org/10.18137/cardiometry.2022.24.486497>
8. Pal S, Thilaka N, Kayal S. 2022. Emerging power in industrialization: empowering India through entrepreneurship. *Journal of Liberty and International Affairs, Institute for Research and European Studies - Bitola* 8(3): 99-114. <https://doi.org/10.47305/jlia2283099p>
9. Mantri VA, Kavale MG, Kazi MA. 2019. Seaweed biodiversity of India: reviewing current knowledge to identify gaps, challenges, and opportunities. *Diversity* 12(1): 13. <https://doi.org/10.3390/d12010013>
10. Gudi N, Lakiang T, Pattanshetty S, Sarbadhikari SN, John O. 2021. Challenges and prospects in India's digital health journey. *Indian Journal of Public Health* 65(2): 209-212. https://doi.org/10.4103/ijph.IJPH_1446_20
11. Kedar MS. 2015. Digital India new way of innovating India digitally. *International Research Journal of Multidisciplinary Studies* 1(4): 34-49.
12. Mohanta G, Debasish SS, Nanda SK. 2017. A study on growth and prospect of digital India campaign. *Saudi Journal of Business and Management Studies* 2(7): 727-731.
13. Biswas AK. 2021. Digital India initiatives and online education system in India amidst Covid 19 pandemic. *Khazanah Pendidikan Islam* 3(3): 125-134.
14. Chiang L, Liao C. 2009. The influence of digital standardization on administrative efficiency in e-government: A view of standards development organizations. *Systems Research and Behavioral Science* 26: 455-468.
15. Vasilyeva EV, Pulyaeva VN, Yudina VA. 2018. Development of digital competencies of state civil servants of the Russian Federation. *Business Informatics* 4(46): 28-42. <https://doi.org/10.17323/1998-0663.2018.4.28.42>
16. Cahyarini B, Samsara L. 2021. The challenges of digital competency implementation towards world-class bureaucracy. *Journal Borneo Administrator* 17(2): 259-274. <https://doi.org/10.24258/jba.v17i2.825>
17. Ortiz-Bejar J, Mario R, Paternina A, Zamora-Mendez A, Lugnani L, Tellez E. 2022. Power system coherency assessment by the affinity propagation algorithm and distance correlation. *Sustainable Energy, Grids and Networks* 30: 100658.
18. Celeste E. 2020. Digital Sovereignty in the EU: Challenges and Future Perspectives. In: (Eds) F. Fabbrini, E. Celeste and J. Quinn. *Data Protection Beyond Borders: Transatlantic Perspectives on Extraterritoriality and Sovereignty*. Oxford: Hart Publishing. pp 211-228. <http://dx.doi.org/10.5040/9781509940691.ch-013>
19. Venkataramanan R, Pradhan A, Kumar A, Purushotham A, Alajlani M, Arvanitis TN. 2022. Digital inequalities in cancer care delivery in India: an overview of the current landscape and recommendations for large-scale adoption. *Frontiers in Digital Health* 4. <https://doi.org/10.3389/fdgth.2022.916342>

20. Shah SS, Patki SM. 2020. Getting traditionally rooted Indian leadership to embrace digital leadership: challenges and way forward with reference to Imx. *Leadership, Education, Personality: An Interdisciplinary Journal* 2(1): 29-40. <https://doi.org/10.1365/s42681-020-00013-2>
21. Norvadewi N, Zaroni AN, Rahmah F. 2021. Zakat management in the covid-19 pandemic era. *El Dinar* 9(2): 165-181. <https://doi.org/10.18860/ed.v9i2.13452>
22. Kodali PB. 2023. Achieving universal health coverage in low- and middle-income countries: challenges for policy post-pandemic and beyond. *Risk Management and Healthcare Policy* 16: 607-621. <https://doi.org/10.2147/rmhp.s366759>
23. Nugroho N. 2022. Systematic literature review: online learning during covid-19 pandemic. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature* 10(1): 120-134. <https://doi.org/10.24256/ideas.v10i1.2491>
