
Digital Public Infrastructure, the Building Blocks for Digital Financial Inclusion and Taxation of the Digital Economy in Liberia.

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Abstract

The digital era presents remarkable opportunities for the digital transformation of economies and an all-inclusive financial system. However, for Liberia, these prospects seem out of reach. The harsh reality of inconsistent, duplicated, siloed, and fragmented e-government service delivery, combined with the scarcity of resources, looms significantly over the country's digital transformation ambitions. Despite the positive outcomes, such as the amendment of the National Electronic Payment Switch (NEPS), the digitalization of the Liberia Revenue Authority (LRA), e-Liberia service centre, coordination and empowerment of the National Identification Registry (NIR) and talks with N-Soft for governance digital solution over the years, the broader adoption of digital financial inclusion, and mobilization of tax revenue from the digital economy, remain a challenge for the government of Liberia. Nonetheless, Digital Public Infrastructure (DPI) has emerged as a ray of hope to make Liberia's digital transformation journey a reality. Based on a conceptual review and critical analysis of literature, policy documents, and briefs from international organizations, this study examines the impact of the government of Liberia's development and implementation of digital public infrastructure on digital financial inclusion and the taxation of the digital economy in Liberia. The outcome of the review reveals that a well-built, well-funded, secure, scalable, and interoperable digital public infrastructure layer, including digital ID, digital payments, and consent data exchange systems, will spur wider adoption of digital financial inclusion in Liberia and enhance the mobilization of domestic tax revenue from the digital economy. With DPI, Liberians can use a secure digital ID to open a bank account, connect payment systems to identity, and exchange verified data across service providers, thus accelerating digital financial inclusion in Liberia. In addition, linking digital ID, digital payments, and consent-based data sharing across the public and private sectors will boost tax compliance and enhance LRA capacity to collect lawful domestic tax revenue from the digital economy. Thus, by implementing an inclusive DPI, the government of Liberia can overcome some of its most entrenched challenges in its digital transformation journey, hindering the broader adoption of digital financial inclusion and the taxation of the digital economy in Liberia.

Keywords: Liberia, Digital Public Infrastructure, Digital identification(ID), Digital Payment system, Data exchange system, Digital economy, Taxation of Digital economy, Digital financial inclusion, e-government service, Liberia Revenue Authority, Liberia Digital Public Infrastructure, Liberia digital financial inclusion, Liberia e-government, digital ID and digital financial inclusion, digital payment system and digital financial inclusion, data exchange system and digital financial inclusion, Digital ID and taxation of the digital economy.

1. Introduction

In an era where digitization is rapidly transforming societies and economies, Liberia stands at a critical juncture in its digital transformation journey. With a young, vibrant population and increasing digital connectivity, Liberia has the potential to harness these digital transformation for economic growth and societal benefit through a broader adoption of digital financial inclusion and mobilization of domestic tax revenue from the digital economy (Adegoke, 2024). Digital technologies are now the backbone of modern societies, underpinning everything from financial services delivery to tax administration (Eaves et al., 2025). However, the Liberia's digital transformation is not holistic nor at societal scale, many of the critical e-government infrastructures are either unavailable, duplicated, siloed, remain fragmented or tied to government ministries or agencies (Eaves et al., 2025). Thus, the benefits of digitalization are not evenly distributed throughout the country which has led to costly inefficiencies, barriers to the broader adoption of digital financial inclusion, ineffective regulation of the digital economy, and difficulties for the Liberia Revenue Authority (LRA) to effectively tax the digital economy (Eaves et al., 2025).

At the heart of this digital evolution is digital public infrastructure (DPI), an approach to digital transformation focused on creating a digital building blocks designed to provide essential digital layers at societal scale that can be reused across government ministries, agencies, local governments and the private sector (Clarke et al., 2025; DCO, 2025; Dhiman et al., 2025b). Digital public infrastructure, enabled by digital identification, digital payment system and consent-based data exchange system, is here to make the government of Liberia digital transformation vision a reality. By leveraging on a secure, scalable, interoperable, and inclusive DPI digital ecosystem, the government of Liberia will be able to widen the nation's digital financial inclusion gaps and effectively generate tax revenue from the digital economy (UNDP, 2023; Eaves et al., 2025; Hadda et al., 2024). DPI will enable the government of Liberia to leapfrog existing traditional challenges and barriers in access to digital financial inclusion and mobilization of tax revenue from the digital economy (Adegoke, 2024; Hadda et al., 2024; Clarke et al., 2025).

As stated by Kanu (2025), the broader adoption of digital financial inclusion in Liberia is limited by inadequate digital public infrastructure (DPI). Thus, the success of a nationwide transition to digital financial inclusion is intrinsically linked to the availability and access to digital public infrastructure (Kanu, 2025; Morte-Nadal et al., 2025). Digital public infrastructure provides a powerful recipe to accelerate and expand digital financial inclusion in Liberia (Rabadan et al., 2025). As explained by Rabadan et al. (2025), the investment, development and adoption of DPI

layer will enables Liberians to use a secure digital ID to open bank accounts, authorize payments, and share verifiable data across digital financial services providers and the Central Bank of Liberia thus bolstering a wider adoption of digital financial inclusion (Rabadan et al., 2025).

As the digital economy continues to expand, traditional tax laws, principles and codes are struggling to keep up thus, presenting a new challenges for tax authorities to effectively and efficiently generate revenue from the digital economy (Mosquera et al., 2025; Abideen et al., 2025; Akapo et al., 2025). Conventional tax regulations and policies were designed for a physical, brick-and-mortar economy and not for the highly digitalized business models in the digital economy (Abideen et al., 2025; Akapo et al., 2025). Also, the intangibility and borderless nature of digital economy makes levying and collecting taxes on them a formidable task for the tax authorities including the Liberia Revenue Authority with inadequate digital capacity as well as resource constraints (Mpofu, 2022a; Mpofu, 2022b). Unfortunately, even international tax policy framework including the OECD's pillar one and two, UN model tax convention, African Tax Administration Forum's (ATAF) and national digital service taxes(DST) does address these challenges posed on the taxation of the digital economy (Mpofu, 2022a; Abideen et al., 2025; Akapo et al., 2025).

Consequently, the constant expansion of the digital economy poses a significant challenge for the low-income countries like Liberia to generate the right amount of domestic tax revenue from the digital economy (Mpofu, 2022a; Mpofu, 2022b). As acknowledged by Mpofu (2022a), identifying individuals and business in the digital economy, determining the scope of their business operation, tracing their revenue, gathering and verifying tax compliance information that leads to the determination of tax base and subsequent tax liability is complex and more challenging for taxing authorities in Africa with limited resources and digital technical capacity. For instance, Multinational Enterprises (MNEs) such as Instagram, Google, Facebook, and TikTok are generating sales revenue in Liberia and also some Liberians content creators and other small and medium size digital business generating sales from the digital economy with a minimal or zero tax revenue generated from them (Mpofu, 2022a).

According to DpiAfrica(2024b), evidence from India, Ghana, Estonia and Uganda suggests that digital public Infrastructure (DPI) can greatly simplify tax administration ,boost tax compliance, and enhance tax authorities capacity to generate lawful domestic tax revenue from the digital economy. Though, the LRA has made increasingly efforts to digitalize the tax administration, the government of Liberia investments, development and adoption of Digital Public Infrastructures (DPI), approach to digital transformations can significantly augment the Liberia Revenue Authority(LRA) ability to mobilized tax revenue from the digital economy to gross domestic product (Dpi Africa, 2024b; Dpi Africa, 2024c; Santoro et al., 2024; Kumar et al., 2025; Kumar, 2025). DPI will enhance tax enforcement by accurately identifying, verifying, and tracking taxpayers operating in the digital economy (Santoro et al., 2024; Dpi Africa, 2024b) Also, DPI has the potential to heighten tax compliance and identification of taxable income

through effective data sharing of digital payment system data (Santoro et al.,2024; Dpi Africa, 2024c).

Therefore, the existing challenges, inefficiencies, and missed opportunities for an all-inclusive impact of Liberia's digital transformation agenda can be eradicated by a shared digital public Infrastructure adoption to e-government service delivery (Eaves et al., 2025). Digital public Infrastructure will enhance digital financial inclusion and the Liberia Reveue Authority (LRA) technical and administrative capacity to tax Liberia's growing digital economy (Dpi Africa, 2024; Marskell et al., 2023). Thus, the government of Liberia, with portion of domestic tax revenue and support from donors, should develop a more intelligent scalable, interoperable digital public infrastructure layers that will benefit Liberians, heighten digital financial inclusion, and increase tax revenue generated from the digital economy.(Dpi Africa, 2024b; Marskell et al., 2023).

Nonetheless, it is worth noting that at the time of writing this study, global success on digital public infrastructure(DPI) remain uncertain, and evidence from early implementors, such as India, Estonia, Brazil, Ghana, Uganda, Kenya raises questions about governance, including self-preferencing, market distortions, data trust, privacy, cybersecurity, and government capacity in terms of financing and technical capabilities (Deshmukh et al., 2025; Morris, 2025; Sherman, 2024). In addition, the success of DPI depends on more than digital technologies. Political, as well as institutional factors, play a crucial role in transforming DPI prospects into meaningful impact on digital financial inclusion and an increase in revenue generated from the digital economy in Liberia(Deshmukh et al., 2025; Morris, 2025; Totolo, 2025).

This article highlights these nuances and through a conceptual review and analysis of literatures the digital public infrastructure concepts and its offers for Liberia digital financial inclusion journey and taxation of the digital economy. Its provides policy recommendation for effective implementation in Liberia, emphasizing that successful and sustainable uptake of DPI will depend on the government of Liberia seeing digitization not just as a technological advancement but as a foundational layer that enables interactions across government ministries, agencies, the privates sector, the Liberian citizens and cohesion with the overall digital economy.

Although past studies have researched the barriers to digital financial inclusion (Kanu, 2025; Nizam et al., 2025; Aziz et al., 2021; Arendse et al., 2024) and the challenges of taxing the digital economy and digitalization of tax administration (Mpofu et al., 2022; Mpofu, 2022a; OECD,2021; Mpofu, 2022b; Rizqiyanto et al., 2025), a key yet underexplored research in the literatures is the role of digital public infrastructures(DPI) as a foundational layer for digital financial inclusion and taxation of the digital economy using a low income economies context such as Liberia. Another distinguishing contribution of this study is based on the argument that digital public Infrastructure is an important nexus and a game changer for a wider adoption of digital financial inclusion and taxation of the digital economy in Liberia.

Hence, this paper aims to address the following **research questions (RQs)** to fill the research gap.

RQ 1: What are the foundational digital building blocks of digital public Infrastructure that bolsters digital financial inclusion and taxation of the digital economy ins Liberia?

RQ 2: How does the government of Liberia achieved a wider adopting of digital financial inclusion through the implementation of Digital Public Infrastructure(DPI).

RQ 3: How does Liberia Revenue Authority (LRA) leverage the Digital Public Infrastructure to tax the digital economy to increase domestic tax revenue?

This study is structured into six sections. Section one gives the study introduction, background, research gaps, research questions and the study contribution to scholarly literature- and then presents the conceptual framework analysis, through review, examine and analysis of academic literature on digital public infrastructures, digital financial inclusion , and taxation of the digital economy in section 2. The third section explains the country context Liberia including Liberia's digital financial inclusion, Liberia's tax administration (LRA), and digital public Infrastructure in Liberia. Section 4 talks about the research methodology employed to gather relevant literature upon which the evaluative review was carried out to produce insight to answer research question 1 to 3. Section 5 presents the results and discussion, while Section 6 provides the conclusion, recommendations of the study.

