

Qualitative Analysis of Sustainable Innovative Performance in Nigerian Tech Startups

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Abstract

This study presents a qualitative, literature-based analysis of sustainable innovative performance in Nigerian tech startups, examining its drivers, constraints, performance implications and ecosystem conditions within a dynamic yet institutionally unstable context. The study synthesises peer-reviewed literature, industry and ecosystem reports, policy documents, and documented secondary case evidence on startups such as Flutterwave, LifeBank, Thrive Agric, RecyclePoints, and Arnergy, using a deductive-inductive thematic analysis guided by the Triple Bottom Line and interpreted through resource-based, dynamic capabilities, and institutional theory perspectives. The synthesis identifies six key drivers of sustainable innovative performance alongside interconnected financial, infrastructural, regulatory, cultural, skills, and ESG-related constraints, and indicates that startups reported in the literature as integrating sustainability into their innovation processes are associated with stronger growth, survival, competitive differentiation, stakeholder trust, and resilience. The study contributes a context-sensitive conceptualisation of sustainable innovative performance and proposes a consolidated conceptual framework that links firm-level capabilities and ecosystem conditions to multi-dimensional startup performance, providing a foundation for future primary empirical research.

Keywords: Dynamic Capabilities, Nigeria, Sustainable Innovative Performance, Tech Startups, Triple Bottom Line.

1. Introduction

Sustainable innovation is increasingly recognised as a strategic approach for advancing social development, environmental sustainability and economic prosperity in developing economies such as Nigeria, particularly within technology-driven ventures (Agbeyangi, *et al.*, 2024; Florek-Paszkowska & Ujwary-Gil, 2025). As digital transformation accelerates and attention to challenges such as inequality and resource constraints grows, sustainable innovative performance has emerged as a key mechanism through which firms generate economic, environmental and social value. For inherently innovation-oriented yet resource-constrained tech

startups, embedding sustainability into innovation processes is becoming essential for achieving long-term competitiveness and resilience.

Nigeria hosts one of Africa's most vibrant and fastest-growing startup ecosystems, driven by sectors such as fintech, health-tech, edtech and e-commerce, but these ventures operate within a complex and often unpredictable institutional environment marked by infrastructural deficits, regulatory uncertainty and limited access to finance (Odeyemi, 2023). At the same time, rising investor expectations, global sustainability standards and digitally enabled business models intensify pressure

on startups to align innovation with sustainability goals. Within this context, sustainable innovative performance becomes not only a strategic necessity but also a pathway to differentiation and value creation in the Nigerian tech ecosystem. Despite rapid growth in global scholarship on sustainable innovation, there remains limited empirical and qualitative insight into sustainable innovative performance in African startup ecosystems, particularly in Nigeria (Ajah, 2023; Duve & Marx, 2025; Egere *et al.*, 2024). Existing work tends to focus on established firms in developed economies, overlooking the contextual, institutional and resource-based factors that shape innovation outcomes for startups in emerging markets and paying limited attention to how sustainability is practised and reflected in performance outcomes. Addressing this gap, the present study undertakes a qualitative analysis of sustainable innovative performance in Nigerian tech startups, examining key drivers, constraints and performance implications and exploring how startups weave sustainability into their innovation processes and how this, in turn, influences organisational performance. The study's contribution lies in drawing this fragmented evidence into a context-specific conceptualisation of sustainable innovative performance and a consolidated framework linking ecosystem conditions and firm-level capabilities to multi-dimensional startup outcomes, an integration largely absent from sustainability and entrepreneurship research focused on developed-economy firms. The four research questions correspond directly to the study's analytical structure, guiding, in turn, the identification of drivers and constraints, the assessment of performance implications, and the analysis of ecosystem conditions that together inform the conceptual model developed later in the paper.

Research Questions

What factors drive sustainable innovative performance in Nigerian tech startups?

What constraints hinder the achievement of sustainable innovative performance?

