International Journal of Innovative Information Systems & Technology Research 14(3):62-69, July-Sept, 2026

© SEAHI PUBLICATIONS, 2026 www.seahipublications.org ISSN: 2467-8562

DOI:10.5281/zenodo.21303708

Commercialization Opportunities in Software Development: Exploring Market Dynamics and Strategic Approaches in Sokoto, Kebbi, and Zamfara States, Nigeria

[1]Bashar Abdullahi & [2] Abdullahi Sidi

Umaru Ali Shinkafi Polytechnic Sokoto, Nigeria

ABSTRACT

Nigeria's digital economy has become an increasingly important driver of national growth, with the information and communication technology (ICT) sector contributing 11.18% of real GDP in the second quarter of 2025. Despite this progress, the distribution of digital economic activity remains markedly uneven, and the North western states of Sokoto, Kebbi, and Zamfara continue to exhibit considerable untapped potential alongside significant structural constraints. This paper examines the opportunities for software development commercialization in these states by analysing market dynamics, institutional frameworks, infrastructure readiness, and human capital development. Through a comparative assessment of their digital transformation trajectories, the study identifies distinct strategic patterns: institution-building and alignment with federal initiatives in Sokoto State; substantial investment in digital infrastructure and skills development in Zamfara State; and a funding paradox in Kebbi State, where considerable expenditure has yielded limited observable outcomes. The paper concludes that sustainable software commercialization in the region requires coordinated efforts in infrastructure provision, capacity building, effective policy implementation, and private-sector participation, while recognising the differing developmental contexts and strategic priorities of the three states.

Keywords: software development; digital economy; commercialization; Sokoto State; Kebbi State; Zamfara State; Nigeria; ICT policy.

1. INTRODUCTION

The global software development industry has undergone a profound transformation over the past decade, with emerging economies increasingly positioning themselves as competitive centres for digital innovation and technology services. Nigeria, Africa's most populous nation and largest economy, has embraced this shift through comprehensive policy initiatives such as the National Digital Economy Policy and Strategy (NDEPS) 2020–2030 and the Nigeria Startup Act 2022. These frameworks seek to reposition the national economy to harness digital technologies, stimulate innovation, attract investment, and generate employment opportunities for the country's rapidly expanding youth population.

The national commitment to digital transformation has yielded notable results. Nigeria's ICT sector recorded a nominal year-on-year growth of 21.39% in the second quarter of 2025, more than double the 10.21% growth registered during the corresponding period in 2024. Likewise, the sector's contribution to nominal GDP increased from 9.25% in the first quarter of 2024 to 10.29% in the first quarter of 2025.

These trends underscore the growing importance of digital technologies in Nigeria's economic structure and the country's gradual diversification away from dependence on crude oil.

Despite these achievements, substantial regional disparities persist. Most digital economic activity remains concentrated in Lagos, Abuja, and a few other urban centres in the southern and central regions of the country. Consequently, the Northwestern states of Sokoto, Kebbi, and Zamfara continue to lag in terms of digital infrastructure, human capital development, and technology entrepreneurship. This imbalance presents both challenges and opportunities: although barriers to software commercialization remain significant, untapped market potential and increasing policy attention provide a favourable environment for targeted intervention.

This paper examines the opportunities for software commercialization in Sokoto, Kebbi, and Zamfara States. Specifically, it analyses the market dynamics shaping the regional software ecosystem, evaluates the strategic approaches adopted by the respective state governments, and identifies the principal enablers and constraints affecting sustainable commercialization. Drawing on policy documents, government reports, industry statistics, and institutional frameworks, the study provides a comprehensive assessment of the region's evolving digital transformation trajectory.

2. Conceptual Framework: Software Commercialization in Developing Regions

2.1 Defining Software Commercialization

Software commercialization refers to the process of transforming software products, services, or intellectual property into marketable offerings that generate economic value. In developing regions, this process encompasses the creation of market-ready applications and platforms, the provision of software development and IT services to domestic and international clients, the development of software-as-a-service (SaaS) solutions, and the cultivation of a sustainable ecosystem of technology entrepreneurs and firms.