2. Review of Literature

The literature review section covered the review of literature on the study theme including digital public infrastructure (DPI), digital financial inclusion(DFI) and taxations of the digital economy.

2.1. Digital Public Infrastructures (DPI)

The Digital Public Infrastructure (DPI) concept, a system of e-government coordinated, shared, multi-use digital services, has gained significant traction since emerging as a priority area and a distinct approach to government-led digital transformation mechanisms during India's 2023 G20 presidency (Deshmukh et al., 2025; Dang et al., 2024). Since then, DPI has drawn the attention of global policymakers, international development organizations, and national governments to advance it globally. As a result, the United Nations, the World Bank, the US government, and other G20 members have all publicly recognized the potential of digital public infrastructure to bridge the digital divide and have made funding available to enable country-level DPI exploration and adoption (Deshmukh et al., 2025; Sang et al., 2025). Furthermore, the United Nations notes that digital public infrastructure can aid countries in achieving their national economic development agendas and also accelerate the achievement of sustainable development goals (Sang et al., 2025).

The Digital Public Infrastructure concept is straightforward yet transformative. Like water systems, energy grids, and road networks that connect one village, town, city, and country to another, DPI provides a shared, reusable foundational digital building block on which interoperability, efficiency, and innovation are built (Killian, 2025; Eaves et al., 2025; Degen et

al., 2024). As Killian (2025) stated, without digital public infrastructure, it is impossible to scale a country's digital transformation effectively, just as it is impossible to drive from one city to another without a road network. DPIs are built on modular software components, assembled and combined to create inclusive, resilient, and adaptable digital solutions that improve public service delivery (Killian, 2025; Eaves et al., 2025).

DPI seeks to transform not a specific government or private sector service but to provide a digitized version of critical societal functions, which include enabling individuals to digitally authenticate themselves through digital credentials, participate in digital payments, and exchange data (Rao et al., 2024; DCO, 2025; DpiAfrica, 2024b; Mazzucato et al., 2024). In that light, digital public infrastructure is understood to meet three fundamental needs, namely: digital identification, digital payments, and data sharing (Sang et al., 2025; Desai et al., 2024). In addition to interoperable components, DPI also encompasses broadband connectivity and governance through a regulatory framework embedded in the design of its fundamental components (Sang et al., 2025). Hence, what is DPI, and why does it matter for digital financial inclusion, taxation of the digital economy, and economic development?

2.1.1. Definition of Digital Public Infrastructures (DPI)

Fragmentation is costly! Most countries' governments have spent millions of dollars on digital transformation to catch up with the global digitization agenda. Nevertheless, many of these digital systems remain incompatible, leading to duplication, inefficiencies, and fiscal waste (Evas et al., 2025). In response, many governments in developing nations, such as Liberia, are shifting from fragmented digitalization to shared digital public infrastructures as a foundational and horizontal approach to digital transformation (Evas et al., 2025; OECD, 2024a).

Nonetheless, while global attention and funding are growing, the definition of DPI ambiguities remains a challenge among academics and international policymakers as of the date of this study. Several stakeholders, scholars, and policy makers have attempted to define digital public infrastructures(DPI), including G20, with varying and similar views, most of which stem from the India G20 meeting (Samdub,2025; NT,2024; DCO,2025; Sang et al., 2025; Marskell et al.,2025).

Based on the G20 digital economy Meeting in 2023,digital public infrastructure was defined as a "set of shared digital systems that should be secure and interoperable, and can be built on open standards and specifications to deliver and provide equitable access to public and/or private services at societal scale and are governed by applicable legal frameworks and enabling rules to drive development, inclusion, innovation, trust and competition and respect human rights and fundamental freedoms" (Samdub,2025; NT,2024; DCO,2025). Also, the United Nation(UN) Global Digital Compact describe DPI broadly as "resilient, safe, inclusive and interoperable digital public infrastructure that has the potential to deliver services and increase social and economic opportunities for all" (Samdub, 2025; NT,2024; DCO,2025). At the same time, Marskell et al. (2025) referred to DPI as the basic capabilities that serve as foundational building blocks for developing digital services at the societal level. Finally, digital public infrastructures

are described by Sang et al.(2025) as the road network on which digital products and services are built to enable access to a range of essential society-wide functions.

From the above definitions, one can infer that digital public infrastructures encompass several layers, such as the physical, digital, domain, and public services layers. These physical layers include internet connectivity infrastructure, data centers, and power supply. The digital layer, on the other hand, comprises digital ID systems, payment systems, and data-sharing platforms. At the same time, the domain layers entail the localization of digital ecosystems through sector-specific digital platforms. Finally, the public services layer includes digital financial services, making public and private service delivery more accessible, efficient, and secure.

2.1.2. Understanding the Digital Layers of Digital Public Infrastructures(DPI)

Though digital public infrastructure is assumed to be a core accelerator of the government's digital transformation journey, it does not exist in isolation (Clark et al., 2025; Mariani et al., 2024; CDPI, 2024). DPI is not just a single digital innovation, but rather a category of innovations that represents a paradigm shift in how governments identify the right digital products and services for their citizens (Mariani et al., 2024; CDPI, 2024). DPI encompasses transitioning from purchasing a series of specific digital solutions to implementing flexible, interoperable digital building blocks that can be easily integrated into various software applications and processes (Mariani et al., 2024). Digital public infrastructure enables novel ways of delivering services by creating innovative tools, such as all-in-one government service apps. (Mariani et al., 2024; Clark et al., 2025; Desai et al., 2023; Mehta et al., 2024). Thus, what are DPI digital layers?

The set of DPI digital layers that enables a holistic and efficient e-government services delivery is constantly evolving with various components since the concept emerged thus, there are different consensus in research documents on DPI digital layers (UNDP,2023; DCO,2025; Clark et al., 2025; NT,2024; OECD,2025; Eaves et al., 2025; Mariani et al., 2024).

For instance, UNDP (2023) listed four components of DPI —namely, digital identity, digital payments, consent-based data sharing, and others —while DCO (2025) states that DPI encompasses four layers —namely, the physical, digital, domain, and public service layers. The World Bank Group (WBG) believes that DPI layers include a digital identity system, a digital payments system, and data sharing. Drawing directly from the G20 playbook, Nt (2024) classified DPI layers into five major categories: verifiable identities and registries, data sharing, signature consent, discovery and fulfillment, and digital payments. Finally from OECD perspectives, based on the foundational needs of digital public infrastructure, DPI layers entails, DPI for security and trust encompassing digital identity and digital payments, DPI for data and information sharing which consist of an interoperable base registry and a data sharing system and DPI for communication referring to digital post, notification services and single digital gateway (OECD, 2024a).

The review and analysis of the above policy research documents revealed that the core DPI digital layers are digital identification systems, digital payment systems, and digital data sharing. Thus, in terms of scope, this paper will focus on policy research documents and literature on the foundational digital building blocks of DPI, including digital ID, digital payment systems, and data-sharing systems.

2.1.2.1 Digital Identification (ID)

Digital identity is a core component of digital public infrastructure that feeds into the other DPI layers (OECD, 2024a; Rossini, 2025). Digital Public Infrastructure approach: Digital identification (ID) provides individuals and businesses with a unique digital identifier that can be authenticated for easy access to digital financial services and tax compliance in the digital economy (OECD, 2024a; DCO, 2025; Rossini, 2025). Digital ID, by providing an authorized, verifiable, and scalable biometric identity, facilitates secure and efficient access to services across government and the private sector, and across borders, without tediously logging in to different government websites (OECD, 2024a; Mariani et al., 2024; DCO, 2025). A national digital biometric ID system allows both citizens and residents to verify their identities, which in turn enables them to participate in the digital economy fully and also provides ease of access to healthcare, employment, and education, as well as other government programs (OECD,2024a; Mariani et al., 2024; Rossini, 2025).

Digital ID is vital for the growing number of Gen Alpha and Gen Z demographics in the 21st century. Moreover, the

With approximately 850 million people worldwide without an official identification, another 1.25 billion deprived of a digitally verifiable identity and at least 3.3 billion of the global population lack access to a government-recognized digital identity which of cause is hindering their ability to access e-government and digital financial services online securely coupled with the estimates 2 billion people, representing 61% of the global workforce according to the International Labor Organization (ILO) working in the informal economy(Torkington,2024; World Bank,2021). A digital ID system is vital, especially in the growing Gen Alpha and Gen Z demographics in the 21st century.

Hence, with a DPI approach, digital ID enables data exchange by ensuring that individuals' and business records can be responsibly matched across different digital systems, such as health, the financial system, the digital tax system, social security, or education. Hence, a well-governed digital identity infrastructure can expand access to financial services, promote greater digital financial inclusion, enhance digital inclusivity among economically vulnerable and marginalized groups, and support economic opportunities and growth by increasing domestic revenue generation from the digital economy.

2.1.2.2 Digital Payment Infrastructure

The digital payments DPI layer facilitates the instant transfer of money between individuals, businesses, and governments (UNDP, 2023). Digital payments infrastructure provides a shared

digital network that enables private organizations, public agencies, and individuals to instantly pay bills, make purchases, send and receive money, anywhere, anytime, through a digital service provider or application (Mariani et al., 2024). Thus, transactions are not siloed by sector or subject to rent or data extraction by a dominant payments provider; rather, digital payments infrastructure is inclusive, facilitating competitive markets for users and last-mile providers (Mariani et al., 2024).

Globally, more than 1.4 billion adults remain unbanked, with no access to secure, regulated financial services (Mariani et al., 2024; Weforum, 2024). Hence, this financial exclusion creates a significant barrier to reaching the economically vulnerable and marginalized groups, primarily in developing and emerging economies, who reside in rural areas (Riverty, 2025). Thus, it limits their opportunities to participate in the broader economy.

Therefore, with secure and unique digital identity framework and interoperable base registries, unified and safe digital public infrastructure payment system digital financial services app, tax administration and digital financial service providers can plug into an open, interoperable instant payment system that will eliminate the barriers and challenges to broader adoption to digital financial inclusion as well as enable tax authorities to mobilized revenue from the digital economy.

2.1.2.3 Data Exchange Infrastructure

Based databases are authoritative sources of core data entities that are fundamental to government processes and services (OECD, 2019; OECD, 2024a). Data sharing systems form the backbone of digital public infrastructure, playing a crucial role in enabling efficient and effective public service delivery (OECD, 2019; Mariani et al., 2024). Data exchange systems enable governments to share data across multiple ministries, agencies, and the private sector, thereby reducing the need for individuals and businesses to repeatedly provide the same data (Mariani et al., 2024). The DPI data exchange layer enables seamless, secure, and consent-based data-sharing among governments, individuals, and businesses.

Thus, as explained by Mariani et al. (2024), with a data exchange system, citizens and private businesses do not have to re-enter their information multiple times to open a bank account, apply for a loan, obtain a tax identification number, or access other government services. A data exchange or sharing system does this by providing foundational building blocks for how data is formatted, authenticated, logged, validated, protected, and made available to various applications and other systems (OECD, 2024a; OECD, 2019; Mariani et al., 2024). For instance, central banks can use data exchange to share their payment records with tax authorities, national identity registrars, and the private sector, such as the financial services industry, through the national digital payment platform. Businesses can share data about the goods and services they administer to improve supply chain management.