How does sustainable innovative performance influence startup growth and competitiveness?

What contextual and ecosystem conditions shape sustainable innovative performance in Nigerian tech startups?

2.0 Literature Review

2.1 Conceptualising Sustainable Innovative Performance in Nigerian Tech Startups

Sustainable innovative performance refers to the extent to which firms design and implement innovations that generate economic, environmental and social value over time (Kneipp *et al.*, 2019). In Nigerian tech startups, it captures how digital ventures integrate sustainability principles into products, services, processes and business models to enhance organisational performance while contributing to wider societal development (Kneipp *et al.*, 2019). Grounded in the Triple Bottom Line, it emphasises that long-term success depends on balancing people, planet, and profit through aligned social impact, environmental responsibility, and financial growth (Nogueira *et al.*, 2024). This moves beyond isolated green initiatives to embedding sustainability in core innovation activities such as digital solution design, platform architecture and ecosystem partnerships, with evidence showing that investments in environmental technologies, eco-efficient digital infrastructure and transparent sustainability reporting support sustainability outcomes and growth, contingent on access to technology, skilled human capital and finance (Amokomoyen *et al.*, 2025; Ibietela & Ibiba, 2025; Odunayo & Fagbemide, 2023).

More broadly, sustainable innovative performance encompasses social and

economic dimensions where startups develop solutions that advance financial inclusion, healthcare access and livelihoods for underserved groups (Alamandi, 2025; Olafare *et al.*, 2026). Effective integration of innovation and sustainability through targeted resource allocation, context-appropriate performance metrics and active ecosystem engagement strengthens resilience, growth and competitive advantage, while alignment with sustainability goals improves access to impact-oriented finance and market differentiation in global value chains (Adebayo *et al.*, 2026; Odunayo & Fagbemide, 2023; Gai *et al.*, 2025). At the same time, the depth and scalability of sustainability-oriented innovation in Nigerian tech startups remain strongly conditioned by ecosystem and institutional factors such as regulatory frameworks, infrastructure quality, access to finance and the availability of support mechanisms

2.2 Theoretical Framework

The theoretical review draws on four main perspectives to explain sustainable innovative performance in Nigerian tech startups: the Triple Bottom Line (TBL), the Resource-Based View (RBV), dynamic capabilities and institutional theory. TBL frames performance as the simultaneous pursuit of economic, social and environmental value, so sustainability is understood not as a peripheral activity but as embedded in core products, services and business models (Elkington, 1997). Sustainable innovative performance, therefore, captures the extent to which startups design and implement innovations that generate profit while also advancing social welfare and environmental stewardship over time. From an RBV perspective, startups that possess valuable, rare, inimitable and non-substitutable resources, such as mission-driven teams, sustainability-oriented cultures, proprietary digital platforms or deep community relationships, are better positioned to create

and sustain such multi-dimensional value through innovation (Barney, 1991).

Dynamic capabilities theory adds a process-oriented view, emphasising that startups must continually sense opportunities and threats, seize them through timely innovation and reconfigure resources in response to turbulence (Teece *et al.*, 1997). In Nigeria's volatile macroeconomic, infrastructural and regulatory environment, this capacity for agility, learning and adaptation is critical for mobilising and renewing sustainability-relevant resources, maintaining sustainability-oriented innovations and translating them into growth, resilience and competitiveness. Institutional theory, in turn, highlights how regulations, policies, funding logics, norms and ecosystem structures both enable and constrain these efforts (DiMaggio & Powell, 1983). Policy reforms, ESG-oriented finance and support organisations can encourage sustainability-focused innovation, yet infrastructure deficits, regulatory uncertainty and fragmented support systems often limit the systematic integration of sustainability into practice. Taken together, these four lenses suggest that sustainable, innovative performance emerges when startups build distinctive sustainability-related resources, develop dynamic capabilities to deploy them in TBL-aligned innovations, and skilfully navigate the institutional conditions of the Nigerian tech ecosystem. Differentiating their roles more explicitly, TBL supplies the normative definition of sustainable innovative performance; RBV explains which internal resources enable it; dynamic capabilities theory explains how startups adapt and renew these resources amid volatility; and institutional theory explains the external regulatory and ecosystem pressures that shape whether such performance can be achieved and sustained. This differentiated reading of the four perspectives directly informs the consolidated conceptual model developed

later in the study, in which firm-level capabilities and ecosystem conditions are positioned as joint antecedents of sustainable innovative performance.