Nigeria's SaaS market, valued at approximately USD 265.72 million in 2024, is projected to grow at a compound annual growth rate of 23.8% between 2025 and 2034. This trajectory suggests considerable commercial potential for regions capable of positioning themselves within the expanding digital economy. Likewise, the markets for custom application development and IT outsourcing continue to expand, driven by increasing digital transformation across industries, a focus on operational efficiency, and the availability of a growing IT workforce.

2.2 Enabling Factors for Software Commercialization

Research on technology entrepreneurship in developing regions identifies several key factors that facilitate successful software commercialization.

Digital Infrastructure. Reliable internet connectivity, broadband access, and robust telecommunications networks constitute the foundational infrastructure required for software development and digital service delivery. Although the National Broadband Plan (2020–2025) set a target of 70% broadband penetration by 2025, penetration stood at approximately 53.86% in early 2026, with 116.7 million subscriptions. This shortfall highlights persistent infrastructure deficits, particularly in underserved regions.

Human Capital. A workforce equipped with competencies in software development, programming, and emerging technologies is indispensable for commercialization. Nigeria has become one of the fastest-growing sources of software developers on GitHub, reflecting a rapidly expanding talent pool. Nevertheless, these skills remain unevenly distributed, with significant shortages in peripheral regions.

Institutional Framework. Supportive policies, regulatory clarity, and mechanisms such as innovation hubs, startup incentives, and regulatory sandboxes are essential for fostering technology entrepreneurship. The Nigeria Startup Act 2022 represents a major step toward reducing regulatory barriers and providing targeted support to technology-enabled enterprises.

Access to Capital. Venture capital, grants, and other financing mechanisms are crucial for enabling software startups to develop products, scale operations, and penetrate markets. Although Nigeria's startup ecosystem attracted approximately US$343 million in funding in 2025, this represented a decline from the

previous year. Public initiatives such as the US$617 million iDICE programme nevertheless demonstrate substantial governmental commitment to strengthening the national innovation ecosystem.

Market Access. Access to both domestic and international markets is a key determinant of the commercial viability of software products and services. Recent federal initiatives aimed at expanding market opportunities for Nigerian startups through partnerships across Africa underscore the importance of market integration for sustainable growth.

2.3 The Regional Dimension

The effectiveness of these enabling factors at the subnational level is influenced by state policies, institutional capacity, and local economic conditions. In recognition of the digital economy's potential to generate employment and diversify revenue sources, Nigerian state governments have increasingly assumed responsibility for driving digital transformation. Indeed, twenty-three states plan to allocate approximately ₦132.45 billion to technology ministries and digital economy initiatives in 2026—nearly four times their actual expenditure in 2025. This significant increase in investment reflects a growing appreciation of the strategic importance of digital development at the state level.

3. State-Level Digital Transformation: A Comparative Analysis

3.1 Sokoto State: Institutional Foundations and Federal Alignment

Among the states examined, Sokoto has emerged as a leader in institutionalizing digital governance. Under the administration of Governor Ahmad Aliyu Sokoto, the state established a Ministry of Innovation and Digital Economy (MIDE), modelled on the Federal Ministry of Communications, Innovation and Digital Economy. This development demonstrates a deliberate commitment to embedding digital transformation within the machinery of government.

A major milestone in this agenda was the enactment of the Sokoto State Information and Communication Technology Development Agency (SICTDA) Law, which provides a statutory framework for ICT development, infrastructure expansion, and job creation. SICTDA is expected to play a central role in leveraging technology for socio-economic advancement and positioning Sokoto as an emerging centre of innovation.

The state has also pursued close collaboration with federal agencies, particularly the National Information Technology Development Agency (NITDA), in areas such as digital skills development, infrastructure expansion, startup support, and alignment with national digital policies. In addition, Sokoto has reaffirmed its commitment to broadband expansion through participation in national investment initiatives and has reportedly trained over 10,000 individuals in entrepreneurship and digital skills while establishing a department dedicated to artificial intelligence and emerging technologies.