Therefore, as put forward by the OECD (2019), a seamless data-sharing system, with appropriate safeguards such as a risk-based approach to privacy and security, is essential for creating one-

stop e-government service delivery and interoperability, thereby facilitating the implementation of the only principle to reduce inconsistent and disruptive administrative burdens. The DPI data-sharing system is essential for promoting innovative data-driven insights and enhancing the quality of e-government service delivery and potential partnerships between the public and private sectors (OECD, 2019).

2.1.2.4 Growing Evidence of DPI Globally

Digital Public Infrastructure represents a transformative shift in a country's approach to digital transformation. According to Marskell et al. (2025), the development and implementation of digital identity, digital payment systems, and data exchange infrastructures in any nation will facilitate government service delivery and efficiency, enable commerce and innovation, improve citizens' welfare, and support sustainable economic development.

DPI is far more predominant and widespread globally than it appears, and is widely heard and believed in academia and the international development arena. Across the globe, digital identity, digital payments, and data exchange infrastructures are thriving in both developed and developing economies, with unique and compelling narratives (Dpimap, 2025). Dpimap 2025's global state of digital public infrastructure states that it identified evidence of DPI across 210 countries in 2025, in their planning, rollout, or implementation phases. The survey results for these 210 countries show that 57 countries, representing 27% of the survey nations, have a digital ID with an automated mechanism in the rollout phase (Dpimap, 2025). While 93 of the 210 surveyed countries have an active digital payment system that enables real-time transactions operated by a government arm (Dpimap, 2025). Ranging from internal platforms facilitating data exchange within government ministries, agencies, and the private sector to share data crucial to government service delivery (Dpimap, 2024).

2.1.2.4 Global Status of Digital Identity

Globally, the approach to digital ID infrastructure is not homogeneous; some existing digital IDs are DPI-compatible, while others lack interoperability features (Dpimap, 2025; Sang et al., 2025). 80% of developed nations have implemented digital ID systems, but only 46% have fully rolled them out nationwide (Dpimap, 2025). Hence, the gap between emerging and developed economies is smaller in terms of digital ID. Developing and emerging economies have rollout rates of 5% and 20%, respectively. Countries in Europe and Asia have the most advanced digital ID programs, with the highest implementation rates, while many countries, including Liberia, are either in the pilot or planning phase. Many of Africa's digital public infrastructure initiatives are still in the embryonic phase.

2.1.2.5 Global Status of Digital Payment Systems

Digital payment systems worldwide vary from bank-only to mobile-only to digital currencies, or a mix of them. Interbank digital payment systems are the most prevalent real-time DPI payment systems, followed by cross-border payment systems, mobile money, and Central Bank digital currencies (DPIMAP, 2025). Payment systems in developing economies display 100% DPI

payment infrastructure, alongside countries in Latin America, the Caribbean, the Middle East, and Asia. While digital payment systems in Africa and Oceania are either in pilot or planning phases.

2.1.2.6 Global Status of the Data Exchange System

Concerning the third DPI pillar, data exchange systems, 90% of the surveyed countries were found to be managed by a unit associated with digital government, indicating a global perspective that positions data exchange as a component of digital public infrastructure (Dpimap, 2025). Of the 103 countries with an active exchange system, 61 disclosed information about the technical architecture their systems leverage. However, most countries' data exchange systems in Africa are still embryonic (Sange et al., 2025).

Therefore, the development and implementation of digital public infrastructure will increasingly impact how individuals and businesses access government services and participate in the digital economy. From digital ID systems to real-time payments and data exchange infrastructure, DPI is being rapidly adopted globally, often with ambitious goals around digital financial inclusion and tax compliance in the digital economy to spur economic growth.

2.2 *Digital Public Infrastructures: the Building Blocks for Digital Financial Inclusion.*

The poor, marginalized, and economically vulnerable groups living in rural areas in most fragile states lack access to reliable internet connectivity, proper identification documents, a secure data governance framework, and interoperable digital payment systems (DFI, 2024; Torkington, 2024). Which are existing barriers and challenges hindering the broader adoption of digital financial inclusion (Kanu, 2025; DFI, 2024; Torkington, 2024)? Hence, digital public infrastructure (DPI) has emerged as a powerful tool to drive digital financial inclusion in these fragile states (Dpi Africa, 2024a). DPI has the potential to improve the delivery of digital financial services to last-mile populations living in the most remote communities in fragile countries, thereby expanding the broader adoption of digital financial inclusion globally (Venkatesan et al., 2024; Hadda et al., 2024; DpiAfrica, 2024a).

DPI elements, such as national digital IDs, interoperable digital payment systems, and data sharing, will serve as the building blocks for the wider adoption of digital financial inclusion. For instance, a digital ID biometric system will speed up identity verification, which in turn will facilitate easier access to financial services (DCO, 2025). DPI can also facilitate seamless payments across devices, financial institutions, governments, and the private sector to accelerate digital financial inclusion for underserved and unserved communities (Torkington, 2024). Therefore, DPI implementation will help the government overcome existing challenges to broader digital financial inclusion.

2.2.1 Digital Financial Inclusion

Digitization has fundamentally transformed the global economic landscape, with particularly profound implications for the delivery of financial services to individuals and businesses in low-

income communities in developing and emerging economies (Yang et al., 2025; Claessens et al., 2020). This digital transformation has catalyzed the development of digital financial inclusion (DFI), an innovative approach to extending financial services to underserved and unserved individuals in low-income communities (Yang et al., 2025; Sandip et al., 2024). Digital financial inclusion has played an essential role in expanding access to and use of financial services for the unbanked and underserved populations in fragile states (Anakpo et al., 2023). Digital financial inclusion continued to impact individuals and businesses globally in meaningful ways (Arendse et al., 2024). As per the World Bank Global Index Report 2025 on “connectivity and financial inclusion in the Digital Economy”, 79% of the world's adults now have a bank account with a commercial bank, mobile money operators, or both, up from 74% in 2021 (Klapper et al., 2024). Nevertheless, despite the rapid growth and numerous benefits of digital financial inclusion, over 1.4 billion of the world's adult population remain unbanked, with no access to secure, regulated financial services (Blaney, 2025; Riverty, 2025). This global gap in financial inclusion creates a massive barrier to economic participation, limiting opportunities for economically vulnerable and less powerful communities worldwide (Blaney, 2025). Hence, as explained by Cook et al. (2024), Fragile nations, especially African countries like Liberia, are lagging behind non-fragile nations in measuring digital financial inclusion due to several barriers and challenges hindering widespread adoption in Fragile states (Rajuror et al., 2025). These barriers include inadequate digital public infrastructures (DPI), lack of KYC documentation requirements, internet connectivity, concerns over cybersecurity and fraud (Kanu, 2025; Anakpo et al., 2023; Arendse et al., 2024; Rabadan et al., 2025)

Thus, as stated by DPI Africa, the development and implementation of DPI can help overcome these barriers and entrenched challenges to a broad adoption of digital financial inclusion.

2.2.2 Bolstering Digital Financial Inclusion adoption through Digital Public Infrastructure

In the age of rapid digitization, access to formal financial services through digital means has become a fundamental right; yet, billions of individuals globally, primarily in fragile countries, remain excluded from this essential aspect of economic inclusivity (DFI, 2024; Torkington, 2024). The inability of the financially excluded group to establish a verifiable identity, access an interoperable digital payments system, and use other data-sharing public infrastructures poses a significant barrier to accessing digital financial services, thereby perpetuating a cycle of poverty and financial exclusion (DFI, 2024; Kanu, 2025).

However, amidst these challenges, a beacon of hope emerges in the form of digital public infrastructure, offering the digital layers to enhance a wider adoption of digital financial inclusion that will empower the underserved and financially excluded communities and grant them the fundamental right to participate in the financial system (DFI, 2024; Torkington, 2024; Kanu, 2025; Mehta et al., 2024). DPI infrastructure, including digital ID, digital payments, and data exchange, supports the acceleration of digital financial inclusion through its potential to reduce transaction costs, increase accessibility, simplify the process, and enhance user experience, thus significantly impacting digital financial inclusion (Torkington, 2024; Amagarat, 2025; BCA, 2024).

2.2.2.1 Digital Identity (ID): The Foundation for Digital Financial Inclusion

The failure to identify a segment of the population has adverse consequences on their ability to access digital financial services, with a subsequent effect on digital financial inclusion (Meira et al., 2024; Metz et al., 2024). Therefore, the advent of digital identification solutions, including biometric identification, digital Know Your Customer (KYC) processes, and the decentralization of identity systems, provides a recipe for expanding digital financial inclusion to marginalized and economically vulnerable groups in fragile countries (DFI, 2024; Cook et al., 2024). Digital identification infrastructures, by providing a secure and efficient means to establish and verify individual and business identities, play a pivotal role in enhancing access to digital financial services for the underserved and financially excluded population in fragile states (DpiAfrica, 2024a; DFI, 2024; DCO, 2025).

At the forefront of the emergence of digital ID is biometric identification, which leverages distinctive physical traits, such as fingerprints and facial recognition, to establish secure and reliable digital IDs (DFI, 2024a). In most fragile states, where traditional forms of identification and documents are scarce or unreliable, biometric identification offers a game-changing infrastructure to bridge the identity barrier to accessing digital financial services (DFI, 2024). Furthermore, biometric authentication enhances security and accuracy and, more importantly, ensures access to and use of digital financial services with ease and confidence, thereby bolstering the broader adoption of digital financial inclusion (DFI, 2024).

Digital KYC and decentralized digital identification systems also offer a promising avenue for streamlining identity verification and onboarding processes, thereby enhancing digital financial inclusion (DFI, 2024; Lureman-Norton, 2025). By digitizing the Know Your Client (KYC) process, commercial banks, mobile money operators, and other financial services providers can verify the identity of individuals and businesses remotely, without the need for paper documentation (DFI, 2024; Lureman-Norton, 2025; Zollmann et al., 2024). The digital KYC process will not only reduce the administrative burden on financial service providers but also empower poor, vulnerable, and marginalized groups in fragile states to access financial services without the constraints of physical proximity (DFI, 2024; Lureman-Norton, 2025). At the same time, a decentralized digital identification system would support users in establishing portable, interoperable identities that can be verified across different platforms and financial service providers (DFI, 2024). This fosters transparency, trust, privacy, and the individual's security, thus paving the way for greater digital financial inclusion.

Some countries have demonstrated a successful and scalable digital ID model. For example, the India Aadhaar platforms provides biometric IDs to over billions citizens and has significantly improves access to financial and government services (DCO,2025), Also, in Nigeria, the National Identification Number(NIN) initiatives expands the scope of digital ID by linking this government infrastructure to mobile phone registration thus, enabling millions of Nigerian in the rural areas access to digital financial services (Dpi Africa, 2025). Moreover, in Singapore, eKYC is facilitated by Singpass data exchange platforms, which reduce the time required to complete

digital transactions by 80% (Markskell et al., 2024). Finally, in Pakistan, digital ID-linked cash transfers increased cash control amongst women by 9% (Markskell et al., 2024).

2.2.2.2 Digital Payments: Bridging the Digital Financial Inclusion Divide

The payment system lies at the heart of every economic activity (Hariharan, 2025; Kane, 2023). Payment systems represent the veins that allow money to flow to where it is needed. Therefore, when payments are largely cash-based without a viable alternative, it creates a barrier for money to flow to where it is needed most, amongst the low-income group in fragile states, thus hindering their fundamental right to access to financial services (Hariharan, 2025; Kane, 2023; Meira et al., 2024).

