7. Creating The Digital Nation: The Role and Challenges of Digital Public Infrastructure in India

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Abstract:

The foundation of human progress has been public infrastructure. Infrastructure has been essential for enabling the movement of people, capital, and information since the nineteenth century's transcontinental railroads and the twentieth century's telecommunications. Developed on top of public infrastructure, democratic nations with mostly open markets have stimulated both private and public innovation, leading to significant value creation in their societies. Digital public infrastructure (DPI) describes the fundamental capabilities that serve as the foundation for creating digital services on a societal level. DPI serves as a bridge between sectoral applications (like social protection and e-commerce) and physical infrastructure (like broadband and data centers). Platforms and systems for digital payments, data exchange, and identification (ID) are the most prevalent forms of DPI.

Digital Public Infrastructure (DPI) includes technologies like identification (ID), payment, and data exchange that assist nations in providing essential services to their citizens. It has changed the way government's function, and this is also true in India. India's economic and social development will be greatly impacted by the recent wave of digital public infrastructure developments that have occurred there. The study has discussed about the concept and role of digital public infrastructure in India and also made an attempt to assess the challenges being involved in its effective implementation. It is determined that India's growing digital infrastructure makes it possible for its residents to get efficient, open, and responsible government services.

Keywords:

Digital Public Infrastructure, India, Economic Development, Impact, Challenges.

7.1 Introduction:

Over the last ten years, the digital economy has expanded at a rate never seen before in history, and data has changed from being a byproduct to being a more valuable asset.

A cash economy predominated in India until the first ten years of the new millennium. As per Reserve Bank of India (2012 report) only 6% of India's more than 10 million businesses have the necessary card payment infrastructure to take non-cash payments. It also estimated that each person only completed six non-cash transactions annually.

As the world economy rapidly transitions to an era powered by insights and information made possible by artificial intelligence (AI), digital public infrastructures have become a class of technological system that can serve as a platform for innovations in both public and private services. The idea of digital public infrastructure, or DPI, is revolutionary and has the power to completely change socioeconomic development, governance, and service delivery. With nations like Singapore and India generating headlines due to their national initiatives, DPI has attracted a lot of attention recently. The topic is also becoming more popular in the emerging world, where digital transformation is viewed as a major force for advancement.

The foundations of these DPIs which include digital identity systems, open data platforms, e-governance portals, digital payments, and other tools—have been established by socioeconomic factors like swift digitalization, rising citizen expectations, greater financial inclusion, privacy concerns, and, most importantly, a changing legislative and regulatory landscape.

Because of digitization and data use, those who are already marginalized run the risk of experiencing increasingly more severe kinds of exclusion. All G20 members must consider the results obtained for citizens, the technological and policy conditions that are most effective in preventing exclusion, and the potential benefits of other members' advancements in order to guarantee inclusive digital services.

In a world growing increasingly digitally sophisticated while maintaining its immense diversity, India's growing digital skills stand out. The Indian government started the "Digital India" project to encourage the country's citizens to embrace digital technology more broadly and to increase the nation's economy through digital methods because of the country's substantial digital transformation and growing youth population.

The three fundamental DPIs—digital identity (Aadhar), real-time fast payment (UPI), and a platform for securely sharing personal data without compromising privacy (Account Aggregator built on the Data Empowerment Protection Architecture or DEPA)—were developed by India first through the India Stack (Roy, 2020). Each DPI layer adds substantial value and satisfies a specific need in every industry.

7.2 Conceptual Framework of Digital Public Infrastructure:

The idea of Digital Public Infrastructure (DPI) was not widely accepted until recently. Digital Public Infrastructure (DPI), under the leadership of India, has been defined as an infrastructure-based strategy that uses technology to accomplish societal goals through an ecosystem (comprising technology, markets, and governance) constructed in the public interest that leverages competitive private innovation within regulatory bounds. This description is based on examples from around the world as well as Indian experiences.

There are several key areas in which it deviates from our conventional conception of digital infrastructure, such as connection infrastructure for mobile networks or internet access. People, money, and information are all mediated by basic DPIs. The first is how people move via a digital identification system.

The second is how money moves through a quick, real-time payment system. Third, the flow of personal data via a consent-based data sharing mechanism to make the advantages of DPIs a reality and provide citizens a genuine control over their data.