24. Kesavadev J, Krishnan G, Mohan V. 2021. Digital health and diabetes: experience from India. *Therapeutic Advances in Endocrinology and Metabolism* 12: 145-157. <https://doi.org/10.1177/20420188211054676>
25. Bhattacharya S, Saleem SM, Hossain MM. 2022. Implementing national digital health blueprint in India-the future opportunities and challenges. *International Journal of Preventive Medicine* 13(1): 99. https://doi.org/10.4103/ijpvm.ijpvm_418_20
26. Sajid R, Ayub H, Malik BF, Ellahi A. 2023. The role of fintech on bank risk-taking: mediating role of bank's operating efficiency. *Human Behavior and Emerging Technologies* 2023: 1-11. <https://doi.org/10.1155/2023/7059307>
27. Hosseinzadeh P, Zareipour M, Baljani E, Moradali MR. 2022. Social consequences of the covid-19 pandemic. a systematic review. *Investigación Y Educación en Enfermería* 40(1): e10. <https://doi.org/10.17533/udea.iee.v40n1e10>
28. Bondre A, Pathare S, Naslund JA. 2021. Protecting mental health data privacy in India: The case of data linkage with Aadhaar. *Global Health: Science and Practice* 9(3): 467-480. <https://doi.org/10.9745/ghsp-d-20-00346>
29. Priyadarshi M, Maratha M, Anish M, Kumar V. 2023. Dynamic routing for efficient waste collection in resource constrained societies. *Scientific Reports* 13(1): 2365. <https://doi.org/10.1038/s41598-023-29593-x>
30. Pegu B. 2019. Challenges of digital India Programme in Karunabari block of Lakhimpur district of Assam. *In International Journal of Recent Technology and Engineering* 8(4): 2075-2078. <https://doi.org/10.35940/ijrte.d7648.118419>
31. Kumar M, Gupta S. 2020. Security perception of e-banking users in India: an analytical hierarchy process. *Banks and Bank Systems* 15(1): 11-20. [https://doi.org/10.21511/bbs.15\(1\).2020.02](https://doi.org/10.21511/bbs.15(1).2020.02)
32. Sood S, Saxena N. 2017. Moving beyond digital literacy and towards e-Governance in rural India. *In: Proceedings of the Special Collection on eGovernment Innovations in India*. ICEGOV '17: 10th International Conference on Theory and Practice of Electronic Governance. ACM. <https://doi.org/10.1145/3055219.3055243>
33. Singh J. 2019. Assessment of digital implementation in India and challenges. *International Journal of Digital Literacy and Digital Competence* 2: 37-53. IGI Global. <https://doi.org/10.4018/ijdlcd.2019040104>
34. Choudhuri B, Srivastava P, Gupta S, Kumar A, Bag S. 2022. Determinants of smart digital infrastructure diffusion for urban public services. *Journal of Global Information Management* 29(6): 1-27. <https://doi.org/10.4018/jgim.295976>
35. Almugari F, Bajaj P, Tabash MI, Khan A, Ali M. 2020. An examination of consumers' adoption of internet of things (iot) in Indian banks. *Cogent Business and Management* 7(1): 1809071. <https://doi.org/10.1080/23311975.2020.1809071>
36. Hulsen T. 2022. Data science in healthcare: covid-19 and beyond. *International Journal of Environmental Research and Public Health* 19(6): 3499. <https://doi.org/10.3390/ijerph19063499>
33. Borrero JD, Mariscal J. 2022. A case study of a digital data platform for the agricultural sector: a valuable decision support system for small farmers. *Agriculture* 12(6): 767. <https://doi.org/10.3390/agriculture12060767>
34. Johnson JL, Saxena A. 2023. On critical proximity: distance, difference, and digital sociality. *Journal of Political Ecology* 29(1): 741-761. <https://doi.org/10.2458/jpe.4783>
35. Balkrishna A, Sharma J, Sharma H, Mishra S, Singh S, Verma SK, Arya V. 2020. Agricultural mobile apps used in India: current status and gap analysis. *Agricultural Science Digest* 41(1): 1-12. doi: 10.18805/ag.D-5140.
36. Siwach J, Kumar A. 2015. Vision of digital India: dreams come true. *IOSR Journal of Economics and Finance* 6(4): 66-71.
