



E-GOVERNMENT AND DIGITAL HEALTH SYSTEMS FOR SUSTAINABLE HEALTHCARE DELIVERY IN NIGERIA

Elisabeta S. Olarinde¹,^{ID} Udosen J Idem²,^{ID} Emem Anwana³,^{ID}
Fulufhelo Godfrey Netswera⁴,^{ID} Omololu Fagbadebo⁵^{ID}

1. Faculty of Management Science, Durban University of Technology, South Africa
2. College of Law, Afe Babalola University, Ado-Ekiti.
3. Faculty of Management Science, Durban University of Technology, South Africa
4. Faculty of Management Science, Durban University of Technology, South Africa
5. Faculty of Management Science, Durban University of Technology, South Africa

Article Information:

Article Type:
Research Article

Manuscript Received:
15 July 2025

Final Revision Received:
15 September 2025

Accepted:
05 June 2025

Published Online:
15 October 2025

Abstract:

Innovative digital health technologies and e-government networks are transforming Nigeria's healthcare system. Nigerian healthcare infrastructure may evolve to solve persistent issues, including limited access, inefficiency, data fragmentation, and poor service delivery, by adopting digital health systems. Despite these advances, infrastructural gaps, fragmented systems, and poor interoperability hinder digital health's accessibility, especially in rural areas. This study examines Nigerian e-government and digital health, reviews existing implementations, and recommends ways to enhance healthcare delivery. The work studies Nigerian laws, digital governance, initiatives, and international best practices through doctrinal and policy research. The findings underscore the need for robust infrastructure, structured data governance systems, improved financing, and standardised cybersecurity standards to provide inclusive, safe, and efficient stakeholder involvement and policy support for sustainable digital health care delivery. This study concludes by proposing an integrative framework model that emphasises the need to restructure legal frameworks, support digital health systems, health providers, and patients, and improve healthcare service delivery in Nigeria to match global standards.

Keywords

E-government, Digital
Health, Health
Information Systems,
Nigeria, Digital
Infrastructure.

Cite this article: Elisabeta Smaranda Olarinde, Udosen Jacob Idem, Emem Anwana, Fulufhelo Godfrey Netswera and Omololu Fagbadebo (2026). E-Government and Digital Health Systems for Better Healthcare Delivery in Nigeria. The Journal of Sustainable Development, Law and Policy, Vol. 17:2. 445-462. DOI: 10.4314/jsdlp.v17i2.20.



© The Author(s)

Publisher: Institute for Oil, Energy, Environment and Sustainable Development (OGEES Institute), Afe Babalola University, Ado Ekiti, Nigeria.

1.0 INTRODUCTION

Digital transformation is increasingly recognised as a cornerstone for strengthening healthcare delivery in Nigeria. Despite notable advancements in infrastructure and e-government initiatives, Nigeria's healthcare system remains hindered by fragmented data systems, insufficient infrastructure, and limited interoperability. In response, the Nigeria Digital in Health Initiative (NDHI), formally launched in 2024, aims to consolidate the country's digital health ecosystem through a modular, open, and interoperable services network, guided by ISO/TC215 health informatics standards to ensure compatibility and scalability. Moreover, the Federal Government has emphasised digital health as a critical enabler of universal health coverage, recognising the need to integrate service delivery, telemedicine, supply chains, and AI-driven diagnostics into a coherent value chain¹. This vision is premised on strengthening real-time public health responses, remote consultations, and comprehensive patient monitoring systems².

While adoption of electronic medical records (EMRs), surveillance platforms like SORMAS (Surveillance, Outbreak Response Management and Analysis System), and Artificial Intelligence (AI) applications such as ADVISER show a lot of promises, however, widespread implementation is hampered by inequitable infrastructure distribution, especially in rural areas, low digital literacy among health workers, and persistent institutional fragmentation across federal, state, and local levels³.

This article investigates how e-government architectures, digital health systems, and regulatory frameworks interplay to enhance healthcare delivery in Nigeria, with a focus on identifying systemic levers to bridge existing gaps in governance, capacity, and scaling mechanisms. The study employs a doctrinal methodology approach in analysing the existing e-

¹ YJ Bakare, 'Nigeria: Harnessing Digital Technology for Universal Health Coverage in Nigeria' (Nigeria Health Watch, 20 November 2024) <https://articles.nigeriahealthwatch.com/harnessing-digital-technology-for-universal-health-coverage-in-nigeria/> accessed 9 August 2025.

² *ibid*

³ OB Banjo, 'Bridging Traditional and Modern Health Systems: The Role of Digital Health in Traditional Medicine Integration in Nigeria' (2025) 1 Health Sciences 2 <https://doi.org/10.1101/2025.04.29.25326680>.

government and digital health system for better healthcare delivery in Nigeria. Data were sought through relevant literature from medical scholarly journal articles, books, scientific articles, library searches, and Google searches PubMed and Yahoo. Keywords such as e-government, digital healthcare, health information system, digital infrastructure, benefits and challenges were used to guide the research. Doctrinal legal research is suitable for this work because it involves a systematic examination of statutes, regulations, policy instruments and case laws to establish and interpret the existing regulatory framework for e-government and digital health. It also enables precise identification of legal norms, obligations, gaps, enforcement mechanisms and grounded recommendations by proposing amendments to data privacy laws to better support the digital healthcare delivery system⁴.