A nation's digital infrastructure is anchored by its foundational DPIs. In order to enable smooth public service delivery and for companies to develop innovative solutions on top of the DPI layers, these layers interface with one another to form an ecosystem. As a result, Open Networks can be created in a way that has never been possible before. These open networks, which include the Open Credit Enablement Network, the Open Network for Digital Commerce, the Open Health Services Network (UHI), and many others, are now being developed in India. These open networks can be created for different sectors by integrating DPIs and producing network effects.

Three different kinds of institutions need to be established if India's DPI success is to turn into a global revolution. First and foremost, we require autonomous DPI steward organizations. Having a responsive and flexible governance framework is crucial. Instead of being dominated by one organization or group, a multiparty governance process carried out by independent DPI institutions will answer to a wide range of stakeholders.

Digital IDs, or government-recognized digital identification and authentication, are still not widely accessible despite being essential for digital interactions with businesses, governments, and other service providers, and consequently the digital economy in general. Their absence poses a serious obstacle because full participation in the digital economy depends on having a safe online means of proving one's identity. Digital identification can unlock economic value equal to 3–13 percent of GDP, according to one estimate (White et al. 2019).

More importantly, a digital ID that allows for safe online transactions, particularly via a mobile device, can help residents, small business owners, farmers, and low-income households in rural and isolated locations access more formal jobs, markets, and services.

As public and private services depend more and more on DPI, for instance, people who are unable to readily access or use digital tools—for a variety of reasons, including poverty, location, and disability—become invisible and are shut out of service delivery. The use of data and digitization raises the possibility of increasingly severe kinds of exclusion for those who are currently underserved.

7.3 Literature Review:

Raghavan, V., Jain, S., &Varma, P. (2019) discussed the India's approach to create the digital infrastructure as public goods, exemplified by the India Stack and Aadhaar. The authors also revealed that these platforms enable diverse use cases, lower transaction costs, and promote financial inclusion.

The study concluded that with around 161 countries developing similar digital ID systems and upgrading interbank payment systems, India's experience serves as a valuable model, showcasing principles that can guide global efforts despite varying local implementations.

Perannagari, K. T., & Gupta, V. (2022) highlighted the different activities and programs the Indian government has put in place to support the digital India aim. The authors also provide insight into current technical trends that have an impact on the growth of digital infrastructure and offer strategies to increase investments in digital infrastructure projects and encourage the use of the newest technology.

Ray, P. P. (2018, January) outlined the features of Digital India from fifteen distinct angles and elaborated on the plan's state-of-the-art, mentioning specific initiatives being implemented in the areas of agriculture, health, industries, commerce, governance, rural and social development, energy distribution, science and technology, transportation, sports, environment protection, education, communication, and citizen interaction. As per the research study Although the strategy presents a number of obstacles, it also provides encouraging advancements for the future.

Thomas, P. (2019) made an attempt to examine some of the concerns and aspects of India's quest for a transactional economy by focusing on a few examples, such as the government's nationwide Digital India initiative, apparent e-commerce industry consolidations, and cartographic concerns about Google Maps.

The study concluded that despite significant investments in initiatives that aimed at increasing India's digital footprint on many levels, it is evident that the government lacks the authority to regulate or suppress disruptive socialities on platforms like Facebook and WhatsApp that rely heavily on connectivities and socialities.

Banerjee, S. (2016) came to the conclusion that Aadhaar directly contributes to the development of digital infrastructure that enables social and economic exchange. Its importance as a means of identity suggests that people who were previously excluded can now be a part of various social programs.

As per the author the immediate benefit in raising teacher absenteeism or employee performance is still unknown. The study revealed that the entire potential of Aadhaar as a transformative instrument that can improve transparency must be realized by making it more widely available and relevant to both urban and rural populations, as well as the rich and the poor. Connectivity and transaction access issues with the Aadhaar server still exist and must be fixed.

Panagariya, A. (2022) in this article examined the two facets of India's surprisingly strong and rapidly expanding financial digitization. As per the study a large portion of this accomplishment can be attributed to the government's implementation of Aadhaar, a biometric identity.