37. Râjeswari S, Suthendran K. 2019. Developing an agricultural product price prediction model using hadt algorithm. *International Journal of Engineering and Advanced Technology* 9(1s4): 569-575. <https://doi.org/10.35940/ijeat.a1126.1291s419>
38. Abirami T, Bhuvaneswari B. 2019. Energy efficient wireless sensor network for precision agriculture. *International Journal of Scientific Research in Science, Engineering and Technology* 6(2): 98-105. <https://doi.org/10.32628/ijrsrset196220>
39. Zhou Y, Hua S. 2022. Recommendation of business models for agriculture-related platforms based on deep learning. *Computational Intelligence and Neuroscience* 2022: 1-5. <https://doi.org/10.1155/2022/7330078>
40. Xie G, Wang L, Khan A. 2021. An assessment of social media usage patterns and social capital: empirical evidence from the agricultural systems of China. *Frontiers in Psychology* 12: 767367. <https://doi.org/10.3389/fpsyg.2021.767357>
41. Glotko AV, Polyakova A, Kuznetsova M, Kovalenko KE, Shichiyakh RA, Melnik MV. 2020. Main trends of government regulation of sectoral digitalization. *Entrepreneurship and Sustainability Issues* 7(3): 2181-2195. [https://doi.org/10.9770/jesi.2020.7.3\(48\)](https://doi.org/10.9770/jesi.2020.7.3(48))
42. Mohanta TK, Mohanta YK, Yadav D, Hashem A, Al-Harrasi A. 2020. Global trends in phytohormone research: Google trends analysis revealed african countries have higher demand for phytohormone information. *Plants* 9(9): 1248. <https://doi.org/10.3390/plants9091248>
43. Bhattacharjee A, Anadón JD, Lohman DJ, Doleck T, Lakhankar T, Shrestha BB, Krakauer NY. 2017. The impact of climate change on biodiversity in nepal: current knowledge, lacunae, and opportunities. *Climate* 5(4): 80. <https://doi.org/10.3390/cli5040080>
44. Gautam RS, Bhimavarapu VM, Rastogi S. 2021. Impact of digitalization on the farmers in India: Evidence using panel data analysis. *International Journal of Management and Humanities* 6(1): 5-12. <https://doi.org/10.35940/ijmh.11372.0851221>
45. Ghosh S, Hari V, Sharma T, Karmakar S, Kasiviswanathan KS, Dhanesh Y, Gunthe SS. 2016. Indian summer monsoon rainfall: Implications of contrasting trends in the spatial variability of means and extremes. *Plos One* 11(7): e0158670. <https://doi.org/10.1371/journal.pone.0158670>

46. Das NN, Andreadis KM, Ines AVM. 2019. Monitoring and forecasting of seasonal rice crop productivity for paddy dominated regions of India. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* 42(3/W6): 201-209. <https://doi.org/10.5194/isprs-archives-xlii-3-w6-201-2019>
47. Sharma A, Chattopadhyay S. 2021. Rescaled range analysis and conditional probability-based probe into the intrinsic pattern of rainfall over north mountainous India. *Journal of Water and Climate Change* 12(8): 3675-3687. <https://doi.org/10.2166/wcc.2021.232>
48. Nedungadi PP, Menon R, Gutjahr G, Erickson L, Raman R. 2018. Towards an inclusive digital literacy framework for digital India. *Education + Training* 60: 516-528. <https://doi.org/10.1108/ET-03-2018-0061>
49. Agarwal T. 2021. Digital India: Opportunities and challenges including in context of COVID-19. *International Journal for Research in Applied Science and Engineering Technology* 9: 1480-1485.