Hence, without a frictionless, low-cost, and borderless alternative like a digital payment system, access to financial services for the poor and economically vulnerable becomes a bottleneck (Miller-Wise et al., 2025). Digital payment systems serve as an essential gateway to an array of digital financial services that bridge the digital financial inclusion divide (Saominen, 2025). Globally, the use of digital payments has expanded rapidly over the years, providing online payment transparency, speed, and security. Thus, the mass adoption of digital payments has created digital financial services such as mobile money, digital banking, and other fintech products, which have dramatically expanded access to financial services for the underserved and financially excluded population (Kanu, 2025; Saominen, 2025).

With a digital public infrastructure approach to digital payment systems and banking, the unbanked will no longer be a question of if but when (Mariani et al., 2024; Rivery, 2025; Weforum, 2024). Digital payments infrastructure is shifting the financial services landscape for the unbanked and underserved with a consistent, integrated, interoperability person to government, business to government, government to government, and business to business digital payments system, creating the foundational digital building blocks and momentum to make digital financial inclusion and taxation of the digital economy a default (OECD, 2025a; Rivery, 2025).

While digital payments are not new, a digital public infrastructure approach to them is distinct from existing forms of digital payments (Miller-Wise et al., 2025; Saominen, 2025). DPI enables digital payments, fosters inclusion and innovation, and provides unprecedented access to financial services, allowing for a diverse user experience and the potential to bridge the digital financial inclusion divide in fragile states (Miller-Wise et al., 2025; Saominen, 2025; Kanu, 2025). DPI approached to digital payments such as Person to Person (P2P), Person to Business (P2B), Business to Business (B2B), Government to Person (G2P) and Governments to Business (G2B) is promoting wider and broader adoption of digital financial inclusion at scale by providing a shared, scalable, interoperable foundational digital payment systems (Miller-Wise et al., 2025; Saominen, 2025; Kanu, 2025). A digital payment system powered by DPI fast-tracks the delivery of government benefits, improves access to digital financial services, and fosters the growth of national digital ecosystems — a recipe to bridge the digital divide (Miller-Wise et al., 2025; Saominen, 2025; Kanu, 2025).

As put forward by DPI Africa (2024), the DPI approach to digital payment systems is not only convenient but also a powerful tool for advancing digital financial inclusion, as well as economic empowerment and growth. Government-to-people (G2P), government-to-business (G2B), people-to-business (P2B), and people-to-people (P2P) digital payment systems have shown promising inroads toward digital financial inclusion (Lopez et al., 2023; Miller-Wise et al., 2025; CCAF, 2025).

According to Lopez et al. (2023), through government assistance programs such as social assistance and sectoral subsidies, the G2P digital payment system can act as a catalyst, bringing the underserved and unbanked populations into the formal financial system, thereby providing a gateway to advancing digital financial inclusion (Lopez et al., 2023). In addition, according to Miller-Wise et al. (2025) and Kane (2023), P2P and P2B payments not only enhance transaction efficiency but also reduce costs and drive digital financial inclusion. Finally, Jia et al.'s (2025) research also revealed that digital financial inclusion is positively associated with the use of P2P digital payment systems.

DPI-enabled digital payment systems are the fastest and most affordable path to digital financial inclusion (Hariharan, 2025). As digital payment infrastructure becomes more widespread, more people in low-income communities in fragile states can engage in e-commerce, save money, access insurance and credit, thus helping to reduce their poverty and improve their standards of living (DpiAfrica, 2024a). Indeed, digital payment systems hold immense power to transform access to financial services by enabling real-time convenience and greater outreach at low cost (Rabadan et al., 2025).

Nevertheless, when digital payment systems and digital ID are linked through interoperable capabilities, their combined potential for advancing digital financial inclusion is exponential (DCO, 2025; Rabadan et al., 2025). The integration of digital payments and digital identity moved beyond streamlining existing services, as it opened the door to entirely new digital solutions that make digital financial services more inclusive, secure, and accessible for everyone (DCO, 2025; Rabadan et al., 2025).

Evidence from DPI development and implementations from India, Singapore, Brazil, Kazakhstan, and Ghana illustrates that the integration between digital payment and digital ID spurred digital financial inclusion (Marskell et al., 2023; DpiAfrica, 2024a; Kamarun, 2025; Hadda et al., 2024; DCO, 2025; Sang et al., 2025).

India's Unified Payments Interface (UPI), a component of the India DPI Stack, has spurred innovation for digital financial inclusion in myriad ways. For instance, between 2017 and 2023, India's Aadhaar system expanded from 92 core transactions to 8,375, thereby increasing access to digital financial services, transforming the country's e-commerce ecosystem, and expanding digital financial services to underserved populations. Similar to the India UPI, the **Brazil Pix** is a DPI-based digital payment system launched in 2020, used by 93% of Brazilian adults across all income levels (Barreto, 2025). According to the Central Bank of Brazil, as of June 30, 2025,

159.9 million people have registered on the Pix platform (Germer, 2025; Barreto, 2025). Rather than relying solely on traditional banking records, fintechs and financial institutions use Pix transaction data to create more inclusive credit scoring models, enabling creditworthiness assessments based on real-time transaction behavior rather than historical patterns (Germer, 2025; Barreto, 2025). Hence, the Brazilian Pix is not only reshaping the payments ecosystem but also fueling digital financial inclusion and economic growth on an unprecedented scale (Germer, 2025; Barreto, 2025). **The Ghana Interbank Payments and Settlement Systems Limited (GhIPSS)** aligns well with DPI approaches to digital payments, with a strong interoperability base that ensures unified integrations across various payments, thus supporting broader digital financial inclusion in the country (Sang et al., 2025).

2.2.2.3 Data Exchange: Unlocking Digital Financial Inclusion

Good data exchange can yield a range of economic and societal benefits, from enhancing the operational efficiency of government service delivery and driving economic growth to enabling access to essential financial services for the unbanked and underserved (OECD, 2019; Totolo et al., 2024). Research published by CGAP in 2020 established a critical knowledge base on the foundational design features of data exchange systems, also known as open finance initiatives, and their connection to financial inclusion goals (OECD, 2019; Totolo et al., 2024).

In the past, financial institutions have acted as the sole custodians of customer data, thus operating in siloed environments (Zhang et al., 2025). With the DPI approach to data sharing, that paradigm is now shifting. DPI data change infrastructure is now gaining momentum globally, altering how financial data flows across countries' financial systems—a key driver of digital financial inclusion (Zhang et al., 2025). DPI data sharing systems ability to creates a secure, interoperable platforms for data exchanges about consumers and their activities can help government and the private sector especially the financial institution and Fintech firms to share securely and process data thus, enabling investors in the financial system to design more efficient and personalized services to improve financial services delivery (Dpi Africa, 2024a; Zhang et al., 2025; Totolo et al., 2024).

According to Vidal et al. (2024), data sharing can significantly reduce financial exclusion in fragile states as digital exchanges enable the provision of better-tailored digital financial services to the unbanked and poorly banked by effectively serving their needs at low cost, regardless of their geographical location (Vidal et al., 2024). By enhancing data exchange between the government and the private sector, the system can drive positive outcomes at both the customer and service-provider levels (Totolo et al., 2024; Vidal et al., 2024).

In early DPI approach data exchanges adopters like Singapore, India, Estonia, Uganda, and Brazil revealed the role data exchange has played in the financial system to advance digital financial inclusion (DCO,2025; Sang et al., 2025; Almeida et al., 2025; Totolo et al., 2024; Marskell et al., 2024; Kotschwar et al., 2024).

For instance, the **Brazilian opening finance data exchange solution** enables authorized agents to share clients' data. Brazil's open finance data-sharing initiatives facilitate clients, including the unbanked, in leveraging their history to establish relationships with financial services providers, fostering competition, promoting innovation in the financial sector, and enhancing digital financial inclusion (DCO, 2025; Almeida et al., 2025). Also, the **Singapore API Exchanges (APEX)**, a DPI approach to data exchange, promotes digital financial inclusion by enabling secure data sharing between agencies and businesses.

Moreover, the Singapore APEX, through the eKYC platform, eases access to financial services by saving time, lowering costs, and improving the quality of data exchange between government agencies, financial institutions, and the private sector, thus advancing the country's digital financial inclusion (Marskell et al., 2024; Kotschwar et al., 2024; DCO,2025).

Furthermore, in 2016, the government of **Uganda launched UGHub**, a national data exchange platform designed for data and system integration (Sang et al., 2025; Marskell et al., 2024). As at the time of writing this paper, the UGhub is engaged by over 100 government ministries, departments, and agencies, as well as private entities – including banks, insurance providers, and fintech firms.

Nonetheless, while DPI data exchange holds a significant potential to enhance digital financial inclusion, however, its silo operational model alone will limit its impacts. But bringing together digital identity, digital payment, and consent-based data exchange into a coherent interoperable DPI infrastructure is the actual recipe for a broader and wider digital financial inclusion and an all-inclusive financial system.

2.3 Digital Public Infrastructure the Building Blocks for Taxation of the Digital Economy

As economies become increasingly digital, tax authorities face challenges in taxing the scope of the digital economy that goes beyond traditional tax regulations (Becker, 2021). Existing local and international tax laws are in principle based on the traditional economy and thereby throw up challenges and complexities when faced with digital alternatives(Becker, 2021). Consequently, taxing the digital economy has become a crucial consideration for tax authorities worldwide (Becker, 2021;Mpofu, 2022). While international tax policy makers have brought into the mixed tax regulations and rules coupled with digitization of tax authorities however, all these efforts primarily focused on revenue allocation and technical coordination as opposed to addressing the underlying challenges for taxing the digital economy (Becker, 2021;Mpofu, 2022a; Mpofu, 2022b)

Hence, many of hurdles including identifying the digital business, determining the scope of their activities, allocation of business profit especially for MNEs such as google, amazon, Facebook, tracing their revenue and gathering and verifying business transaction history to determined their tax liabilities for tax compliance in order to generate lawful domestic tax revenue from the digital economy still remains a concerns and challenges for tax authorities in developing and emerging economies (Becker, 2021;Mpofu, 2022a). While the digital economy continues to

grow, with tax revenue leakages, tax authorities globally remain unclear about the most effective and efficient way to generate domestic tax revenue from the digital economy (Becker & Mpofu, 2022a; Hadzhieva, 2016).

Thus, addressing the issue of taxing the digital economy is becoming increasingly prominent among policymakers, governments, civil society organizations, and international development organizations as the digital transformation of global economy continue to grow constantly (Becker, 2021; Mpofu, 2022a; Mpofu, 2022b). As explained by Mpofu (2022a), the changes in business models and the lack of physical presence and intangibility in the digital economy have enabled MNEs, small and medium-sized businesses, as well as private individuals, to evade taxes, avoid paying taxes, or pay negligible taxes.

Digital public infrastructure a approach to digital transformation which enables efficient service delivery, seamless data exchange, and effective digital governance is believed has the potential to improve tax compliance in the digital economy. limit tax evasion, tax avoidance, and tax fraud (Santoro, 2023; ICTD, 2025). Existing research and evidence from early adopters of DPI provide a straightforward narrative about how investment, development and implementation of DPI will enhance tax authorities capabilities to generate domestic tax revenue from the digital economy (Santoro, 2023; Dpi Africa, 2024b; Dpi Africa, 2024c; Nose et al., 2024; Chandra et al., 2024). For instance, according to Chandra et al. (2024), the India DPI Stack has delivered value and is driving growth in domestic tax revenue collection from the digital economy.