2.3 Empirical Review of Sustainable Innovative Performance in Nigerian Tech Startups

Empirical studies increasingly identify sustainable innovative performance as a key driver of growth, resilience and competitiveness in startup and technology-intensive environments. In the Nigerian context, evidence shows that innovation capabilities and sustainability-oriented practices are positively associated with organisational performance, suggesting that ventures which deliberately embed sustainability into their innovation activities are better positioned for long-term success (Ibietela & Ibiba, 2025). Access to appropriate technology, skilled human capital and financial resources has been found to support innovation and, in turn, enhance performance, underscoring the importance of resource configurations and context-specific performance metrics in understanding how innovation contributes to growth and competitiveness (Ezema *et al.*, 2025; Odunayo & Fagbemide, 2023). Research further indicates that startups that integrate sustainability principles into their innovation culture and processes enjoy more stable growth, stronger stakeholder trust, and higher customer retention, particularly when they adopt user-centred design, collaborate with NGOs, utilise clean technologies, and engage in local sourcing (Rasheed *et al.*, 2025).

Digital innovation capability and novel business models have also been shown to improve organisational survival, customer retention and competitive positioning, although weak digital infrastructure and regulatory bottlenecks continue to constrain these gains in Nigeria (Chijioke & Onuoha, 2025; Olotu *et al.*, 2025). Startups that incorporate environmental considerations such as energy efficiency, waste reduction

and circular economy practices tend to achieve stronger sustainability outcomes and more favourable strategic positioning in green and impact-driven markets, indicating that sustainable innovative performance offers a substantive competitive advantage rather than merely reflecting ethical intent (Sharma & Subba, 2025). Beyond environmental aspects, evidence on innovation and resilience among Nigerian SMEs demonstrates that entrepreneurial innovativeness is positively linked to the ability to withstand shocks and adapt to turbulence, while innovation-related factors, including idea generation, new product development, operational efficiency and customer satisfaction are consistently associated with sustained startup performance (Ezema *et al.*, 2025; Oiku, 2024).

Overall, these studies suggest that sustainable innovative performance in Nigerian tech startups emerges from the interaction of internal capabilities, such as innovation culture, digital capacity and resource access, with external ecosystem conditions related to infrastructure, regulation, finance and support programmes, and that strategic alignment of innovation with social, environmental and economic objectives tends to yield superior outcomes in terms of growth, survival, resilience and stakeholder trust. Read critically, however, this evidence remains fragmented: most studies examine drivers, constraints or performance outcomes in isolation, draw on single-sector or single-firm accounts, and rarely specify how these elements combine into a coherent explanatory model. This gap motivates the literature-based synthesis undertaken here, which draws the fragmented evidence together into a single conceptual account of how firm-level capabilities and ecosystem conditions jointly shape sustainable innovative performance in Nigerian tech startups.

2.4 Case Studies of Sustainable Innovative Performance in Nigerian Tech Startups

The following case studies highlight examples of Nigerian tech startups with sustainable innovative performance business models.

Case Study 1: Flutterwave - Fintech Innovation for Inclusion and Scale

Flutterwave is a leading Nigerian fintech company that allows businesses and individuals across Africa to make and receive transactions. Flutterwave seeks to enhance financial inclusion by simplifying cross-border payments, integrating various payment channels, and supporting SMEs and digital entrepreneurs, thereby enhancing market efficiency and regional economic integration (Akintola, 2025; Olalekan et al., 2024). The platform helps small and medium businesses cut costs and enter new markets, as it lowers friction related to transactions.