After this introduction, section II surveys the literature. It also develops a theoretical framework for the study. Section III examines Nigeria's E-Government and Digital Healthcare Scenario. Section IV discusses Nigerian digital health practice challenges, while section V explores other countries' e-government and digital healthcare systems. Section VI presents the study's findings and discussion of pathways for advancing e-governance in Nigeria, while section VII presents its conclusions.

2.0 E-GOVERNANCE AND SUSTAINABLE DEVELOPMENT: A REVIEW OF THE LITERATURE

In recent times, Nigeria has embarked on a transformative journey toward integrating e-government platforms with digital health systems, aiming to improve healthcare delivery across its national health infrastructure. According to Okukorode et al⁵, the adoption of electronic medical records (EMR) in multiple teaching hospitals, for example, has led to a remarkable 142% improvement in data quality, underscoring the potential

⁴ EO Oluokun, FF Adedoyin, H Dogan and N Jiang, 'Digital Interventions for Managing Medication and Health Care Service Delivery in West Africa: Systematic Review' (2024) 1 Journal of Medical Research 2 <https://doi.org/10.2196/44294>

⁵ SO Olukorode, OJ Adedeji, A Adetokun and AI Abioye, 'Impact of Electronic Medical Records on Healthcare Delivery in Nigeria: A Review' (2024) 3(9) PLOS Digital Health 2 <https://doi.org/10.1371/journal.pdig.0000420>

of digitisation to enhance accuracy and efficiency in clinical care⁶. Additionally, according to Chika et al⁷, Nigeria's experience during the COVID-19 pandemic demonstrated how digital healthcare tools like telemedicine, mobile health messaging, and centralised dashboards improved outbreak response, patient tracking, and public awareness, offering valuable lessons for future public health preparedness⁸. Oseni⁹ argued that the increasing penetration of e-government initiatives, especially at the local government level, provides a crucial infrastructure backbone; however, implementation is often hampered by fragmentation, weak leadership, and connectivity constraints.

Corroborating the sentiment expressed by Oseni¹⁰, Ravi et al¹¹ postulate that despite acknowledging obstacles like power outages and poor training, digital health recognises this system's potential to drive Universal Health Coverage (UHC) if aligned under a unified governance strategy. They further said that digital systems worldwide struggle to provide improved healthcare with increased chronic disease, ageing populations, climate change, and a dark economic future. Oluokun et al¹² in their work, a systematic review of 29 West African studies found that phone-based, telemedicine, and e-platform interventions significantly enhance medication management and service delivery. The learned authors went further to state that Nigerian cases dominated the phone-based category, indicating a strong regional potential, yet noting persistent infrastructural

⁶ Oluokun, Adediji, Adetokun and Abioye, 'Impact of Electronic Medical Records on Healthcare Delivery in Nigeria: A Review' (n, 5)

⁷ UE Chika and others, 'Digital Healthcare Tools in Nigeria: Strengthening Public Health and Pandemic Preparedness – Insights from the COVID-19 Crisis' (2024) 1 *Telehealth and Medicine Today* 2 <https://doi.org/10.30953/thmt.v9.445>

⁸ *ibid*

⁹ KO Oseni, *Barriers Facing E-Service Adopting and Implementation at Local Environment Level in Nigeria* (University of Westminster Press 2017) <https://dx.doi.org/10.2139/ssrn.4796196>.

¹⁰ *ibid*

¹¹ N Ravi, C Thomas and J Odogwu, 'How to Reload and Upgrade Digital Health to Serve the Healthcare Needs of Nigerians' (2024) 1 *Frontiers in Digital Health* 2 <https://doi.org/10.3389/fdgh.2023.1225092>

¹² EO Oluokun, FF Adedoyin, H Dogan and N Jiang, 'Digital Interventions for Managing Medication and Health Care Service Delivery in West Africa: Systematic Review' (n, 4)

and usability challenges¹³. Opadele et al¹⁴ argued in their work that, in a large-scale Nigerian project across Oyo State, the ADVISER AI optimiser improved childhood vaccination targeting among 13,000+ families. They stated this marks Nigeria's first AI-driven health intervention, suggesting a valuable role for intelligent systems in public health¹⁵.

Sharon¹⁶ posits that IoT in healthcare offers simple access to patient information^{24/7}, reduces medical mistakes, improves decision-making, and offers cheaper costs for treatment. The learned author further said that his findings indicate that privacy and security provide the greatest risks, while the need for a steady supply of electricity and a fast Internet connection poses the most challenges. The study associates itself with the view expressed by the authors. However, there is a noticeable absence of discussion regarding the application of e-government and digital health and suitable theoretical frameworks in their work. Also, this study proposed an integrative framework model that emphasises the need to restructure legal frameworks, support digital health systems, health providers, and patients, and improve healthcare service delivery in Nigeria to meet global standards, which other works have ignored, thus filling the gaps in the literature.