2.3.1. Digital Economy

The burgeoning digital economy today has rapidly influenced the geopolitical platforms on which trade, commerce, and investments operate, redefining traditional business models and providing new ways for buyers and sellers to interact within and across national borders without physical presence through e-commerce and e-services (Pinkey, 2019; Aslam et al., 2025; Akatkin et al., 2023). Moreover, the digital economy has facilitated a surge in remote cross-jurisdictional sales, decoupling economic and physical presence (Rosario et al., 2023). With modern multinational enterprises deriving a larger share of their value from intellectual property that is easy to shift across borders and hard to value for transfer pricing purposes due to a lack of comparable (Xia et al., 2024; Talin, 2024; Aslam et al., 2025). As affirmed by Kemp (2025), as of July 2025, a total of 5.65 billion people representing 68.7% of the world population were actively participate in the digital economy. While Digital Cooperation Organization(DCO) report on digital economy trends in 2025 projected the digital economy to grow three times faster than the global economy to reach approximately US\$24 trillion in 2025 (Kemp, 2025; DCO, 2025). Research from (Abideen et al., 2025; Herath, 2024; OECD, 2025a) illustrates that the digital economy is a make-up of different model.

Abideen et al. (2025) academic research indicates that the digital economy comprises three business models, namely, the subscription model, advertising model, and data model. At the same time, Herath (2024) states that the digital economy encompasses three components: digital enabling infrastructures, e-Commerce, and digital media. On the other hand, the OECD (2025a)

of the view that the digital economy present opportunities to benefit consumers through easy access to information, goods, and services, such as digital tools, digital business models offering alternatives, and digital technologies integrated into consumer products. In summary, the digital economy includes business such as Amazon, Netflix, Uber, computing companies, mobile money operators, digital banking institutions, AWS cloud services, Hotmart connect creators with international audience, Facebook, tik Tok, Instagram, X, Google(Alphabet), Microsoft, apple apps and Samsung apps stores (Abideen et al., 2025; Herath, 2024; OECD,2025a).

The digital economy is new thus, there is not much definitive jargons in the definition of digital economy (Talin, 2024; Xia et al., 2024; Pinkey, 2019; ALRC, 2023).

Talin (2025) defines the digital economy as economic activities enabled by digital technologies, encompassing an innumerable range of digital tools, from digital banking and fintech products to digital marketing and logistics automation. Xia et al. (2024) referred to the digital economy as the collection of economic and commercial activities that utilize digital technologies and electronic communications. In addition, Pinkey (2019) describes the digital economy as the sum of economic output derived from numerous digital inputs, including digital infrastructures, digital applications, digital skills, and policies that leverage the use of digital technologies to foster growth and productivity in the economy. The Australian Law Reform commission on the other hand, defines the digital economy as a global network of social and commercial activities enabled by digital platforms such as internet connectivity, sensor networks and electronic devices.

The above definitions of the digital economy illustrate several differences between the traditional economy and the digital economy (Talin, 2025; Pinkey, 2019; Xia et al., 2024). For instance, the digital economy is not bound by borders because information, services, and business transactions can be shared instantly across borders. Moreover, the digital economy is built on a real-time mentality, where individuals, businesses, and governments expect feedback, and services are available on demand and utilized when requested. Furthermore, the digital economy enables a high degree of personalization that is not possible in the brick-and-mortar physical economy. The digital economy enables tailored services for individuals. Finally, the digital economy, as opposed to the traditional economy, enables the transmission of information via the internet, forming the basis of e-commerce. This makes it possible for non-physical goods, such as digital services like cloud storage, music, and video streaming, to be offered globally.

As the pace of the digital economy continues to evolve, the need for effective policy and regulatory measures becomes increasingly necessary (Talin, 2025). That is because, as economic and commercial activities become increasingly digital, the traditional taxation model based on physical presence becomes less effective in covering the further expansion of the digital economy (Rotimi. Hence, policymakers and tax authorities are now grappling with how to tax digital transactions from the digital economy fairly and effectively (Talin, 2025).

2.3.2. Taxation of the Digital Economy

As the global economies becomes increasingly digital, tax authorities face challenges in taxing the digital economy that go beyond existing tax laws that are based on the bricks and mortar economy (Bohio, 2024; Rizqiyanto et al., 2025; Kang'oro et al., 2024; Lucas-Mas et al., 2021).

As stated by UNTD (2024) , online sales are expected to continue rise and take a larger share of total retail sales with an increase of 22.5% by 2028. Also, global e-commerce sales is expected to reach \$6.4 trillion by 2025. Thus, collecting direct taxes, VAT and other taxes from the digital economy without any physical presence presenta a new challenge for tax administrations word wide but more especially for tax authorities in Africa (Bohio, 2024; Rizqiyanto et al., 2025; Keegan et al., 2024).

Studies by Pinkney (2019), Hadzhieva (2016), Becker (2021), Mpofu (2022a), Adebisi et al. (2023), Rizqiyanto et al. (2025), Aliu et al. (2025), Keegan et al.(2024) highlight the challenges faced by tax authorities in the taxation of the digital economy.

One notable challenge in taxing the digital economy postulated by Mpofu (2022a), is the invisibility and cross-border nature of digital transactions make it difficult for tax administrators to levy and collect taxes from the digital economy in both developed and developing economies. Another crucial concern regarding the taxation of the digital economy was shared by Rizqiyanto et al. (2025). The authors, in their findings, state that legal constraints in identifying digital transactions of micro businesses, small businesses, and medium businesses in the digital economy significantly reduce tax compliance and the collection of tax revenue from the digital economy. In his policy documents for the European Parliament on "Tax challenges in digital economy, Hadzhieva(2016) research reveals that digital economy is substantially different from the traditional bricks and mortar business in the financial system thus, taxation of the digital market is problematic due to anonymity, difficulty to determine the tax base, lack of paper trail, tax heavens and tax authorities inadequate capacity to navigate the digital economy. Finally, Aliu et al. (2025) state that existing tax laws based on the traditional tax framework are insufficient for the taxation of the digital economy.

Recognizing these challenges, the Organization for Economic Co-operation and Development (OECD), the United Nations (UN), and the African Tax Administration Forum (ATAF) have all proposed international frameworks, rules, and regulations to address existing challenges faced by tax authorities to tax the digital economy (Siva et al., 2025; David,2025; Ndajiwo, 2020; OECD, 2025b;) OECD, 2025c).

In October 2021, 136 OECD countries agreed to a historic global tax agreement under the OECD/G20 Inclusive Framework to reform international tax regulation for the digital economy (Abideen et al., 2025; Siva, 2025;OECD, 2025b). OECD's International policy responses to existing challenges in taxing the digital economy have been a two-pillar solution, which aims to implement fair taxation of multinational enterprises. Pillar One proposes to allocate a share of "residual" profits of the largest and most profitable MNEs to market countries, creating a new taxing right (Amount A) for countries like Kenya and Liberia, where users are located. Pillar

Two introduces a Global anti-Base Erosion regime: a 15% minimum effective corporate tax rate on large MNEs, implemented via coordinated rules (Abideen et al.,2025; Siva, 2025; Okanga et al., 2022).

However, the impact of the OECD's two-pillar solution was short-lived and insufficient to address the prevailing challenges in taxing the digital economy, especially for developing and emerging economies like Liberia. Therefore, many countries have pursued unilateral digital tax measures to tax the digital economy, including digital services taxes, significant economic presence tax rules, withholding taxes on digital transactions, and tariff and trade measures (Siva, 2025). Uruguay introduced significant economic presence tax rules in 2018, and Kenya introduced a withholding tax on digital transactions in 2024 (Siva, 2025). Kenya, France, Spain, India, and the United Kingdom are among the countries using digital services taxes. In January 2020, Italy introduced a 3% tax on revenues from digital advertising, including digital platforms that enable users to interact and the transmission of data collected from users and generated by the use of a digital interface (Siva, 2025). Spain followed in 2021 with a similar 3% tax on revenues from Spanish users in respect of online advertising services, online intermediation services, and online data transmission (Siva, 2025). Austria imposes a 5% tax on gross revenues from digital advertising services provided in Austria. In Africa, Kenya was the first country to impose a withholding tax on digital transactions (Siva, 2025).

In sum, the landscape of digital economy taxation is a complex mix of cooperative regimes, such as the OECD Two-Pillar plan or proposals at the United Nations for a global tax convention, and unilateral measures tailored to specific countries. Notwithstanding, these measures do not fully address the existing challenges in the taxation of the digital economy. One of them is the legal constraints in identifying digital transactions of micro businesses, small businesses, and medium businesses in the digital economy. Another issue is the burden of determining the tax base and the lack of a transaction paper trail. Additionally, existing tax laws based on the traditional tax framework are insufficient for the taxation of the digital economy. Hence, given the difficulties in taxing the digital economy effectively, what other models are available, especially for countries in Africa like Liberia?

To this end, digital Public Infrastructure (DPI) has surfaced as the modern road, the electric pipes, and a solution to existing challenges in taxing the digital economy (Veza et al., 2025). When built well and well-funded, DPI can yield a significant real-world benefit in the tax administration of the digital economy. It could make life easier for tax authorities, especially in African countries, including Liberia. Digital public infrastructure, built on open-source, interoperable, and scalable pillars, can be likened to Lego blocks. Such digital infrastructure, including digital identity, digital payments, and data exchange mechanisms, can boost tax compliance and bolster the mobilization of tax revenue in the digital economy (Santoro, 2024; Dpi Africa, 2024).

2.3.3 Digital Identity (ID): The Building Block for Taxation of the Digital Economy

Digital public infrastructure (DPI) approaches digital ID systems at its core, facilitate the identification of taxpayers, streamlining registration, enhancing tax compliance, and reinforcing revenue generation from the digital economy (Santoro et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). Digital ID provides unique identifiers to manage identity data across public and private digital transactions in the digital economy (OECD, 2022; Santoro et al., 2025). The DPI digital ID layer enables tax authorities to integrate digital ID data with tax records, facilitating improvements in tax compliance and mobilization of revenue from the digital economy (Santoro et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). As explained by Naik et al.(2025), digital ID by enabling coordination with tax authorities, other government ministries, agencies, and private sectors coupled with the combination of data from multiple sources will increased mobilization of tax revenue from the digital economy through improve data quality for tax compliance and enforcements and reduce tax gap from tax avoidance, tax evasion and tax fraud in the digital economy.

By leveraging biometrics authentication attributes, digital ID can enhance taxpayer registration by linking individuals to verified digital identification, thus reducing errors, reliance on self-reporting, and tax enforcement costs (Santoro et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). With a digital biometric ID system, tax authorities can easily identify non-compliant businesses and individuals operating in the digital economy, thus, increasing their ability to mobilized revenue from digital market (Santoro et al., 2025; Dpi Africa, 2024b) Evidence from DPI adopters such as India, South Korea, Uganda, Ghana and South Africa shows that digital ID system have yield tremendous result in augments the collection of revenue from the digital economy.

In India Aadhaar digital ID system a unique identifier that digitally stores residential, contact, and biometric details through identity authentication, enabling a faceless tax assessment mechanism with reduced physical human interaction in the tax administration process and streamlining tax assessments in India for businesses and individuals operating in the digital economy (PWC,2020; Nair, 2025). In 2022, Uganda's tax authority linked the national digital ID to tax identification numbers and was able to register over 350,000 new taxpayers (Santoro et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). Similarly, in Ghana, the Revenue Authority(GRA) partnered with the National Identification Authority to replace its old taxpayer identification number (TIN) system with an integrated digital ID system in its tax administration systems in April 2022(Santoro et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c).