Case Study 2: LifeBank – Health-tech for Access and Social Impact

LifeBank is a Nigerian health-tech startup that leverages digital platforms, data, and logistics technology to enhance access to essential medical supplies such as blood, oxygen and other necessary materials, connecting hospitals, blood banks, and logistics providers to reduce delays and information gaps in supply chains. Sustainable innovative performance in the LifeBank model is achieved through technological drivers such as real-time matching, digital dispatch and data-driven routing, combined with social value in the health sector and a scalable, revenue-generating business model that links social sustainability to organisational performance and growth (Faheem & Dutta, 2023).

Case Study 3: Thrive Agric - Agritech for Inclusive and Sustainable Livelihoods

Through the use of digital platforms, Thrive Agric, an agritech startup, links smallholder farmers with finance, inputs, and markets to stabilise incomes and reduce vulnerabilities resulting from shocks and stresses in

agricultural value chains. Farmers receive investment from people and organisations through the platform; they also get agronomic help and structured offtakes, which help them have more predictable and resilient livelihoods. According to Kanu & Przezbórska-Skobiej (2025), Thrive Agric enhances farmers' productivity and income, resulting in economic sustainability. In addition to improving food security and empowering rural farmers, Thrive Agric enhances social sustainability by enabling better resource allocation and improving farmers' capacity to adapt to shocks, reflecting sustainable innovative performance in the context of climate and market instability.

Case Study 4: RecyclePoints and Arnergy - Tech-Enabled Environmental Sustainability

RecyclePoints and Arnergy illustrate how Nigerian startups apply technology to achieve environmental sustainability while creating broader social and economic value. RecyclePoints uses a technology-enabled recycling and rewards platform to encourage households and organisations to sort and trade recyclables, thereby improving waste management, promoting a recycling culture, and generating green jobs, particularly in low-income communities (Izuchukwu *et al.*, 2025). This model demonstrates how environmental benefits can be combined with behavioural change and economic opportunities.

Similarly, Arnergy provides solar energy solutions through an energy-as-a-service model, reducing reliance on diesel generators, lowering emissions and improving energy reliability for homes and businesses (Mujeeb *et al.*, 2025), while enhancing access to electricity in underserved areas and improving operational efficiency.

These five cases illustrate how digitalisation is described, in the ecosystem and industry literature, as supporting financial inclusion, healthcare access, sustainable agriculture,

waste reduction and clean energy alongside growth, competitiveness and resilience. They are used in this study as illustrative secondary examples of how sustainability-oriented innovation is reported in the Nigerian tech ecosystem.

3. Methodology

3.1 Research Design and Approach

This study is an integrated qualitative literature synthesis based on a systematic literature search to examine sustainable innovative performance in Nigerian tech startups. The approach combines qualitative synthesis of academic literature, industry and ecosystem reports, policy documents, and documented case evidence on leading Nigerian tech startups. This design is appropriate for exploring a dynamic, context-sensitive phenomenon in which empirical work is emerging but still fragmented, and in which ecosystem, institutional, and firm-level factors interact in complex ways. All findings reported in the sections that follow represent a thematic synthesis of secondary evidence and should be read as a reasoned interpretation of the existing literature rather than as direct empirical observation of firm practices.

3.2 Data Sources and Selection Criteria

An extensive review of academic and grey literature published between 2000 and 2025, with emphasis on recent studies (2015–2025), was conducted to examine innovation, sustainability and startup performance in Nigeria and comparable emerging economies. Academic sources were obtained from Scopus and Google Scholar, focusing on peer-reviewed journal articles, conference papers and scholarly publications relating to sustainable innovation, digital entrepreneurship, technology ventures and organisational performance. Grey literature sources included industry reports, ecosystem analyses, policy documents and impact assessments relevant to the Nigerian technology ecosystem.