2.1 Theoretical Framework

The Innovation Diffusion Theory (IDT) is applied in this study to investigate the current trends and factors that motivated people, organisations and countries of the world, including Nigeria, to adopt this theory into their e-government and digital healthcare service. The (IDT), which was developed by Everett Rogers¹⁷, postulates that new

¹³ *ibid*

¹⁴ O. Kehinde, R. Abdul, B. Afolabi, P. Vir, C. Namblard, A. Mukhopadhyay and A. Adereni, 'Deploying ADVISER: Impact and Lessons from Using Artificial Intelligence for Child Vaccination Uptake in Nigeria' (2024) 38(20) *Proceedings of the AAAI Conference on Artificial Intelligence* 2 <https://doi.org/10.1609/aaai.v38i20.30223>

¹⁵ O. Kehinde, R. Abdul, B. Afolabi, P. Vir, C. Namblard, A. Mukhopadhyay and A. Adereni, 'Deploying ADVISER: Impact and Lessons from Using Artificial Intelligence for Child Vaccination Uptake in Nigeria' (n, 14)

¹⁶ O Sharon, 'How Internet of Medical Things Can Improve Healthcare' *Punch Newspaper* (21 April 2023) <https://punchng.com/how-internet-of-medical-things-can-improve-healthcare/> accessed 9 August 2025.

¹⁷ EM Rogers, *Diffusion of Innovations* (3rd edn, The Free Press 1983).

technologies are adopted based on compatibility, trialability, relative advantage, observability and complexity in a social system or organisation. In the Nigerian context, since 2014, Nigeria has witnessed digital health interventions such as AI-driven vaccination tools and telemedicine platforms that offer ideal test cases for IDT theory. These innovations demonstrate how perceived benefits, ease of use, social influence, and pilot exposure influence uptake among health providers and informal care providers. For instance, the AI-based ADVISER vaccination system in Oyo State significantly improved immunisation rates across 13,000 families, a tangible benefit that drove adoption due to improved outcomes and efficiency¹⁸. Folajimi et al.¹⁹ views were supported by a study conducted by Olan et al.²⁰ when they say that, under a crisis situation, emerging digital technologies can address SC disturbances. They argued that emerging digital technologies help agents make complicated decisions and manage information transmission. The study also shows that the use of IDT by Naija care, which involves less complex innovations, is adopted more readily²¹. The use of this theory in Nigeria was easier to adopt, reduce risk, and support wider adoption. For example, the pilot deployment of the ADVISER scheduler allowed stakeholders to see direct benefits and build trust before statewide adoption. These platforms foster innovation diffusion theory within professional communities. Digital resilience among Nigerian SMEs during COVID-19, explored in an IDT-informed study, highlights the role of facilitating conditions and supportive infrastructure for diffusion in weak institutional contexts²².

From the above, it is clear that applying Rogers' IDT model to Nigerian digital health and e-government adoption yields powerful insights and

¹⁸ F Ashiru, F Nakpodia and JJ You, 'Adapting Emerging Digital Communication Technologies for Resilience: Evidence from Nigerian SMEs' (2023) 327 *Annals of Operations Research* 795 <https://doi.org/10.1007/s10479-022-05049-9>

¹⁹ *ibid*

²⁰ F Olan and others, 'Artificial Intelligence and Knowledge Sharing: Contributing Factors to Organizational Performance' (2022) 145 *Journal of Business Research* 605 <https://doi.org/10.1016/j.jbusres.2022.03.008>.

²¹ S Agha, LA Ruiz-Gaona and M Gorgens, 'Factors Associated with the Adoption of a Digital Health Service by Patent Proprietary Medicine Vendors (PPMVs) in Lagos, Nigeria' (2022) *SAGE Journals* <https://doi.org/10.1177/20552076221142666>

²² S Agha, LA Ruiz-Gaona and M Gorgens, 'Factors Associated with the Adoption of a Digital Health Service by Patent Proprietary Medicine Vendors (PPMVs) in Lagos, Nigeria' (2022) *SAGE Journals* <https://doi.org/10.1177/20552076221142666>

success so far. The study recommends that to accelerate the diffusion of digital health innovations, stakeholders must invest in pilot initiatives, harness peer networks, reduce complexity through training, tools, and ensure clear communication of benefits. Supporting infrastructure and enabling environments such as broadband access, stable electricity, and formal endorsement can further enhance adoption conditions.