2.3.4 Digital Payment Systems: The Recipe for Taxation of the Digital Economy

Domestic tax revenue collection has been a significant uphill, especially with the rapid growth of the digital economy (Chandra et al., 2024). Digital public infrastructure, digital payment layer, is poised to enhance tax authorities ability to curtail tax avoidance, reduce tax evasion and tax fraud by making transactions visible, facilitating data analysis for audits, and allowing for

electronic paper trail thus, mobilized tax revenue from the digital economy (DpiAfrica, 2024b; DpiAfrica, 2024c; Chandra et al., 2024; Bernald et al., 2025).

Digital payment system creates ease for tax compliance in the digital economy, as transactions are digitally recorded, which creates a paper trail that empowers tax authorities to enforce tax compliance, better identify taxable income, and collect lawful domestic tax revenue from the digital economy (Santoro et al., 2024; Kumar et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). Hence, the DPI approach to digital payments, by converting daily digital transactions into compliance-ready records, reduces time and cognitive burdens, and strengthens tax authorities' capacity to tax the digital market (Santoro et al., 2024; Kumar et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c). Moreover, the digital receipts generated by digital payment systems present an opportunity to reduce tax compliance burdens when converted into tax audit-ready records, while minimizing administrative burdens. One of the most significant effects of the digital payment system is its role in bringing small and medium-sized businesses operating in the digital economy into the tax system (Santoro et al., 2024; Kumar et al., 2025; Dpi Africa, 2024b; Dpi Africa, 2024c).

Early adopter of digital public infrastructure digital payment layers including India, China, Mexico, South Korea, Ghana evidences illustrates that an interoperable and secured digital payments is a key building block to effectively tax the digital economy. For instance, research indicates that India UPI digital payment system have had positive impact on taxation of the digital economy in India (Shankar, 2025; Santoro et al., 2025; Kumar et al., 2025). Kumar et al.(2025) study on India UPI digital payment system revealed that digital payments system(UPI) have a significant positive relationship with tax compliance and tax revenue generation from the digital economy. The authors also reveal that digital payments system significantly contributes to direct and indirect tax revenue increase in India. In addition, Verma et al.(2024) research on cross-border transactions and UPI digital payment systems results shows that digital payments system increase tax revenue from cross border trade. In the case of Mexico, CFDI digital payments system rollout lead to increase in tax revenue reported especially for Value Added Tax(VAT). While the Chinese e-Fapiao enables real-time conversion of daily digital transactions into tax compliance-ready records for the tax authority (Kumar, 2025).

2.3.5 Data Exchange System Taxation of the Digital Economy

Taxation cannot exist without information; in order to estimate taxes and enforce tax compliance, tax authorities need information on economic and commercial activities, as well as transaction data (Sang et al, 2025). Hence, the DPI approach data exchange infrastructure is a core layer for taxation of the digital economy. Data sharing system enables a secure, scalable, and interoperable data exchange between digital ID registry, digital payment systems for tax authorities to gain data and information from government, the private sectors and citizens to facilitates effective and efficient taxation of the digital economy (DpiAfrica, 2024b; DpiAfrica, 2024c). Therefore, by facilitating the automatic exchange of data between tax authorities and digital platforms, digital public infrastructure addresses challenges such as tax evasion and avoidance in the digital economy, supporting fair and efficient tax compliance and the

mobilization of fair tax revenue from MNEs and other cross-border digital businesses (Sange et al., 2025).

One notable global success story in data exchange is Estonia's X-Road data exchange platform, which enables secure and cost-efficient data exchange within the government, including the tax authority, to bolster effective tax compliance (Hirdaramani, 2025).

In summary, DPI layers potentials to identify and track digital and non-resident tax payer as well as converting daily digital transactions into compliance-ready records, would enhance the taxation of MNEs including google, Amazon, Apple, Facebook, Tik Tok, myspace, Microsoft, Instagram operating in the digital economy without physical presence (Muhammed, 2025). Therefore, whether its OECD pillar 1 or pillar, or national regulation for taxing MNEs in the digital economy, digital public infrastructure right digital building to support tax authorities p to mobilize revenue from MNEs operating commercial and economic activities outside their jurisdictions. Finally, through DPI approach tax authorities will also be able to generate domestic tax revenue from the informal and small-scale digital entrepreneurs with their borders as well as local influencer and content creators earning revenue via social media platforms (David, 2025).

3 Liberia Country Context

Liberian citizens' satisfaction with government service delivery and their ease of access to government services can translate into a positive overall perception of the government's effectiveness and support towards economic development and an inclusive financial system (Rossini, 2025). As such, building and operating seamless digital offerings to better serve Liberian citizens' evolving needs should be a national priority (Rossini, 2025). However, this vision is far from reality, as the nation's digital transformation journey has focused solely on the digitalization of individual sectoral e-service delivery rather than a holistic, inclusive approach to bridge the country's digital divide (Eaves et al., 2025).

Government ministries, agencies and state-owned enterprises often developed isolated digital solution where each institution operates independently thus leading to fragmented, siloed inefficient and costly digital transformation approach with several economic consequences including high duplication cost, limited scalability, high transaction cost, information asymmetry and incomplete information (Eaves et al., 2025). These limitations not only misplaced the use of public funds, but also hindered innovation and economic growth thereby creating barrier to e-government service delivery, wider adoption of digital financial inclusion and taxation of the digital economy (Eaves et al., 2025).

Nevertheless, adopting a digital public infrastructure approach to digital transformation will serve as a fundamental building block for transforming Liberia's digitalization from fragmented, siloed approaches to a holistic, inclusive digitalization of public service delivery. Digital Public Infrastructure (DPI), in this regard, provides the government of Liberia with vital opportunities

to advance digital financial inclusion and mobilize domestic tax revenue from the digital economy.

3.1 Current Status of Digital Public Infrastructure (DPI) in Liberia

Liberia's digital transformation journey is still at its formative stage, characterized by inconsistent and duplicated e-government service delivery as scarcity of resources looms. This section examines the current status as of the date of this paper for each DPI approach's digital layers in Liberia including digital identity(ID), digital payment systems, and data exchange systems.

3.1.1 Current status of Digital Identity in Liberia

The digital ID system in Liberia is still in its embryonic stage. At the time of writing this research, the National Biometric Identification System (NBIS) had registered only 720,000 Liberians. In addition, Kanu (2025) states that on April 14, 2025, the President of Liberia signed an Executive Order mandating that all Liberians and foreign residents to enroll in the National Biometric Identification System and obtain a biometric ID card to access public and private services nationwide. Furthermore, the National Identification Registry and the Liberia Telecommunication Authority (LTA) signed an MOU in 2024 to ensure that all mobile users are linked to a verifiable ID (Kanu, 2025). Moreover, the Liberia National Identification Registry had plans to start issuing new national biometric ID cards by April 2026, but the procurement process for a national biometric system was cancelled in August 2025 (Doodoo, 2025). Hence, Liberia does not have a DPI approach to a digital ID system as of the date of this research paper—a view confirmed by the DPIMap 2025 survey on the status of Liberia's digital ID system (DPIMap, 2025).

3.1.2 Current status of Digital Payment System in Liberia

In recent years, the government of Liberia through the Central bank of Liberia(CBL) has introduced DPI payment system infrastructures aimed at increasing digital financial inclusion in the country (Kanu, 2025). The Government of Liberia via CBL continued to strengthen the Liberia's digital payment infrastructures through funding from domestic tax revenue and support from international development organizations. As the time of writing this paper, the Central Bank of Liberia (CBL) has launched the following digital payment systems; the amended National Electronic Payment Switch (NEPS) enabling seamless interoperability amongst Liberia's commercial banks, mobile money operators, and other Fintech operators to support digital financial inclusion in Liberia (Kanu, 2025; CBL, 2025). The amended NEPS digital payment system supervise by the Central bank of Liberia allows users to send and received money, pay bills, purchase goods and services and payment of taxes to the Liberia Revenue Authority(LRA). However, the current digital payment systems in Liberia is classified by Dpi Map 2025 surveyed as a work in progress (DpiMap, 2025).

3.1.3 Current status of Data Exchange System in Liberia

Kanu(2025) states that open ownership is supporting some government ministries and agencies to develop and operationalized a regulatory framework for data sharing system. Thus, Liberia at the time of writing this study does not have a DPI approach interoperable and real time data exchange infrastructure (Dpimap, 2025).

3.1.4 Current status of E-Government in Liberia

Electronic governance (e-governance) is a form of digital transformation that utilizes advanced Information and Communication Technologies (ICTs), primarily web-based Internet applications, to enhance governance and government service delivery (DpiAfrica, 2025). Through the strategic implementation of information and communication technologies (ICT), the Liberian government has made significant paces in enhancing public administration, increasing transparency, and fostering a more inclusive society.

Liberia e-government services deliveries as at the time of writing includes E-Liberia service centre which act as a central hub for accessing Government of Liberia information and services online through seamless, user-friendly experience that empowers citizens with easy access to essential resources, fostering transparency, efficiency, and engagement in governance (Berry, 2025; e-Liberia, 2025; Njoya, 2024). Next is the integrated financial management system (IFMS) a comprehensive software solution that consolidates various financial processes, such as accounting, budgeting, and payroll, into a single, unified platform. Liberia IFMIS provides real-time financial data that enhances transparency and accountability across government miniserries, agencies and state-owned enterprise through a broader e-governance initiative (Lombe, 2022; Berry, 2025). Followed by the Liberia e-GP procurement system which is designed to digitize all aspects of Liberia's public procurement, from tender announcements to contract awards and payments (PPCC, 2025; Berry, 2025). Liberia's e-GP procurement system reduces corruption in public procurements that have historically plagued Liberia's procurement system (PPCC, 2025; Berry, 2025).

3.1.4.1 Current status of Liberia Revenue Authority Digital Transformation

The Liberia Revenue Authority (LRA) has made significant strides in transitioning the authority administrative process to a fully integrated digital system(Santoro, 2023; LRA, 2025). With digital system such as Liberia Integrated Tax Administration System(LITAS), ASYCUDA enabling e-filing, e-payments, e-registration and e-tax clearance portal, digital systems digital billing and receipt system, digital payment system by streamlining tax payments through integrations of digital banking and mobile money platforms (Santoro, 2023; LRA, 2025).However, while the Liberia Revenue Authority(LRA) has made significant progress in digitalization of the authorities tax administration, there is a need for government of Liberia to develop and implement digital public infrastructure approach to e-government to effectively and efficiently tax the digital economy as well as enhancing digital financial inclusion in the country.

3.2 Digital Financial Inclusion in Liberia

Liberia has made tremendous progress in digital financial inclusion (DFI), a digital financial innovative approach to extend financial services to the traditionally unserved and financially excluded population in Liberia (Kanu,2025; Yang et al., 2025). The growth in digital transformation such as introduction of mobile money platforms, digital banking, and other fintech products into the country's financial system, has catalyzed the evolution and expansion of digital financial inclusion (Kanu, 2025). As affirmed by the Central Bank of Liberia's 2024 annual report, e-money transactions totalled US\$959.32 million, while point-of-sale (POS) transactions increased to US\$54.88 million in 2024 (CBL, 2025). Additionally, in 2024, 11.5 million mobile money accounts were registered in Liberia, alongside over 231,038 registered mobile money agents (CBL, 2025).