50. Kalyvaki M, Bacimanova N. 2023. Overcoming barriers to digital transformation of higher education. In: Competitiveness and Innovation in the Knowledge Economy. 26th International Scientific Conference "Competitiveness and Innovation in the Knowledge Economy". *Academy of Economic Studies of Moldova*. <https://doi.org/10.53486/cike2022.20>
51. Ciara H, Power DJ. 2018. Challenges for digital transformation – towards a conceptual decision support guide for managers. *Journal of Decision Systems* 27(Sup 1): 38-45. DOI: 10.1080/12460125.2018.1468697
52. Jain A, Pande M. 2022. Challenges and solution of digitalization in retail sector of India during COVID-19. *Cardiometry* 25: 521-527. <https://doi.org/10.18137/cardiometry.2022.25.521527>
53. Subramanyachary P, Raja Sekhar BM. 2021. Digitalization in India: opportunities and challenges. *Journal of Management and Science* 11(4): 20-23. <https://doi.org/10.26524/ms.11.37>
54. Mahesh KM, Aithal P, Sharma K. 2022. Open network for digital commerce -ondc (e-commerce) infrastructure: to promote sme/ msme sector for inclusive and sustainable digital economic growth. *International Journal of Management Technology and Social Sciences* 7(2): 320-340. <https://doi.org/10.47992/ijmts.2581.6012.0223>
55. Jain N, Raman T. 2021. A partial least squares approach to digital finance adoption. *Journal of Financial Services Marketing* 27(4): 308-321. <https://doi.org/10.1057/s41264-021-00127-8>
56. Mahesh K, Aithal P, Sharma K. 2023. Government initiatives and digital innovation for Atma Nirbhar MSMEs/SMEs: To achieve sustainable and inclusive economic growth. *International Journal of Management Technology and Social Sciences* 8(1): 68-82. <https://doi.org/10.47992/ijmts.2581.6012.0256>
57. Kumar S, Ihita G, Chaudhari S, Paventhan A. 2022. A survey on rural internet connectivity in India. <https://doi.org/10.1109/comsnets53615.2022.9668358>
58. Dhalaria P, Arora H, Singh A, Mathur M, Kumar AS. 2022. Covid-19 vaccine hesitancy and vaccination coverage in India: an exploratory analysis. *Vaccines* 10(5): 739. <https://doi.org/10.3390/vaccines10050739>
59. Sandhu D, Barn R. 2022. The internet is keeping me from dying from boredom: Understanding the management and social construction of the self through middle-class Indian children's engagement with digital technologies during the covid-19 lockdown. *International Journal on Child Maltreatment Research Policy and Practice* 6(3): 489-504. <https://doi.org/10.1007/s42448-022-00135-8>
60. Ahmed S, Sur S. 2021. Effects of demonetization, GST and AMP; Covid-19 pandemic in the adoption of digitalization by rural MSMEs in India. *NMIMs Management Review* 29(03): 32-58. <https://doi.org/10.53908/nmmr.290302>
61. Singh N, Sahu G, Rana N, Patil P, Gupta B. 2018. Critical success factors of the digital payment infrastructure for developing economies. *IFIP Advances in Information and Communication Technology* 533: 113-125. https://doi.org/10.1007/978-3-030-04315-5_9
62. Kaur S, Ali L, Hassan M. 2021. Adoption of digital banking channels in an emerging economy: exploring the role of in-branch efforts. *Journal of Financial Services Marketing* 26(2): 107-121. <https://doi.org/10.1057/s41264-020-00082-w>
63. Gandhi J, Thanki S, Thakkar J. 2021. An investigation and implementation framework of lean green and six sigma (lg and amp; ss) strategies for the manufacturing industry in India. *The TQM Journal* 33(8): 1705-1734. <https://doi.org/10.1108/tqm-12-2020-0289>
64. Sinha S, Mukhopadhyay S, Upadhyay P, Dwivedi Y, Bhattacharyya S, Paul M, Bhattacharyy A. 2023. Challenges and opportunities in its transformation of public service delivery: case of India post. *Transforming Government People Process and Policy* 17(1): 134-146. <https://doi.org/10.1108/tg-04-2022-0053>
65. Tan S, Taeihagh A. 2020. Smart city governance in developing countries: a systematic literature review. *Sustainability* 12(3): 899. <https://doi.org/10.3390/su12030899>
66. Kumar H, Singh M, Gupta M, Madaan J. 2017. Digitized residential address system: a necessity towards the faster service delivery and smart cities development in India. In: Kar A. *et al.* Digital Nations – Smart Cities, Innovation, and Sustainability. I3E 2017. *Lecture Notes in Computer Science* Vol 10595. Springer, Cham. https://doi.org/10.1007/978-3-319-68557-1_38
67. Buteau S. 2021. Roadmap for digital technology to foster India's MSME ecosystem—opportunities and challenges. *CSI Transactions on ICT* 9(4): 233-244. <https://doi.org/10.1007/s40012-021-00345-4>