3.0 E-GOVERNMENT AND DIGITAL HEALTHCARE IN NIGERIA

Nigeria, Africa's most populous country, faces longstanding challenges in governance and healthcare delivery, worsened by infrastructural gaps, institutional inefficiencies, and regional inequities. In recent years, the federal government has launched multiple initiatives, most notably the Digital Nigeria programme and the establishment of the Service Compact with All Nigerians (SERVICOM) to improve public-sector service delivery, that signal a push toward digitalisation in public administration²³. For instance, the Federal Ministry of Health (FMOH) and the Federal Ministry of Communication Technology (FMCT) began coordinating the development of the National Health Information and Communication Technology (Health ICT) Strategic Framework in late 2014 and continued into the first half of 2015. The framework was expected to run from 2015 to 2020 and involved multiple sectors and stakeholders²⁴.

To Ravi et al²⁵, an early goal of Nigeria's National Health ICT strategy model was to ensure that all citizens have access to quality healthcare. The main goal of the framework was to achieve universal health coverage in Nigeria by 2020 through health ICT usage. The vision monitored healthcare demand and supply using the National Health Management Data System (NHMIS), Logistic Administration Information System (LAIS), Civil Registration and Vital Statistics (CRVS), and National Identity Management System to increase health care access. The

²³ IG Aloba and others, 'Implementing Electronic Health System in Nigeria: Perspective Assessment in a Specialist Hospital' (2020) 20(2) *African Health Sciences* 948 <https://doi.org/10.4314/ahs.v20i2.50>

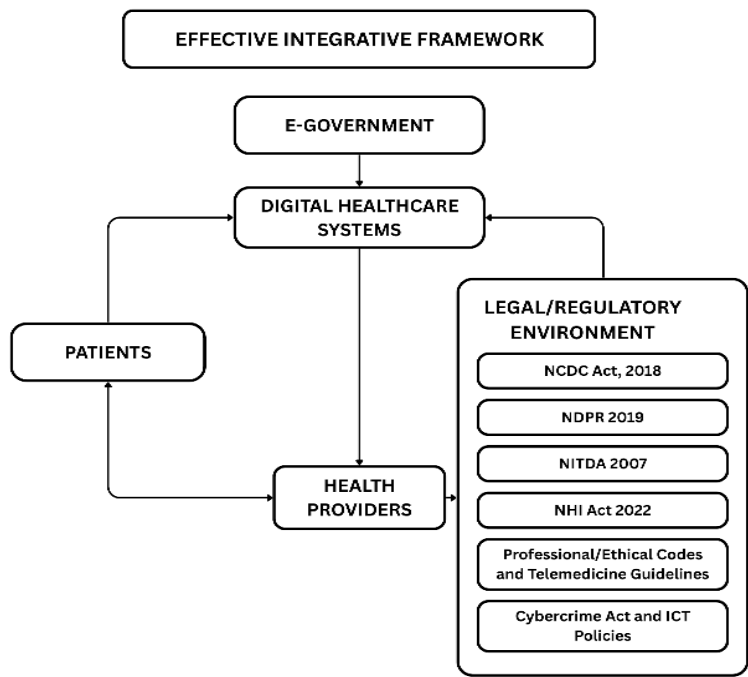
²⁴ N Ravi, Thomas and Odogwu, 'How to Reload and Upgrade Digital Health to Serve the Healthcare Needs of Nigerians' (n, 11)

²⁵ *ibid*

establishment of adequate rules, procedures, infrastructure, financial resources, and oversight mechanisms was envisioned to be supported through a nationwide Health Information Exchange (HIE). Furthermore, the Nigeria Centre for Disease Control (NCDC) and Prevention Act, enacted in November 2018, provides the statutory foundation for the NCDC to coordinate, promote, and strengthen efforts in preventing, detecting, and managing communicable diseases as well as other public health threats, including infectious disease outbreaks across Nigeria. Again, in 2019, the National Information Technology Development Agency (NITDA) enacted a subsidiary legislation under the NITDA Act 2007 for protecting personal data in Nigeria, aiming to safeguard individuals' privacy rights and foster a secure digital environment for data transactions. The current study avers that although this law introduced fundamental fair principles and raised awareness of data privacy across institutions, the law lacked focus on health-specific data contexts. This study suggests that precise rules on how to handle data relating to healthcare delivery, data sharing, AI usage and consent processes are critical. Furthermore, the federal government of Nigeria, aiming to upgrade the country's data protection laws, enacted the Nigeria Data Protection Act 2023 in line with GDPR, which establishes the NDPC authority, mandates consent, data controller registration, and impact assessments.

However, the enforcement capacity of this law is still very weak. This law needs specific rules for EMR, AI tools, telemedicine platforms, health insurance data and clarity on cross-border health data transfers, consent and liability. Additionally, the National Health Insurance Authority (NHIA) Act 2022 made health insurance compulsory, outlines legal rights and responsibilities for both the patients and health care providers and enables hospitals to secure digital tools, for example, Medstrat, to improve enrolment and claims processing. Notwithstanding the achievements of this Act, urban areas benefit more than rural ones due to the fact that digital access remains limited. Again, the Medical and Dental Council of Nigeria (MDCN) code of medical ethics from 2008, including explicit guidance on telemedicine, has implicitly upheld confidentiality and data security via ethical codes for practitioners. However, the liability framework for telemedicine remains vague. This study postulates that this code be amended to provide liability frameworks, patient consent, and quality oversight standards. The current study suggests that there may also

be a need for the use of e-government, legislative mandates and interoperability protocols coverage to ensure efficient and accessible digital health services in Nigeria, as it has been successfully done in other regional and international case studies and proposes an integrative framework. This proposal is summarised in Figure 1 below.