Overall, Sokoto's strategy may be described as an **institution-led transformation**, emphasizing strong governance structures, policy coherence, and regulatory certainty as the basis for sustainable digital growth and private-sector investment.

3.2 Zamfara State: Infrastructure-Led Digital Transformation

Zamfara State has pursued a more assertive, infrastructure-oriented approach, with the objective of becoming a leading technology hub in Northern Nigeria. The Zamfara Information and Communications Technology Development Agency (ZITDA) has spearheaded this effort through three strategic pillars: expansion of digital infrastructure, implementation of e-governance systems, and promotion of digital literacy and skills acquisition.

A hallmark of Zamfara's strategy has been the elimination of right-of-way charges for telecommunications operators. This policy has stimulated fibre-optic deployment and attracted support from the Nigerian Communications Commission's Universal Service Provision Fund, facilitating connectivity to key public institutions within Gusau metropolis. By removing a major obstacle to broadband expansion, the state has created favourable conditions for software development and digital entrepreneurship.

The state has also introduced the Zamfara Electronic Governance platform (e-GovConnect) and adopted Nigeria's first state-level Digital Literacy Framework. Furthermore, the establishment of the Zamfara

Institute of Information Technology (ZIIT) through legislation represents a substantial investment in human capital. The institute is mandated to train professionals in software development, cybersecurity, data science, artificial intelligence, and related fields, thereby creating a sustainable pipeline of skilled talent.

Zamfara's experience exemplifies an **infrastructure-led transformation**, combining investments in connectivity with institutionalized skills development to support long-term digital and economic growth.

3.3 Kebbi State: The Funding Paradox

Kebbi State presents a more complex and, in many respects, cautionary case. In November 2024, the state established a Ministry of Digital Economy and allocated ₦1.53 billion in capital expenditure between January and September 2025. This substantial investment, one of the highest in the region, was intended to position Kebbi as a leading centre for digital innovation in Nigeria.

Despite this commitment, implementation has lagged considerably behind expenditure. Investigative reports indicate that many of the ministry's websites and digital platforms are inactive, non-functional, or inaccessible. Although the state's official portal purports to offer a range of e-government services, many of the associated websites are inoperative. In one instance, the website of the state water board appeared to have been compromised by an unauthorized external entity. Only the websites of the Kebbi State Internal Revenue Service and the Kebbi State Investment Promotion Agency remained functional, with the former reportedly falling short of NITDA's standards for government websites.

These shortcomings extend beyond technical deficiencies. Erroneous information published online indicated that several local government areas were located at an address in London, suggesting a lack of basic quality assurance. More seriously, the exposure of sensitive taxpayer information on the tax portal of the Kebbi State Internal Revenue Service has raised significant concerns regarding privacy and data protection.

The Ministry of Digital Economy has acknowledged challenges such as inadequate infrastructure and low levels of digital literacy, calling for collaborative efforts to address these constraints. Nevertheless, the disparity between substantial financial investment and limited observable outcomes points to deeper institutional issues, including weak implementation capacity, inadequate accountability mechanisms, and a possible misalignment between policy objectives and execution.

Kebbi's experience thus illustrates a **funding paradox**: significant financial commitment to digital transformation without commensurate institutional capacity or implementation effectiveness. This pattern raises important questions about the absorptive capacity of public institutions and the conditions under which financial investment can be translated into meaningful digital development outcomes.

4. Market Dynamics and Commercialization Opportunities

4.1 National Market Context

The commercialization prospects of software development in Sokoto, Kebbi, and Zamfara must be understood within the broader context of Nigeria's rapidly expanding digital economy. The ICT sector contributed 11.18% to the country's real GDP in the second quarter of 2025, underscoring its growing importance within the non-oil economy. This expansion reflects the increasing digitization of economic activities and the rising demand for software solutions, digital platforms, and IT services.