The literature search was conducted between March and August 2026 using combinations of the keywords “sustainable innovation”, “sustainable innovative performance”, “tech startups”, “digital entrepreneurship”, “technology ventures”, “Nigeria”, and “Sub-Saharan Africa”. Boolean operators (AND, OR) were used to construct search strings such as: (“sustainable innovation” OR “sustainable innovative performance”) AND (“tech startups” OR “digital entrepreneurship” OR “technology ventures”) AND (“Nigeria” OR “Sub-Saharan Africa”).

The search yielded approximately 585 records across both databases. After duplicate removal, 490 unique records remained for title and abstract screening. Of these, 125 documents were considered potentially relevant and were subjected to full-text review.

Studies were included if they: (i) examined innovation, sustainable innovation, sustainability, entrepreneurship or organisational performance; (ii) focused on technology startups, digital ventures, entrepreneurial firms or closely related contexts; (iii) examined Nigeria, Sub-Saharan Africa, or comparable emerging-market environments; and (iv) were published as peer-reviewed journal articles, conference papers, books, policy documents, industry reports or other credible institutional publications available in English.

Studies were excluded if they: (i) focused exclusively on large established corporations without relevance to startups or entrepreneurial ventures; (ii) addressed non-technology sectors without clear implications for innovation or startup performance; (iii) were purely opinion-based and lacked empirical, conceptual or documentary support; (iv) were duplicate records; or (v) provided insufficient information to support thematic analysis. Grey literature sources were additionally

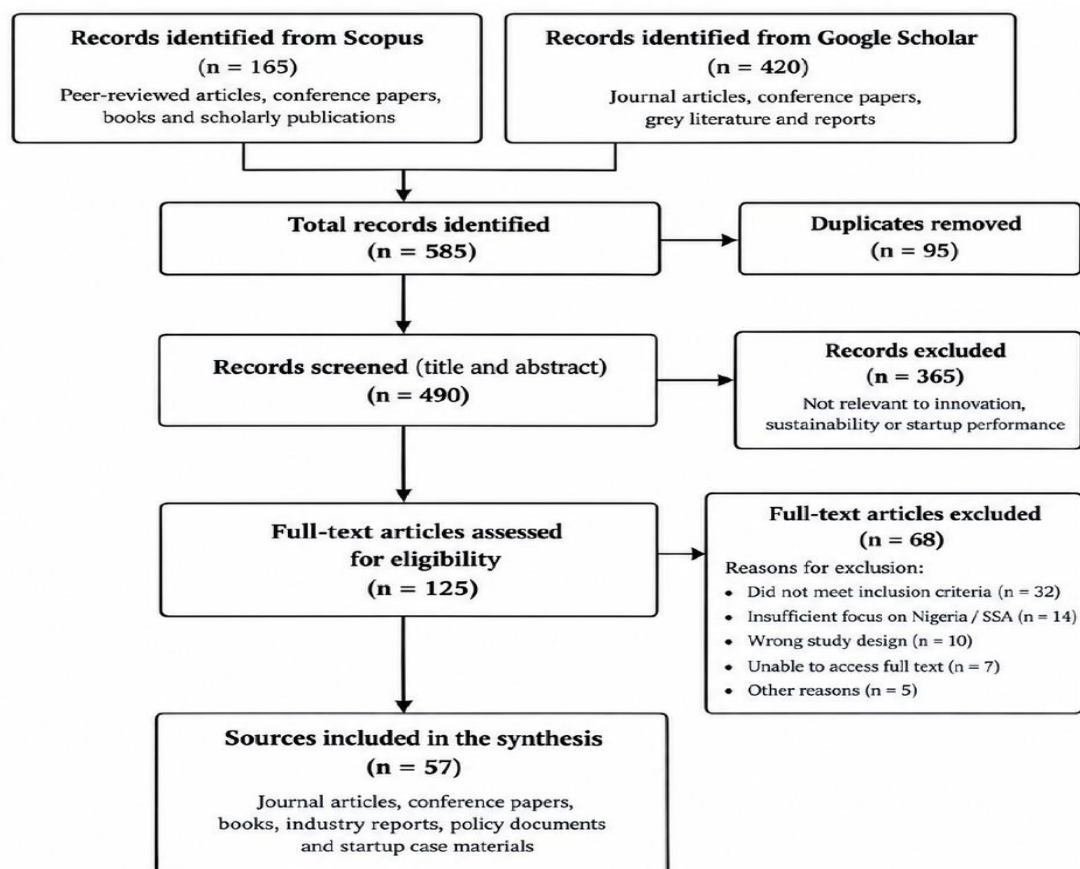
assessed for author credibility, methodological transparency and consistency with other evidence sources before inclusion.