Source: The authors

Fig.1 is a proposed integrative framework model which demonstrates how governance structures, legal norms and interoperability formats converge to ensure secure, efficient, and accessible digital healthcare service delivery in Nigeria. It outlines a mutually beneficial relationship between technology, policy implementation and service delivery essential for sustainable e-health adoption. Based on the above, this study has extended doctrinal research, bridged the gap and advanced legal and policy technology integration knowledge in this field of study.

4.0 NIGERIAN DIGITAL HEALTH PRACTICE: OBSTACLES AND ISSUES

In Nigeria, the pursuit of modernising public services through e-government and advancing digital healthcare has gained urgency in the aftermath of the COVID-19 pandemic. These initiatives hold the promise of enhancing efficiency, expanding access, and boosting service equity across urban, rural and village populations²⁶. However, despite the advancement and applications of e-health in Nigeria in the area of widespread mobile penetration and the proliferation of telemedicine pilots, critical obstacles continue to impede meaningful progress in its execution and adoption²⁷. This sub-section sets the stage for exploring, through recent scholarly insights, the diverse challenges currently shaping the digital transformation of government and healthcare services in Nigeria. Afieroho et al²⁸ aver that frequent electricity outages and weak broadband and mobile networks make telemedicine, electronic record systems and online government services unreliable in Nigeria, leading to frequent service disruption and low user trust. While Nwkoroeze et al²⁹ stated that weak *ICT (information and communications technology)* infrastructure and lack of government readiness to adopt a fully blown digital maturity a part of the challenges of e-health practice in Nigeria.

Mamuye et al³⁰ posit that human factors such as low digital literacy, resistance to change, and skills gaps are yet another barrier for the smooth adoption of e-healthcare services. They further contended that health workers, civil servants, and citizens often lack training or are resistant to adopting e-services and e-health platforms. Studies show perceived

²⁶ N Ravi, Thomas and Odogwu, 'How to Reload and Upgrade Digital Health to Serve the Healthcare Needs of Nigerians' (n, 11)

²⁷ N Ravi, Thomas and Odogwu, 'How to Reload and Upgrade Digital Health to Serve the Healthcare Needs of Nigerians' (n, 11)

²⁸ P Afieroho and others, 'Adopting E-Government to Monitor Public Infrastructure Projects Execution in Nigeria: The Public Perspective' (2023) 9(8) *Heliyon* e18552 <https://doi.org/10.1016/j.heliyon.2023.e18552>

²⁹ CN Nwkoroeze, TR Onwuekwem and UH Chukwu, 'Evaluating the Impact of E-Government and Digital Transformation on Public Service Delivery in Nigeria' (2025) 13(2) *Global Journal of Political Science and Administration* 32 <https://doi.org/10.37745/gjpsa.2013/vol13n23141>

³⁰ A Mamuye and others, 'Facilitators and Barriers to the Sustainability of eHealth Solutions in Low- and Middle-Income Countries: Descriptive Exploratory Study' (2023) 7(1) *JMIR Formative Research* 2 <https://doi.org/10.2196/41487>

complexity and lack of training are major barriers³¹. The view expressed by Mamuye et al³² was supported by Ravi et al³³ when they postulated that to promote effective use of digital health solutions, regulatory institutions such as the Medical and Dental Council of Nigeria could require healthcare professionals to undergo compulsory training in telemedicine consultations. Building strong knowledge and acceptance of telemedicine and digital health practices among practitioners is essential for successful adoption, particularly since these innovations remain relatively new within the Nigerian healthcare landscape.

Oke and Sibomana³⁴ emphasised that although government policies exist, such as data protection laws, health strategies, implementation is uneven as overlapping mandates, weak law and regulatory enforcement, and absence of national standards for health data exchange impede adoption and interoperability³⁵. Additionally, Mamuye et al³⁶ stated that many digital health pilots are donor-funded or short-term projects with no future or sustainability plan. They also contended that weak procurement practices problem and budget constraints limit scale-up and long-term maintenance of e-healthcare facilities³⁷. Adaji³⁸ avers that high-impact data incidents and weak operational security practices (and under-resourced cybersecurity teams) reduce public trust and raise legal and compliance risks for e-health and e-government services not only in Nigeria but to the entire sub-Saharan African countries³⁹.