Researcher also revealed that the financial transactions need conclusive evidence of the participants' identities, and Aadhaar through biometric verification without the need for a paper, significantly easing electronic transactions. The study also provides examples of entrepreneurship, both directly in the fintech area through the development of new web-based services and the emergence of new companies that utilize the developed fintech infrastructure.

7.4 The Reasons Behind the Adoption of DPI:

DPIs have been implemented in many nations worldwide to supply services in a variety of areas, hence the phenomenon is not limited to India. Verifiable digital identity systems like Nigeria's National ID or Bank Verification Numbers, Bangladesh's National ID, the Philippines' PhilSys, Rwanda's National Identity Agency (NIDA)-managed digital identity system, Saudi Arabia's Nafath digital identity management platform, Singapore's Singpass, and the United Arab Emirates' UAE-Pass are among them.

DPIs present economic prospects on a national and international scale. Users can pay merchants in different countries thanks to speedy payment systems like Singapore's PayNow and India's Unified Payments Interface (UPI), which facilitate quicker domestic and international transactions. Thus, by offering a fundamental digital structure, DPIs can help companies innovate and reach a wider audience.

➢ DPI's greatest strength is found in its capacity to enable all private sector participants to provide solutions (via interoperability), which will promote innovation and move development objectives closer to completion. The effectiveness of DPIs depends on cooperation between the public and commercial sectors.
➢ The establishment of a dependable and effective DPI ecosystem can be facilitated by continued cooperation between different parties, such as governments, businesses, and regulatory agencies.
➢ India has developed a population-scale, open, and interoperable DPI to meet its development goals. These include the provision of digital identification, the enhancement of financial inclusion, the facilitation of digital payments, the transformation of health, education, and skill development, and the vision of an open network for future digital commerce and urban mobility.
➢ With the advent of DPI, citizens now have online access to a variety of government services, ushering in an era of e-governance.
➢ Regardless of geography or socioeconomic status, DPI enables people and companies to engage in the digital economy.
➢ India's DPI programs, often known as the India Stack, have played a significant role in increasing output, increasing efficiency, and creating job possibilities.
➢ Innovation, financial inclusion, and worldwide connectivity are all facilitated by a strong digital infrastructure. It acts as a launching pad for companies and entrepreneurs.
➢ DPI is paving the road for a more accessible and fair future by revolutionizing healthcare through telemedicine and education through e-learning.

7.5 Impact of Digital Public Infrastructure:

Comparing digital infrastructure to more conventional infrastructure needs like power, water, and transportation, the former has become just as important, if not more so. In addition to upending the established order, the COVID-19 epidemic has fueled the growth of the world's digital infrastructure.

The economy and society of India have been significantly impacted by digital public infrastructure. Here are few areas where the impact is evident:

> Financial Inclusion: UPI's contributions to the advancement of financial inclusion in India have been substantial. By lowering the expense of managing cash and fostering financial awareness, UPI has facilitated access to digital financial services for the unbanked population.
> E-Government: By implementing e-governance programs like Direct Benefit Transfer (DBT), which has decreased corruption and welfare system leaks, the government has been able to use Aadhaar.Citizens now have the ability to construct a digital identity thanks to Aadhaar, which has improved the efficiency and transparency of government services.
> Efficiency for businesses: GSTN has made tax administration easier, lowering compliance costs for companies and increasing tax administration transparency. The GSTN has reduced the time and expense of compliance by enabling taxpayers to file returns online.
> Research and education: NKN has promoted innovation and knowledge exchange by facilitating resource sharing and collaboration amongst academic and research organizations. The speed of research and development has increased thanks to NKN, which has enabled researchers to work together and exchange resources and data.