Following full-text assessment against these criteria, 57 sources were retained for the final synthesis. Titles and abstracts were initially screened for relevance to innovation, sustainability and startup performance, while full texts were

subsequently assessed for methodological and contextual suitability. Emphasis was placed on studies published between 2015 and 2025 to capture recent developments in the Nigerian technology ecosystem, while seminal theoretical works published before 2015 were retained where necessary to provide conceptual and theoretical grounding.

Figure 1

Source-Selection Process for the Thematic Synthesis



3.3 Case Evidence on Nigerian Tech Startups

The study incorporates documented secondary case evidence of selected Nigerian tech startups to provide deeper contextual insight into sustainable innovative performance. These cases were purposively selected from industry reports, ecosystem mappings and “tech-for-good” compilations, with attention to sectoral

diversity across fintech, health-tech, agritech, waste management and clean energy. The selected startups include Flutterwave in fintech, LifeBank in health-tech, Thrive Agric in agritech, RecyclePoints in waste management and Arnergy in clean energy, each representing different applications of innovation aligned with sustainability objectives. Specifically, cases were selected on the basis of (i)

consistent and repeated appearance in Nigerian tech ecosystem reports and ‘tech-for-good’ compilations as examples of sustainability-oriented innovation, (ii) coverage of a distinct, high-priority sector so as to capture sectoral breadth rather than depth within a single industry, and (iii) availability of sufficiently detailed secondary documentation to support thematic analysis. The five cases are therefore treated as illustrative exemplars of how sustainability-oriented innovation is discussed in the ecosystem literature, not as a representative or random sample, and the findings drawn from them should not be read as evidence of these startups’ superior or causal performance relative to unexamined peers.

Information on these ventures was sourced from ecosystem reports, impact assessments and reputable industry analyses that describe their business models, innovation practices and sustainability outcomes. Although these cases are not based on primary fieldwork, they serve as illustrative secondary evidence showing how sustainable innovative performance is operationalised within the Nigerian tech ecosystem.

3.4 Data Analysis and Thematic Synthesis

All materials were analysed using qualitative thematic analysis combining deductive and inductive coding. The deductive approach was guided by the Triple Bottom Line dimensions of economic, social, and environmental performance, alongside the concept of sustainable, innovative performance, while the inductive approach allowed themes to emerge around key drivers, constraints, and strategic or performance implications. Coding followed a structured, phase-based thematic analysis procedure comprising familiarisation with the corpus of academic, policy and industry sources; generation of initial codes; searching for candidate themes; reviewing and refining themes against the coded extracts; and defining and

naming the themes reported in Sections 4 and 5. Coding was conducted manually using a structured, spreadsheet-based coding matrix in which excerpts from each source were tagged against the TBL-derived deductive codes (economic, social and environmental value) and against inductively generated codes for drivers, constraints, performance outcomes and ecosystem conditions.

The analysis was applied across academic studies, policy and ecosystem reports, and startup case evidence, enabling the identification of recurring patterns and context-specific insights within Nigerian tech startups. The Triple Bottom Line framework provided a consistent lens for examining how innovation activities relate to economic, social and environmental outcomes. To support the trustworthiness of the resulting themes, coding decisions and emerging themes were periodically cross-checked between the two authors, with disagreements resolved through discussion and, where necessary, re-examination of the original source material; this investigator triangulation supplements the source triangulation described in Section 3.5.