The projected compound annual growth rate of 23.8% for the SaaS market through 2034 signals strong and sustained demand for cloud-based software solutions. Likewise, the custom application development and IT outsourcing markets are projected to experience continued growth, driven by ongoing digital transformation across industries and an increasing emphasis on operational efficiency. Nigeria's emergence as one of the fastest-growing sources of software developers on GitHub further suggests the existence of an expanding talent pool with the potential to meet both domestic and international demand.

4.2 Regional Market Characteristics

The Northwestern region, comprising Sokoto, Kebbi, and Zamfara States, presents a distinctive environment for software commercialization. Several factors shape this landscape.

Agricultural Sector Dominance. Agriculture remains the backbone of the regional economy, creating significant opportunities for software solutions that support agricultural value chains, including farm management systems, supply-chain tracking, market information platforms, and financial inclusion tools. Evidence from Kebbi State indicates that digital extension services have a positive and statistically significant impact on farmers' productivity, income, and technology adoption, underscoring the market potential for agricultural technologies.

Public Sector Demand. The increasing digitization of government operations has generated demand for custom software applications, e-governance platforms, and IT consulting services. The automation of administrative processes, payment systems, and procurement platforms offers immediate commercialization opportunities for local developers.

Youthful Demographics. The region's large and growing youth population constitutes both a potential workforce for the software industry and a significant market for digital products and services.

Infrastructure Constraints. Limited broadband penetration, unreliable electricity supply, and inadequate digital infrastructure continue to impede the development, delivery, and adoption of digital solutions. At the same time, these challenges create opportunities for innovations such as offline-first applications, low-bandwidth platforms, and alternative connectivity models.

4.3 Specific Commercialization Opportunities

An assessment of prevailing market dynamics and ongoing state initiatives reveals several promising avenues for software commercialization in the Northwest:

Agricultural Technology (AgriTech). Opportunities exist for the development of precision agriculture tools, market information systems, supply-chain management platforms, and agricultural finance applications. Evidence of the positive impact of digital extension services in Kebbi State suggests a receptive market for such innovations.

E-Government Solutions. The increasing digitization of public administration has created sustained demand for custom software applications, including government portals, workflow automation tools, document management systems, and citizen-engagement platforms.

Educational Technology (EdTech). The expansion of digital skills programmes in Sokoto and the establishment of the Zamfara Institute of Information Technology indicate growing demand for digital learning platforms, examination management systems, and technology-enabled training solutions.

Financial Technology (FinTech). The region's large unbanked population presents substantial opportunities for mobile payment systems, digital banking services, and other financial inclusion initiatives.

Health Technology (HealthTech). Investments in broadband connectivity for health facilities, such as the Specialist Hospital in Gusau, create favourable conditions for telemedicine platforms, health information systems, and patient management applications.

Software Outsourcing. By leveraging lower operating costs and an emerging pool of technical talent, software firms in the region can provide development services to clients both within and beyond Nigeria, thereby participating in the growing global outsourcing market.

5. Barriers and Challenges to Commercialization

5.1 Infrastructure Deficits

Despite recent progress, inadequate infrastructure remains a major impediment to software commercialization. National broadband penetration, at approximately 53.86% in early 2026, remains below the target established by the National Broadband Plan, with even lower levels in rural areas of the Northwest. Frequent fibre cuts and equipment thefts continue to disrupt connectivity, undermining the reliability of digital services and increasing business risks.

Unreliable electricity supply further elevates operating costs, as software firms must invest in alternative power sources. These energy constraints adversely affect both the production of software services and the adoption of digital technologies by end users.

5.2 Human Capital Gaps

Although Nigeria's software talent pool is expanding, its distribution remains uneven. The Northwestern states continue to face shortages of trained developers, limited access to high-quality technology education, and insufficient opportunities for practical experience. While recent initiatives in Sokoto and Zamfara represent important progress, their long-term impact will require sustained investment and support.

Moreover, the quality of digital skills training is inconsistent. Some programmes lack practical, industry-relevant content and fail to establish pathways to employment, thereby widening the gap between training outcomes and market requirements.