7.6 Challenges in The Way of Effective Implementation of Digital Public Infrastructure:

Although India has benefited much from digital public infrastructure, these projects are not without difficulties and disputes. Here are a few of the main issues and disputes:

> Privacy issues: The Aadhaar program has come under fire for privacy issues. Critics contend that sensitive personal data gathered by Aadhaar may be exploited for identity theft and other nefarious purposes.
> Security risks: Due to reports of fraudulent transactions and security breaches, UPI has come under fire for security issues. The safety and dependability of digital payment systems have come under scrutiny due to UPI's security issues.
> Lack of availability of proper Infrastructure: Deficits in the fundamental mechanisms required for the efficient implementation and utilization of digital public infrastructure are referred to as infrastructure gaps. These disparities may hinder acceptance, scalability, and access, making it more difficult to accomplish the desired results.
> Shortage of Funds and Non-Sustainability: A sustainable methodology and substantial financial resources are needed to establish and maintain extensive digital public infrastructure.
> Lack of interoperability: The ability of various platforms, technologies, and systems to function together without any problems is known as interoperability. The successful deployment of digital public infrastructure is severely hampered by a lack of interoperability.

7.7 Navigating Challenges:

Initiatives for digital public infrastructure must be developed and implemented with effective administration. It is essential for the successful execution of digital public infrastructure projects because it fosters sustainability, efficiency, equity, and transparency.

The significance of digital technology in fostering social and economic growth is being increasingly acknowledged, despite the fact that India has encountered numerous obstacles in implementing digital public infrastructure projects. For India's future development, the ongoing creation and execution of digital public infrastructure projects is probably going to be crucial.

Collaboration is necessary to overcome the obstacles encountered when implementing digital public infrastructure projects. Collaboration between governmental administrations, private sector companies, and civil society groups is necessary to create and carry out successful digital public infrastructure projects.

When it comes to the creation and execution of digital public infrastructure projects, the private sector can be extremely important. The development of digital infrastructure and services can be supported by private sector organizations by utilizing their financial resources and technological know-how. The requirements of the public sector and the capabilities of the private sector can be better met through public-private partnerships, which can result in more efficient Sustainable digital public infrastructure initiatives.

7.8 Suggestions:

The DPIs have been primarily implemented by the government, but their success has also depended on the participation of numerous non-state actors, such as investors, entrepreneurs, industry associations, tech companies, policymakers, and civil society volunteer groups. Followings are some of the suggestions:

➢ The government, as the principal sponsor, and the numerous regulatory agencies must work together harmoniously and cooperatively for any DPI to be implemented successfully.
➢ The nation's DPI must be conceptualized by the government — with an appropriate legal architecture defining the responsibilities of regulators and other stakeholders — and funded to be established and sustained. The projects for digital public infrastructure need to be implemented effectively and efficiently. This means ensuring the technology is secure and reliable and that there are no technical glitches or errors throughout the implementation phase."
➢ Digital public infrastructure initiatives need to be inclusive and promote social justice. Policymakers need to be aware of the digital divide and address it in order to ensure that underrepresented groups have access to the digital infrastructure
➢ The stakeholder participation in shaping the regulatory framework must be ensured by the regulator. They will then be responsible for ensuring compliance with the framework and building trust in the DPI's activities.
➢ The business sector can make a considerable contribution by supporting public entities and companies in advancing implementation of digital technologies and ensuring that various pieces of infrastructure are functioning properly. Because to India's distinctive public-private model, many private companies, including fintechs, big tech such as Google and Facebook, technology service providers, and traditional banks, generated technology-driven use cases that were beneficial for their target clientele.

7.9 Conclusion:

Digital public infrastructure has been instrumental in improving the economy & society of India with research and education process, e-governance, financial inclusion, and boosting corporate efficiency and wholesome growth. Employing a DPI approach can accelerate the advancement of the SDGs by yielding significantly multiplied outcomes across industries and society. DPI can bend the development growth curve upward by integrating robust public and private innovation, governance frameworks, and affordable technology. However, establishing inclusive DPI requires continuous arrangement and support. This transition requires policy actions and investments, nationally and globally, to build the key technological-gov-local digital ecosystems needed —far beyond the passive, self-controlling, closed information systems and ecosystems which do not have a diverse enough stakeholder basis with the right capabilities and accountability to drive the new era of socioeconomic development at scale. But there are also drawbacks and disputes to digital public infrastructure, including privacy concerns, threats to security and implementation difficulties. And to ensure that digital public infrastructure initiatives are designed equitably and inclusively, there is an important role for administrators to play in understanding these potential risks and working to mitigate them in their respective programs and projects. This entails guaranteeing universal access to digital infrastructure, promoting digital literacy, and helping those deprived of digital devices or broadband connectivity.

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