³¹ *ibid*

³² *ibid*

³³ N Ravi, Thomas and Odogwu, 'How to Reload and Upgrade Digital Health to Serve the Healthcare Needs of Nigerians' (n, 11)

³⁴ GI Oke and O Sibomana, 'Adoption of Digital Health Technology in Nigeria: A Scoping Review of Current Trends and Future Directions' (2025) 1(1) *Advances in Public Health* 2 <https://doi.org/10.1155/adph/4246285>.

³⁵ *ibid*

³⁶ Mamuye and others, 'Facilitators and Barriers to the Sustainability of eHealth Solutions in Low- and Middle-Income Countries: Descriptive Exploratory Study' (n, 30)

³⁷ *ibid*

³⁸ AE Adaji, 'Reconciling the Ideals of Open Science with Data Privacy in the Context of Health Research in Nigeria: A Legal Analysis' (2023) *Health Research Policy and Systems* 2 <https://doi.org/10.21203/rs.3.rs-3293485/v1>

³⁹ *ibid*

Babatope et al⁴⁰ argue that poorly designed change management staff and organisational implementations that ignore clinical and administrative workflows produce low adoption. Organisational culture, leadership buy-in and change management are often insufficiently addressed in Nigeria⁴¹. Adedinsewo et al⁴² in their contribution to knowledge say regulatory uncertainty for new tech such as AI, telemedicine and ethical concerns needs greater emphasis on advancing digital health in Nigeria. They also went further to say that the rapid emergence of AI, advanced digital tools creates regulatory and ethical gaps, policymakers are catching up, and that uncertainty slows institutional adoption⁴³.

To overcome these hurdles, integrated strategies are needed, combining infrastructure and connectivity investment, policy reform, capacity building, sustainable financing models and robust governance frameworks. Only then can Nigeria fully leverage e-government and digital healthcare to advance easy access, efficiency, equity, and responsiveness in the public sphere.

5.0 E-GOVERNMENT AND DIGITAL HEALTHCARE SYSTEMS IN OTHER JURISDICTIONS

E-government and digital health systems are central to modernising health service delivery, as they can improve access, reduce costs, enable population health analytics, and integrate care across settings. This subsection explores e-government and digital health systems for better healthcare delivery in the UK, Singapore, and South Africa. In the UK, e-government and digital health systems are among the most developed globally, but it is not considered the outright best. It ranks within the top tier for legal and regulatory clarity, governance structures for ethical safeguards and policy design.

⁴⁰ EA Babatope and others, 'Assessing the Factors Militating Against the Effective Implementation of Electronic Health Records (EHR) in Nigeria' (2024) 14(1) *Scientific Reports* 3 <https://doi.org/10.1038/s41598-024-83009-y>

⁴¹ *ibid*

⁴² D Adedinsewo and others, 'Contextual Challenges in Implementing Artificial Intelligence for Healthcare in Low-Resource Environments: Insights from the SPEC-AI Nigeria Trial' (2025) 12 *Frontiers in Cardiovascular Medicine* 3 <https://doi.org/10.3389/fcvm.2025.1516088>

⁴³ *ibid*

The Health and Social Care Act 2012 introduced significant reform to the structure of the National Health Service (NHS). The NHS has prioritised large-scale digital transformation to improve access, efficiency and care coordination through digital patient records, NHS App and regional EPR deployments. The National Healthcare Service is the United Kingdom's publicly funded healthcare system designed to provide care virtually free at the point of use for all UK citizens and residents. However, some services like prescriptions, dental care or optometry may involve small charges depending on the UK region.

According to Pope et al⁴⁴, the UK National Health Service industrial partnership improves patient care by developing new medicines and technology and improving data and online resources for study and care.⁴⁵ Allcock et al⁴⁶ are of the view that the NHS's size and decentralised service delivery in both primary care and social care make integration and standards of digital health enforcement difficult. They further contend that evidence from recent evaluations shows that technical solutions alone don't fix organisational fragmentation⁴⁷.

The UK E-government and digital health system illustrates the complexity of transforming a very large public and the need for pragmatic, well-governed and result-oriented industry partnerships leading to a strong potential health care delivery to its citizenry, as opposed to Nigeria with a weak digital health care system. According to the International Citizens Insurance global index ranking in 2023⁴⁸, Singapore now ranks first globally for healthcare, followed by Japan in second place and South Korea in third place. This progress is underpinned by Several intertwined legal and regulatory mechanisms of e-government, namely: the Personal Data Protection Act (PDPA) 2012, the Healthcare Services Act (HCSA)

⁴⁴ R. Pope and others, 'Real-World Learnings for Digital Health Industry-NHS Collaboration: Life Sciences Vision in Action' (2024) 11(3) *Future Healthcare Journal* 2 <https://doi.org/10.1016/j.fhj.2024.100168>.

⁴⁵ *ibid*

⁴⁶ JA Allcock and others, 'Landscape of Digital Technologies Used in the National Health Service in England: Content Analysis' (2024) 8(1) *JMIR Formative Research* 2 <https://doi.org/10.2196/51859>

⁴⁷ *ibid*

⁴⁸ International Citizens Insurance, 'The Best Healthcare in the World: Country Rankings' (2025) https://www.internationalinsurance.com/health/systems/?srsltid=AfmBOoqPwVm-D_FXdl13ODXBenR2w0PUWNfrsFr2VH621f_P_Z3yxyJw accessed 7 August 2025.