5.3 Institutional and Policy Challenges

Differences in institutional capacity among the three states create distinct challenges for software commercialization. While Sokoto and Zamfara have demonstrated considerable commitment to digital transformation, Kebbi's experience illustrates that financial investment alone is insufficient without effective implementation mechanisms.

In addition, inconsistent policy execution, weak regulatory enforcement, and limited coordination between state and federal institutions generate uncertainty for software entrepreneurs. The absence of robust intellectual property protection, data privacy safeguards, and effective contract enforcement further constrains the growth and commercialization of software innovations.

The section is already well structured. A polished and academically formalized version is as follows:

5.4 Access to Capital

Despite federal initiatives such as iDICE and the Nigeria Startup Act, access to early-stage finance remains limited in the Northwest. Venture capital and angel investment continue to be concentrated in Lagos and other major urban centres. The 17% year-on-year decline in Nigeria's startup funding to US$343 million in 2025 further reflects the broader macroeconomic challenges that disproportionately affect peripheral regions.

5.5 Market Access and Demand Constraints

Limited market access constrains the commercial viability of software products developed within the region. The local market for software services remains relatively small, while entry into national and international markets requires marketing expertise, professional networks, and credibility that many regional firms have yet to develop.

Although federal efforts to expand market opportunities for Nigerian startups through partnerships across Africa are encouraging, their benefits have not yet been felt substantially in the Northwest.

6. Strategic Approaches and Recommendations

6.1 Differentiated Strategies for Each State

Given the differing starting points and strategic orientations of the three states, a uniform approach would be inappropriate.

Sokoto State should leverage its institutional foundations and alignment with federal initiatives to attract private investment and foster software entrepreneurship. Priority actions include operationalising SICTDA with a clear mandate and adequate resources, establishing innovation hubs and incubation programmes, developing a state-level startup policy aligned with the Nigeria Startup Act, and strengthening partnerships with federal agencies for technical assistance and capacity building.

Zamfara State should build upon its infrastructure investments and institutional innovations to develop a comprehensive software ecosystem. Key priorities include accelerating the full operationalisation of ZIIT and aligning its curriculum with industry needs, attracting technology firms through the state's zero right-of-way policy and related incentives, adopting procurement policies that favour local software firms, and establishing mentorship and internship programmes to facilitate the transition from training to employment.

Kebbi State faces the immediate challenge of translating financial investment into measurable outcomes. Priority measures include conducting a comprehensive audit of digital economy expenditures and

achievements, strengthening institutional capacity and accountability mechanisms, restoring the functionality of core digital infrastructure and e-services, and seeking technical support from NITDA and other federal agencies. Without addressing the implementation deficit, additional funding is unlikely to produce meaningful progress.

6.2 Cross-Cutting Recommendations

In addition to state-specific measures, several region-wide actions are warranted:

- Promote regional collaboration through shared infrastructure, joint software procurement, and harmonised policy frameworks.
- Strengthen public–private partnerships involving telecommunications firms, technology companies, and development partners.
- Expand digital literacy and skills development initiatives to encompass youth, women, entrepreneurs, and the broader population.
- Ensure that all government digital platforms comply with NITDA standards for quality, security, and accessibility.
- Improve access to finance by establishing state-level innovation funds, providing matching grants, and facilitating connections with venture capital and angel investors.

These measures would enhance the enabling environment for software commercialization and support the sustainable growth of the digital economy across Sokoto, Kebbi, and Zamfara States.

Your conclusion is well developed and academically sound. A polished version is as follows:

7. CONCLUSION

The prospects for software commercialization in Sokoto, Kebbi, and Zamfara States are considerable, yet their realization depends on overcoming significant structural constraints. The three states have pursued distinct pathways to digital transformation: Sokoto has emphasized institution-building and alignment with federal initiatives; Zamfara has adopted an infrastructure-driven strategy; and Kebbi illustrates the limitations of substantial financial investment in the absence of effective implementation and institutional capacity.