Furthermore, World Bank Findex database report on digital financial inclusion, as of December 31, 2024, shows that 50% of Liberians made digital payments using a digital banking apps, debit card, credit card, or mobile money platform (Klapper et al., 2025). The implication is that 96% out of the 52.21% of the country population that do owned account used digital payments platform for everyday transactions (Kanu et al., 2025; Klapper et al., 2025). Nevertheless, as explained by Kanu(2025), these progress is only concentrated in Monrovia the capital city of Liberia amongst the working class and wealthiest elite. A similar view shared in World Bank snapshot on Liberia digital financial services and digital connectivity. The World Bank snapshot report revealed that the percentage gap between the poorest and wealthiest in the Liberia is 12% as at December 31, 2025 (World bank, 2025).

3.2.1 Existing barriers to Digital Financial Inclusion in Liberia

Traditionally, the lack of proper identification including national identification card, passport and proof of address have hindered millions of people in Liberia from opening bank account, mobile money account with GSM operators, applying for loans, and accessing other digital financial services (DFI, 2024; AFI, 2019; Marskell et al., 2024). Hence, without a trustworthy identification mechanism most Liberians are left out of the formal financial sector. In addition, as put forward by AFI(2019), Know your customer(KYC) are a significant impediments to the expansion and inclusiveness of the any formal financial system. Thus, the inability of the poor, vulnerable and marginalized group to establish a verifiable identity poses a significant barrier to digital financial inclusion (DFI, 2024; AFI, 2019; Marskell et al., 2024). Therefore, the absence of a complete scalable and interoperable payment infrastructure, digital KYC and data exchange system in Liberia hinders the wider adoption of digital financial inclusion in the country (Kanu, 2025).

As put forward by Charles(2022), internet connectivity an element of digital public infrastructure plays a critical role in facilitating digital financial inclusion, fostering sustainable economic growth and promoting a wider social inclusion. Thus, the economically vulnerable and less powerful populations in the rural and semi-urban part of the country are impeded with

less or no access to digital payments system due to limited access to internet connectivity thereby affecting digital financial inclusion in Liberia (Klapper et al., 2025; Charles, 2022).

Finally, as put forward by Kanu(2025) and Eaves (2025), the existing inadequate, fragmented, siloed digital public infrastructural including data exchange and governance challenges in the Liberia financial system are limiting the broader adoption of digital financial inclusion in Liberia. Thus, the introduction of digital public infrastructures such digital identity solution innovative approaches such as the ongoing national biometric identification system, digital transformation of the know your customer process and decentralized identity system would revolutionize the landscape of digital financial inclusion in Liberia.

3.3 Taxation of Digital Economy in Liberia

In Liberia, the Liberia Revenue Authority (LRA), a semi-autonomous organization established in 2013 through an Act of the National Legislature, is entrusted by the government of Liberia with the responsibility to collect domestic tax revenues (LRA, 2025; MFA, 2013). Since the LRA started effective operations on July 1, 2014, the organization has made significant progress in fulfilling its mandate to collect domestic tax revenue. Cumulatively, from 2014 to 2024, LRA has collected approximately US\$5.2 billion in domestic tax revenue to support the government of Liberia's public expenditure and various economic development agendas (LRA, 2025). Hence, as reported in the Liberia Revenue Authority's 2023 and 2024 annual reports, domestic tax revenue accounted for 86% and 95% of the annual budget for fiscal years 2023 and 2024, respectively (LRA, 2024; LRA, 2023). As stated by LRA(2025), one of the key drivers of the success of the Liberia Revenue Authority has been tax reforms and digital transformation of the tax administration.

As noted earlier, Liberia Revenue Authority has leverage on digital transformation and technology to digitalize the tax administration system in bid to close the domestic tax revenue gap, built a stronger trust with taxpayers and to contributed significantly toward national budget and economic development (Liberian Investigator,2025). According to Santoro(2023), the Liberia Revenue Authority collaboration with commercial banks and mobile money operators have provided an interactive platform for payment of taxes through mobile money, point of sale (POS), internet banking, other online payment platforms, debit and credit cards with an online receipt generator. Furthermore, the Liberia Revenue Authority has integrated it system with the Liberia national Identification Registry and in advance discussion with N-Soft for a digital infrastructure that will capture digital transactional data across the digital economy(LRA, 2025). Also, as highlighted in the Liberia Revenue Authority 2024 annual report, LRA have secured 50 satellite terminals to power internet in the rural and remote part of the country to boost revenue collection. However, while Liberia has made progress in the digitalization of the tax administration, there are gaps in the Revenue Code, Administrative policy, and a holistic approach to digital transformation for the Liberia Revenue Authority (LRA) to effectively and efficiently tax the digital economy.

As the world becomes a global village through digitalization, Liberia, like other developing economies, faces significant challenges in applying its Revenue Code of 2000 and its amendments to the taxation of the digital economy (Adebisi et al., 2023). Hence, the efficiency and technical capacity of the Liberia Revenue Authority (LRA) are important to ensure governments can collect lawful domestic tax revenue from the digital economy in order to reduce tax evasion, tax avoidance, tax fraud, and fund essential public services (Adebisi et al., 2023; Deshi et al., 2025).

3.3.1 Liberia Revenue Code and Taxation of Digital Economy

Liberia's principal status on taxation, the Revenue Code of 2000 and its amendments does not expressly address taxation of the digital economy. Also, Liberia participate in global tax dialogues but has yet to implement a standalone digital services tax on the digital economy. Hence the rise of digital economy presents a challenge for the current Liberia Revenue code and its amendments. With more and more commercial and economic activities happening digitally, the government of Liberia through the Liberia Revenue Authority (LRA) must find a way to generate tax revenue from the digital economy. At the moment, Liberia has yet to legislate or issue a regulation on taxation of the digital economy.

Thus, LRA reliance on existing tax law and administrative regulations presents challenges in taxing the digital economy and exposure to base erosion and profit shifting coupled with tax avoidance and evasion. Moreover, at the moment, Liberia has not implemented neither OECD strategy to address tax challenges of the digital economy nor the UN Model tax convention or the Digital Service Taxes (DST) rate imposed upon revenues generated by MNEs, small and medium digital business and individual social media influencers on online advertising, streaming, e-commerce and digital content created that are within the Liberian borders or having significant economic presence in these countries.

Digital Public Infrastructures (DPI) presents a transformative opportunity to overcome these challenges for the Liberia Revenue Authority to effectively and efficiently tax the digital economy (Sanday et al., 2025). Evidence from India DPI approach have shown that digital public infrastructure does not only improve domestic tax revenue collection but can also improve tax administration efficiency and enhance tax compliance cost in the digital economy without changes in tax policy (Maheshwari, 2023; Sanday et al., 2025).

Therefore, investments, development and implementation of DPI in Liberia will potentially augment the Liberia Revenue Authority tax administration, improve compliance, and expand the tax base of the digital economy thereby reducing the Government of Liberia reliance on foreign aid, and enhancing domestic revenue mobilization to support fiscal sustainability and sovereign development planning (AfDB, 2025; Sanday et al., 2025).

4. Review Methodology

This article examines the development and implementation of digital public infrastructure (DPI) as a foundational element for digital financial inclusion and taxation of the digital economy in Liberia. The study adopts a conceptual and analytical qualitative literature review approach. The researcher conducted an evaluative analysis and interpretive critique of legislative documents, policy beliefs, international development organization blogs, and scholarly literature to conceptualize the views of various researchers and policymakers regarding digital public infrastructures acting as a building blocks for digital financial inclusion and mobilizing revenue from the digital economy in Liberia. The researcher aimed to provide a conceptual analysis of each DPI layer, exploring the potential benefits for digital financial inclusion, as well as the implications for domestic tax revenue generation from the digital economy in Liberia.

As stated by Mpofu (2022), a qualitative review of literatures approach enables researchers to gathered relevant literatures, policy documents and legal documents to review, appraise, comment on them and synthesize them. This equips researchers to give a comprehensive picture of the conceptual aspect of the research title. A critical review helps the researchers is drawing out comprehensive and converging view on the subject area as well as identify research, policy, and methodological gaps that could be explored further by future researchers (Mpofu,2022; Snyder, 2019). In evaluating the literature, the researcher draw out controversial areas such as the ambiguities in the taxation of the digital economy and DPI approach application to the digital economy.

The researcher reviewed policy documentation and briefs on digital public infrastructure, digital financial inclusion, taxation of the digital economy, and Liberian policy documents from ministries and agencies. The documentation reviewed includes working papers, blogs, annual reports, policy reports, survey reports, policy briefs released by international organizations, including the World Bank, IMF, DSO, European Union, United Nations, Centre for Financial Inclusion, CGAP, AFI, and accounting firms among others, on taxation of digital economy. These follows an examination of documents from tax bodies, such as ATAF, and developmental bodies, including the OECD, as well as working papers from research institutions like the DPI Africa and the International Centre of Tax and Development (ICTD), and other similar bodies to supplements the study findings. The literature search was conducted using the Google Scholar search engine. A total of 165 articles were reviewed. This was to overcome the limitation of scarcity in literature, policy documents, briefs, and working papers, which linked the novel nature of the issue of Digital public infrastructure, taxation of the digital economy, and digital public infrastructure as a building block for digital financial inclusion, as well as taxation of the digital economy.

The study's qualitative approach also involves a thematic analysis to identify prespecified aspects regarding the study's focus in discussing the results and conclusions of the research. This aligns with the advantages of thematic analysis as expounded by Mpofu (2022). Data were presented in accordance with the key focal points of the research, namely the possibilities for investment and development of digital public infrastructure in Liberia, to promote broader

adoption of digital financial inclusion and taxation of the digital economy. The core themes and study concepts were further divided into sub-themes guided by the facts that emerged from the review. Accordingly, sources used were also referenced both in-text and in the reference list to augment the traceability, confirmability, and credibility of the study.

5. Results and Discussion

The research, after an in-depth analysis of policy documents, policy briefs, survey reports, and other scholarly literature, highlights the critical role of the investment, development, and implementation of the Digital Public Infrastructures (DPI) approach to digital transformation in promoting digital financial inclusion and mobilizing tax revenue from the digital economy in Liberia. DPI, with its scalability, interoperability, reusability, and cross-sectoral layers such as digital ID, digital payment system, and data exchange, will play a vital role in Liberia's digital transformation journey from the current fragmented e-government services to a holistic DPI approach that fosters digital financial inclusion and taxation of the digital economy by the Liberia Revenue Authority (LRA).

The study uncovers that Liberia does not have a DPI compatible digital identification biometric system with an interoperability features at the time of writing. In addition, the current National payment system is at its basic level with minimum functionality. With the person to person(P2P), government to person(G2P) and person to business (P2B) to be effective December 1, 2025. Moreover, the country does not have a digital know your customer or e-signature support system. Furthermore, the study noted that data exchange system is nascent in Liberia. Finally, the study discovered that though Liberia participate in global and regional tax dialogues is yet to implement a standalone digital services tax (DST) for taxation of the digital economy. The Liberia Revenue Authority (LRA) still rely on the existing Revenue code and other administrative practices with no mechanism to identify and track digital tax payers in the digital economy. Thus, the authority is currently face with challenges in taxing the digital economy such as inadequate treaty coverage and cross boarder cooperation, lack of technical capacity to identify and track informal operators in the digital economy and no digital tax administrative policy small and medium operators in the digital economy.

5.1 Bolstering Digital Financial Inclusion in Liberia through Digital Public Infrastructure

One of the most critical economic development agenda that digital transformation can enhance is digital financial inclusion which has manifested in the form of mobile money and digital banking, with the goal of banking the unbanked in Liberia (Kanu, 2025). While the percentage of adults with bank or mobile money account has increased since 2011, digital financial inclusion still remains a challenge in Liberia especially in the rural and semi-urban areas in the country. Challenges such as lack of proper identification, physical documentations, KYC, scalable and interoperable nationwide payment structure, internet connectivity, data sharing and poor public infrastructures have hindered the wider adoption of digital financial inclusion in Liberia (Kanu, 2025).