3.5 Triangulation and Validity Considerations

To enhance credibility, the study employed methodological triangulation by integrating evidence from academic research, industry and ecosystem reports, and policy documents. Findings from quantitative and survey-based studies were compared with ecosystem analyses and documented startup cases, allowing convergences and divergences to refine emerging themes.

Although reliance on secondary data limits the capture of firm-specific and recent developments, the breadth of sources provides a comprehensive and multi-layered understanding of sustainable innovative performance in Nigerian tech startups, supporting the analysis of its key drivers, constraints and strategic implications.

4. Findings and Discussion

The themes presented below emerged from the thematic synthesis described in Section 3 and represent recurring patterns identified across the reviewed academic, policy, ecosystem and case-based sources, rather than new primary evidence collected by the authors. Where a claim is drawn directly from a cited source, this is indicated by the accompanying citation; where the discussion moves beyond the cited evidence to draw out implications or connections across sources, this reflects the authors' interpretation. The five case startups discussed throughout are used illustratively, to show how the identified drivers, constraints and outcomes appear to operate in specific, well-documented Nigerian ventures, and should not be read as a representative sample or as evidence that these startups outperform others in the ecosystem.

4.1 What Factors Drive Sustainable Innovative Performance in Nigerian Tech Startups?

4.1.1. Ecosystem Regulation, Policy, and Support Structures

Tech startups in Nigeria are shaped more by innovation-focused policies, digital infrastructure and ecosystem support than by traditional sectoral policies such as National Renewable Energy and Energy Efficiency Policy (NREEEP). Government policies, R&D incentives, startup support programmes and enabling environments such as incubators and hubs positively influence innovation and organisational performance (Odunayo & Fagbemide, 2023). Frameworks linked to the Nigerian Startup Act also help reduce regulatory uncertainty, improve access to incentives and strengthen intellectual property protection, enabling startups to scale innovation more effectively (Okolie & Akwiwu, 2023).

For impact-oriented ventures such as Arnergy and RecyclePoints, alignment with sustainability priorities including energy

access, waste management and the SDGs enhances access to climate and ESG-focused funding, further strengthening their innovative performance (Elechi *et al.*, 2025; Muhammad *et al.*, 2026).

4.1.2. Market and User Demand for Inclusive, Digital, and Sustainable Solutions

Customer and user demand for inclusive, accessible, and responsible digital solutions is a core external driver of sustainable, innovative performance in Nigerian tech startups. According to Hamou *et al.* (2025), startups thrive by addressing latent demand for financial inclusion, affordable services, and seamless user experiences, as seen in the payments, health-logistics and agrifinance cases discussed in Section 2.4. This problem-driven demand for health, livelihoods, inclusion, and reliability pushes startups to innovate in ways that embed social value creation in their offerings, thereby enhancing both market relevance and performance outcomes (Sharma & Subba, 2025).

4.1.3. Technological Capabilities and Digital Innovation Capacity

Technological advancement and digital innovation capabilities are central internal drivers of sustainable innovative performance. Studies on digital entrepreneurship and organisational survival in Nigerian fintech firms show a strong, significant relationship between digital innovation capability, digital business model innovation, and organisational survival, including business continuity and customer retention (Ajah, 2023; Chijioke & Onuoha, 2025). Likewise, research on innovation and organisational performance in Nigerian startups finds that access to technology, human capital, and financial resources positively influences innovation and, by extension, performance. In practice, the case startups examined in this study leverage software, platforms, data analytics, and IoT to deliver scalable solutions, enabling them to optimise

resource use, personalise services, monitor impact, and iterate rapidly, key features of highly sustainable, innovative performance in volatile environments.