2020, the Ministry of Health (MOH), the Health Sciences Authority (HSA) and the Singapore Medical Council (SMC). Together, these frameworks aim to strike a balance between innovation, patient safety, and data integrity. The above position was supported by Palaniappan et al⁴⁹ when they argued that Singapore pursues a tightly governed, whole-of-nation digital health strategy with a strong emphasis on national health identifiers, integrated electronic medical records, and high digital literacy among citizens. The country targets efficient care coordination, preventive care and healthy-ageing initiatives⁵⁰. They further emphasise the balancing act between innovation, ethics, patient safety, and data privacy within Singapore's regulatory framework⁵¹.

Another study conducted by Leow et al⁵² posit that an economic evaluation of the Primary Technology-Enhanced Care (PTEC) for Hypertension program using real-world data demonstrates both health benefits and cost-effectiveness, reinforcing Singapore's evidence-based adoption of telehealth strategies. In the light of the above, it is clear that Singapore demonstrates how tight governance and unified platforms can produce high-value integration for the overall effectiveness of the healthcare system for the citizenry.

South Africa is a regional leader in digital government in Africa and has a formally articulated national digital health agenda, the National Digital Health Strategy 2019–2024, that explicitly links digital systems to goals for universal health coverage and the National Health Insurance (NHI) reforms. The strategy promotes interoperable information systems, a national architecture, scaling of high-impact mHealth, and governance mechanisms to support data sharing across public and private sectors⁵³. The 2019–2024 National Digital Health Strategy frames digital health as a key enabler for “better health for all South Africans” and is being

⁴⁹ K Palaniappan, C Ghosh, P Gideon and S Vogel, *A Regulatory Perspective of Digital Health Transformation: A Singapore Case Study* (DukeNUS Medical School 2023).

⁵⁰ *ibid*

⁵¹ *ibid*

⁵² AS-T Leow and others, ‘A Comparative Analysis on the Latest International and Local Guidelines for the Management of Hypertension’ (2025) 66(5) *Singapore Medical Journal* 240 <https://doi.org/10.4103/singaporemedj.SMJ-2025-094>.

⁵³ National Department of Health, *National Digital Health Strategy for South Africa 2019–2024* (Pretoria, 2022).

operationalised alongside the government's NHI rollout and other health transformations⁵⁴.

According to Agbeyangi and Lukose⁵⁵, telemedicine and mHealth services expanded markedly during the pandemic; systematic reviews and recent primary studies show increased uptake for remote consultations, chronic-disease monitoring, and HIV and maternal health support, but uptake is uneven and shaped by infrastructure and provider readiness. To move from promising pilots to equitable, nationwide impact, South Africa needs a concerted push on interoperability standards, infrastructure investments targeted at underserved areas, clinician-led system design, and a transparent, enforceable governance framework that protects privacy while enabling responsible data use⁵⁶.

The current authors aver that across the UK, Singapore, and South Africa, e-government and digital health systems show strong potential to improve healthcare delivery, but outcomes hinge on governance, inclusion, financing and implementation realism rather than on technology alone. This research reveals that Singapore demonstrates how tight governance and unified platforms can produce high-value integration; the UK illustrates the complexity of transforming very large public systems and the need for pragmatic, well-governed industry partnerships; South Africa highlights the promise of digital health for UHC but also the constraints imposed by infrastructure, equity and coordination challenges.

6.0 DISCUSSION AND RESULTS

This study examines e-government and digital health systems for better healthcare service delivery in Nigeria. The current research's result is different from previous works and literature, which are largely either on e-government administration of public service or e-health in Nigeria.

⁵⁴

⁵⁵ AO Agbeyangi and JM Lukose, 'Telemedicine Adoption and Prospects in Sub-Saharan Africa: A Systematic Review with a Focus on South Africa, Kenya, and Nigeria' (2025) 13(7) *Healthcare* 762 <https://doi.org/10.3390/healthcare13070762>.

⁵⁶ C Zharima, F Griffiths and J Goudge, 'Exploring the Barriers and Facilitators to Implementing Electronic Health Records in a Middle-Income Country: A Qualitative Study from South Africa' (2023) 5 *Frontiers in Digital Health* 2 <https://doi.org/10.3389/fdgh.2023.1207602>

They have not appraised the issue of e-government and digital health systems for efficient healthcare service delivery in Nigeria, nor have they explained a theoretical model suitable for effective healthcare service delivery in Nigeria, nor do they propose an effective integrative model for sustainable digital healthcare services delivery in Nigeria. They also do not examine digital healthcare service delivery in other jurisdictions such as the UK, Singapore and South Africa, which the gaps that this study covers. One of the novel findings is that the extant legal, regulatory and policy frameworks have played an important role so far in the practice, operations and obligations towards the development of Nigeria's digital health systems for better healthcare service delivery, yet there are important gaps in the legal, regulatory, policy framework and enforcement to be filled which present a challenge. The above finding is supported by Oluokun et al's⁵⁷ argument when they said that digital technologies have greatly impacted medicine and health care delivery in Nigeria and other West African nations. However, the effect is minimal. Thus, initiatives must be devised to overcome the barriers to digital intervention tool use in Nigeria and other West African nations to completely integrate them into health services.