At the national level, the environment is increasingly conducive to digital entrepreneurship. The sustained growth of Nigeria's ICT sector, the rapid expansion of the Software-as-a-Service (SaaS) market, and supportive policy frameworks such as the National Digital Economy Policy and Strategy and the Nigeria Startup Act provide a strong foundation for software commercialization. Moreover, the region's large youth population, predominantly agrarian economy, and ongoing public-sector digitization create promising market opportunities for locally developed software solutions.

Nevertheless, challenges persist, including inadequate infrastructure, shortages of skilled human capital, institutional weaknesses, limited access to finance, and restricted market reach. Addressing these issues will require coordinated and sustained efforts in infrastructure provision, skills development, policy implementation, private-sector participation, and inter-state collaboration.

The varying circumstances of the three states underscore the need for differentiated strategies. Sokoto should consolidate its institutional gains, Zamfara should capitalize on its infrastructure investments, and Kebbi must strengthen implementation and accountability mechanisms before additional investments can yield meaningful results. At the same time, regional cooperation, public–private partnerships, expanded digital literacy initiatives, and adherence to quality standards will be essential to advancing software commercialization across the Northwest.

Ultimately, the success of software development commercialization in the region will depend on translating policy aspirations into measurable outcomes, strengthening institutional capacity, and fostering an enabling ecosystem in which technology entrepreneurs can innovate and thrive. The foundations are in place; the imperative now is effective and sustained execution.

REFERENCES

6Wresearch. (2025). *Nigeria custom application development market (2025–2031)*. 6Wresearch.

6Wresearch. (2025). *Nigeria IT outsourcing market (2025–2031)*. 6Wresearch.

BusinessDay. (2026, January 20). Nigeria's startup funding falls 17% in 2025. *BusinessDay*.

BusinessDay. (2026, March 2). States plan ₦132 billion technology spending after undershooting 2025 allocations. *BusinessDay*.

Federal Ministry of Communications and Digital Economy. (2019). *National digital economy policy and strategy (2020–2030)*. Federal Republic of Nigeria.

Federal Ministry of Communications, Innovation and Digital Economy. (2025). *Nigeria joins the Digital Public Goods Alliance*. Government of the Federal Republic of Nigeria.

Foundation for Investigative Journalism. (2025, December 16). Kebbi's websites remain inactive despite ₦1.5 billion expenditure on the digital economy. *FIJ*.

Gajam, H. (2025, March 16). Zamfara ICT framework and zero right-of-way charges are revolutionising the state's digital landscape. *Vanguard*.

National Information Technology Development Agency. (2025a). *NITDA inaugurates National Sandbox Regulatory Working Group*. Voice of Nigeria.

National Information Technology Development Agency. (2025b). *NITDA and YEIP partner to drive youth entrepreneurship and innovation*. NITDA.

Nairametrics. (2025, September 23). ICT sector boosts Nigeria's GDP with an 11.18% contribution in Q2 2025. *Nairametrics*.

Nigerian Communications Commission. (2025). *NCC–NGF business roundtable on broadband connectivity*. NCC.

Research and Markets. (2025). *Nigeria software as a service market outlook: Forecast trends, market size, share and growth analysis report (2025–2034)*. Research and Markets.

Sokoto State Government. (2025, April 25). *Sokoto Assembly passes Governor Aliyu-sponsored bill into law*.

Sokoto State Government. (2025, November 12). *Digital Nigeria 2025: Sokoto State Government commits to digital growth and sustainability*.

Sokoto State Government. (2025, November 14). *NITDA assures support for Sokoto's digital transformation agenda*.

The Guardian. (2025, November 26). Nigeria's ICT development rises by 13% as inadequate political will slows Africa's progress. *The Guardian*.

Zamfara State Government. (2025, October 13). *Zamfara is going digital*.

Zamfara State Government. (2025, October 28). *We are building a technology-driven Zamfara, says Governor Lawal*.

Zamfara State Government. (2026, February 26). *Governor Dauda Lawal signs bill establishing the Zamfara Institute of Information Technology (ZIIT)*.