Literature, policy documents, and a brief review revealed that digital public infrastructure (DPI) provides a powerful building block to bolster and expand the broader adoption of digital financial inclusion in Liberia. Therefore, a well-built and well-funded DPI, including digital identity, digital payment, and a consent-based data exchange, secured, scalable, interoperable, and built on open standards at a societal scale, can have a significant real-world payoff for Liberia's unbanked population in rural, remote villages, and semi-rural areas, thus increasing digital financial inclusion in Liberia.

DPI digital identity solutions such as biometric identification, digital know your customer (e-KYC), e-signature, and a decentralized identity will eliminate the need for physical documents, enhance integrity and security for digital financial service providers, streamline identity verification and onboarding process for the unbanked and underserves communities and empowered Liberian citizens to established portable and interoperable identities that can be verifiable across different platforms paving the way for a greater digital financial inclusion coverage in Liberia. The DPI digital payment system can facilitate unified payments across digital banking, fintech service providers, the government of Liberia, and other financial services providers within Monrovia and across the fifteen counties in Liberia. DPI's approach to the digital payment layer will enable digital financial inclusion all around Liberia at a lower cost and with real-time continuity.

With the increasing mobile phone usage in Liberia, mobile money, digital banking, and internet connectivity will create a scalable and interoperable digital payment system in Liberia. Promoting an unprecedented opportunities for banking the unbanked in Liberia, thereby improving digital financial inclusion in the country. The potential of DPI extends beyond digital ID and digital payment systems. It also lies in the creation of a secure, interoperable, and consent-based data exchange infrastructure. Data exchange governance will enable the government of Liberia and financial institutions to share data securely and process it, thereby facilitating better decision-making, accountability, and digital financial service delivery to Liberia's underserved and unserved populations.

Digital ID can simplify access to financial services through digital payment systems, such as mobile money, digital banking, and other fintech solutions, coupled with the Central Bank of Liberia's amended National Digital Payment System. In contrast, the data exchange system will enable the seamless exchange and reuse of data across different government platforms, thereby expanding digital financial inclusion in all 15 counties of Liberia. Thus, by bringing together standard building blocks such as digital ID, digital payment, and consent-based data exchange into a coherent interoperable and scalable digital public infrastructure, the government of Liberia can move beyond fragmented e-government service delivery towards a shared foundation for trusted and seamless service delivery that will bolster a wider adoption of digital financial inclusion in Liberia.

5.2 Leveraging Digital Public Infrastructure for Taxation of the Digital Economy in Liberia

Taxing the digital economy presents a unique challenge for policymakers and tax administrators in developing economies, including Liberia. The advent of digital business in the digital economy, without physical presence, poses a dilemma for the Liberian tax system, as mobilizing tax revenue from the digital economy becomes a challenge. The Liberian tax system, which is heavily based on the physical presence of business, is becoming less relevant as the digital economy continues to expand. Liberia, with a 71% youth demographic profile, is a significant user of the internet, social media platforms, cloud computing, and other digital services. Hence, the growth in the digital economy provides an opportunity for the government of Liberia to increase domestic revenue collection to support public expenditures, including the construction of public Libraries in all 15 counties.

However, as mentioned earlier, the growth in the digital economy in Liberia presents challenges to Liberia's conventional Revenue Code of 2000 and its amendments. These challenges arise from the nature of the digital economy, including mobility and reliance on data, inadequate infrastructure for detecting digital transactions in real-time, and identifying and tracking digital economy taxpayers, which creates complexity in tax compliance and the mobilization of tax revenue from the digital economy. For instance, Liberia's social media content creators, digital small and medium-sized businesses, and large multination organizations such as Google, Facebook, TikTok, Instagram, and Netflix can earn revenue from Liberia without paying lawful taxes. Despite efforts by the OECD, ATAF, and the United Nations on taxation of the digital economy, with proposals such as significant presence rules, withholding taxes on digital transactions, and a digital services tax, these challenges still exist for developing nations like Liberia in taxing the digital economy.

To that end, literature, policy documents, and a brief review revealed that digital public infrastructure (DPI) presents a transformative opportunity for the Liberian government, particularly through the Liberia Revenue Authority (LRA), to tax the digital economy in Liberia effectively. Evidence from countries such as India, Estonia, Ghana, and Uganda shows that Digital Public Infrastructures not only enhance domestic tax revenue collection from the digital economy and reduce the challenges in taxing the digital economy but also improve LRA administrative efficiency and reduce taxpayers' compliance costs. By leveraging the DPI approach to digital identity, digital payments, and data exchange systems, LRA will be able to increase the formalization and mobilization of tax revenue, improve tax compliance, and expand the tax base from the digital economy while minimizing administrative burdens.

The DPI approach to digital identity is one of the key building blocks supporting local digital businesses and cross-border businesses without physical presence. An interoperable, scalable biometric digital ID system will enable a trusted, seamless, and remote taxation of the digital economy. Digital ID by linking individuals and business owners to verifiable biometric ID can help the Liberia Revenue Authority (LRA) accurately identify and track informal local operators in the digital economy while simplifying tax registration and compliance for Liberians.

A DPI approach to a digital payment system will integrate small and medium-sized businesses in the digital economy into the financial system, increasing their responsibility to pay lawful taxes. Moreover, a real-time digital payment system that converts daily payments into compliance-ready records reduces LRA time and cognitive burden, thereby strengthening the tax base to drive domestic tax revenue from the digital economy. Hence, with a digital payment system, as individuals and businesses increasingly engage with fast real-time payment systems —P2P, P2B, G2P, G2B, and B2B — the Liberia Revenue Authority will gain better visibility into these financial transactions for tax compliance and enforcement. Thus, a fast payment system that creates digital trails of transactions will empower the LRA to identify taxable income and enforce compliance efficiently and effectively in the digital economy.

Consent-based data exchange is the icing on the cake in the DPI approach. With an interoperable data exchange system, the Liberia Revenue Authority will leverage taxpayers' data from every sector in Liberia to enforce and mobilize lawful revenue from the digital economy. Thus, LRA will be able to identify and track non-tax-compliant Liberian content creators, small and medium-sized businesses, and MNEs operating in the digital economy engaging in tax evasion, tax avoidance, and tax fraud.

The study also discovered that a scalable, interoperable, and linked digital ID, digital payments, and data sharing system will augment the Liberia Revenue Authority's (LRA) ability to not only identify and track taxpayers in the digital economy but also simplify tax compliance and tax registration while improving the quality of the authority's data on the digital economy. Thus, the investment, development, and implementation of a digital public infrastructure integrated into the LRA's existing e-services delivery platform will serve as a building block for effectively and efficiently taxing the digital economy in Liberia.

6. Conclusion and Recommendations

6.1. Conclusion

With a few taps on their electronic devices, Liberian citizens and small- to medium-sized businesses in remote villages can open bank accounts using their digital ID linked to their e-signature, digital financial service providers can verify other information through e-KYC. Businesses and self-employed individuals in semi-urban areas in the country can pay their withholding taxes and goods and services taxes to the LRA using digital payment systems. Farmers in rural and semi-urban areas in the 15 counties in Liberia can receive government subsidies directly into their accounts, linked to their digital identification (ID). Liberians can conduct almost any transaction end-to-end online, regardless of their location, from electronically signing to application for a loan to payment and filing of taxes with seamless consent-based data sharing between LRA, government ministries, agencies, Liberia Telecommunications Corporation, National Identification Registry (NIR), Central Bank of Liberia(CBL), and the private sector. All these is possible through a secured, scalable and interoperable digital public infrastructure approach to digital transformation.

This research article concludes that a well-funded and well-built digital Public Infrastructure (DPI) powered by a scalable, interoperable, and linked digital ID, digital payment, and data exchange system by the government of Liberia will be the building blocks for a wider adoption of digital financial inclusion and mobilization of domestic tax revenue from the digital economy. DPI would make life easier for Liberians every time they interact with the government of Liberia, great for economic development, and fosters an all-inclusive financial system in all 15 counties in the country.

6.2. Recommendation

Digital transformation is like a major road network renovation. Investment in DPI will definitely help the government of Liberia achieve its digital financial inclusion target and assist the Liberia Revenue Authority in reducing tax avoidance, tax evasion, and tax fraud in the digital economy. A holistic, digitally mature government will improve economic resilience, societal development, and an all-inclusive financial system. Therefore, the Government of Liberia needs a strategic plan that aligns government ministries, agencies, the private sector, and ordinary citizen to ensure coordination and commitments toward the end goal in their digital transformation journey. Hence, this study recommends the following for a successful development and implementation of digital public infrastructure in Liberia.

6.2.1 Review and Update Existing e-Government and Governance Structure

The government of Liberia should review the existing digital system and governance structure, as well as the country's overall digital readiness. To develop and implement DPI in Liberia, the government must first invest in enabling factors for digital transformation readiness. This is followed by a review, update, or development of digital economy governance structures, such as policies on privacy, cybersecurity, and data trust; access to information policies; policies on digital financial services, not only for mobile money but for the digital economy as a whole; and policies on government security. Furthermore, the government of Liberia should review existing e-government service deliveries alignments with DPI digital layers and integrate them, while discarding those that do not match any of the DPI models.

6.2.2. Imperative Infrastructures

Foundation infrastructure, including internet connectivity and access, GSM network coverage in all 15 counties, and energy supply in the form of electricity or solar panels, is essential for the development and implementation of DPI layers. These elements support the broader adoption of digital financial inclusion and the taxation of the digital economy. DPI system, like any other digital innovation, will require internet connectivity and electricity to provide value. These imperative infrastructures are critical ingredients to the successful implementation of Liberia's DPI strategy.

6.2.3. Alignments of Government and Private Sector initiatives

To achieve an optimal balance between digital transformation and the regulation of digital public infrastructure, the government of Liberia should ensure alignment with private sector initiatives. That is just like the Brazil Open Finance Initiative; the GOL should seek and create space for private sector initiatives and experiments in the development and implementation of DPI.

6.2.4. Alignments of Liberia Digital Tax Regime with Global Standards

The ongoing tax reforms and digital transformation of the Liberia Revenue Authority must be assessed within the broader context of global digital tax rules and policies, to better apply DPI in the taxation of the digital economy. OECD initiatives on base erosion and profit shifting, 15% minimum tax framework, ATAF's digital service tax, and UN model digital PE for taxation of the digital economy. The international tax framework for taxation of the digital economy emphasizes taxing profit where value is created and users are located, regardless of physical location. In addition, the Liberia Revenue Authority should develop a simplified tax regime for individuals, small and medium-sized businesses operating in the digital economy within the Liberia borders, such as YouTube, Facebook, Instagram, and TikTok content creators, as well as local artists generating revenue through other digital music platforms and digital financial services providers. Moreover, the Liberia Revenue Authority should invest in digital infrastructure analytics capacity within the tax enforcement and audit departments. Finally, the authority should launch nationwide awareness programs on digital tax to bridge the knowledge gap.

6.2.5. Localized Digital solutions that Connect the Liberian Youth population.

Liberia's youth population makes up 71% of the country's 5.7 million population. DPI development offers the government of Liberia the opportunity to grow local talents by utilizing their innovative talent in the process. The youth population of Liberia has the potential to spearhead the development of a localized digital public infrastructure, provided the government of Liberia gives them the necessary tools and resources to engage in its development and implementation (DPI).

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