Another important result of this work is that the Federal Government has launched the Nigeria Digital in Health Initiative (NDHI) and set up a national implementation committee, signalling a clear policy push to unify digital health architecture, standards, and governance. However, most of the activity is still at the planning or early stage rather than mature nationwide deployment. This result corroborates the view expressed by Egwudo et al⁵⁸ when they argued that reviews of Nigeria's digital health landscape and government announcements show policy consideration but limited national deployment to date. The current authors suggest that to effectively implement e-governance in the digital health system in Nigeria, strong enabling policy and rapid but well-governed operationalisation capacity and funding plans must be developed to avoid policy practice gaps presently experienced.

⁵⁷ EO Oluokun, FF Adedoyin, H Dogan and N Jiang, 'Digital Interventions for Managing Medication and Health Care Service Delivery in West Africa: Systematic Review' (n, 4)

⁵⁸ AE Egwudo and others, 'Integrating Digital Health Technologies into the Healthcare System: Challenges and Opportunities in Nigeria' (2025) 7(4) *PLOS Digital Health* <https://doi.org/10.1371/journal.pdig.0000928>

This article also shows that pilots show a measurable health impact when data-driven optimisation is used (ADVISER). For instance, AI and optimisation tools can be deployed successfully in Nigeria and produce measurable improvements in healthcare delivery. The ADVISER system, which is an AI-driven vaccination intervention optimiser, was deployed in Oyo state and reported improved allocation of outreach resources and higher vaccine uptake in pilot populations of about 13,000 families. Also, the Automated Digital Immunisation System (ADIS) in Kwara state of Nigeria reduced vaccination defaulters and improved real-time tracking. Our position is strengthened by the research conducted by Opadele et al⁵⁹ when they posit that Nigeria's first AI-enabled tool chain for health intervention allocation, the ADVISER framework, uses an integer-based linear programme to optimise the cumulative likelihood of vaccination success.

This work has also made a novel contribution in this field of study by proposing an integrative model theory for sustainable and better healthcare service delivery in Nigeria and other sub-Saharan African nations. There is an urgent need to upgrade applicable legal and regulatory frameworks, digital health systems, and the capacity of health providers and patients to efficiently leverage and use e-governance for successful and sustainable digital healthcare service delivery, for Nigeria's digital healthcare systems to be in line with other countries of the world, such as the United Kingdom (UK), Singapore and South Africa. This study has examined e-government and digital health systems in the UK, Singapore and South Africa to draw lessons for Nigerian Policymakers to draw inspiration to drive our laws and policy implementations forward for better healthcare service delivery in Nigeria. The result was that across the UK, Singapore, and South Africa, e-government and digital health systems show strong potential to improve healthcare delivery, but outcomes hinge on governance, inclusion, financing and implementation realism rather than on technology alone. Singapore shows how tight governance and unified platforms can produce high-value integration; the UK shows the complexity of transforming very large public systems and the need for pragmatic, well-governed industry partnerships; and South Africa shows

⁵⁹ Kehinde, Abdul, Afolabi, Vir, Namblard, Mukhopadhyay and Adereni, 'Deploying ADVISER: Impact and Lessons from Using Artificial Intelligence for Child Vaccination Uptake in Nigeria' (n, 14)

the promise of digital health for UHC but also its infrastructure, equity, and coordination challenges. The current research advocates that the Federal Government of Nigeria should follow Singapore's lead in digital governance and e-health systems, which accord with sustainable development goals.

7.0 CONCLUSION

This research clearly shows that Nigeria has made significant progress in legalising e-government and digital health utilising NDPA, NHIA, NCDC, and NITDA regulations. Yet, health-specific data privacy, interoperability, cybersecurity, telehealth legislation, and digital inclusion implementation limitations exist. Filling these gaps requires health-tailored NDPA amendments or new health data legislation, national health system interoperability standards, licensing frameworks for telemedicine and EMR providers, enforceable cybersecurity rules for health data, broader digital infrastructure, adequate funding, and literacy programs.

Addressing these weaknesses can transform Nigeria's digital health ambitions into sustainable, equitable healthcare delivery. Alternatively, the study suggests that the National Assembly prioritise creating an e-government legislative regime that relates digital health to sustainable and improved service delivery in Nigeria. Also, the current research proposed a model theory highlighting the necessity for restructuring the legal frameworks, improved support for digital health systems, health providers and patients, for sustainable and better healthcare service delivery in Nigeria, in conformity with what is available on the world stage.