4.1.4. ESG Orientation, Impact Logic, and Responsible Innovation

For many Nigerian tech startups, ESG (Environmental, Social, and Governance) orientation and broader impact logic function as important enablers of sustainability-oriented innovation. According to Adebisi et al. (2025), Nigerian tech startups embracing ESG highlight that ventures aligning products and processes with climate resilience, liveability, safety, and environmental sustainability, such as the waste-management and clean-energy cases discussed in Section 2.4, are better positioned to attract global and impact-oriented investors and to build long-term legitimacy. These orientations encourage startups to design innovations that deliver measurable social and environmental outcomes alongside commercial performance, thus strengthening their sustainable innovative performance profile and appeal to ESG-sensitive stakeholders (Adiguzel & Sonmez Cakir, 2025; Zahra et al., 2025).

4.1.5. Strategic Orientation, Leadership, and Intangible Capabilities

Innovation sustainability management in Nigerian startups underscores the strategic importance of intangible capabilities such as innovation culture, leadership commitment, agility, and adaptability in driving sustainable product and process development (Ibietela & Ibiba, 2025). Startups with strong innovation culture and agile processes are better able to align their offerings with user needs, integrate sustainability considerations, and pivot in response to ecosystem shocks (Kharbeet et al., 2026), with agility and adaptability shown to mediate the relationship between innovation and performance in Nigerian ICT and agribusiness startups more broadly (Ayodele et al., 2019). This leadership

commitment to purpose-driven missions, evident among the case startups discussed in Section 2.4, shapes organisational priorities, partnerships, and innovation trajectories, underpinning their sustainable innovative performance.

4.1.6. International Capital, Standards, and Networks

International influence through foreign venture capital, global standards, and transnational networks acts as a powerful driver. The Nigerian startup ecosystem is heavily fuelled by foreign VCs and impact investors whose expectations often include attention to ESG, governance quality, and scalable impact (Egere et al., 2024). Reports on ESG and sustainable finance in Nigeria show that a growing share of foreign capital requires ESG alignment, pushing firms to adopt sustainability metrics, governance structures, and impact reporting (Owoeye, 2025). For Nigerian tech startups, participation in regional and global accelerator programmes, impact funds, and climate-tech initiatives exposes them to global norms in sustainability and innovation management, encouraging more structured approaches to impact measurement, responsible data practices, and environmental stewardship. This international exposure reinforces the integration of sustainability and performance in innovation activities, particularly in climate-tech and impact-oriented ventures.

4.2 What Constraints Hinder the Achievement of Sustainable Innovative Performance in Nigerian Tech Startups?

4.2.1. Funding Constraints and Capital Structure

Access to sufficient, appropriately structured finance remains one of the most critical constraints on Nigerian tech startups. While a few high-profile ventures attract substantial venture capital, many early-stage startups struggle with limited access to seed and growth capital, high cost of borrowing, collateral requirements, and

investor risk aversion, particularly outside Lagos and major hubs (Egere et al., 2024). Ajah (2023) reports that many founders cite restricted access to capital, scarce bank finance, and limited accelerator or grant opportunities as major barriers to launching, scaling, and sustaining operations. For startups seeking to embed sustainability into their innovations, this constraint is amplified because sustainability-oriented models often require higher upfront investment, longer payback periods, and impact-measurement capabilities that many local investors do not yet fully price in, resulting in under-investment in R&D and reliance on short-term survival strategies rather than long-term, sustainable, innovative performance.

4.2.2. Infrastructure Deficits and Digital Fragility

Persistent infrastructure deficits, including unreliable electricity, inadequate broadband coverage, and weak physical logistics networks, directly constrain the ability of tech startups to innovate and scale sustainably. Findings from research on digital entrepreneurship and organisational survival in fintech firms highlight how fragile digital infrastructure undermines startups' capacity to maintain service quality, retain customers, and sustain innovation cycles (Chijioke & Onuoha, 2025). For platform-dependent and data-intensive ventures, outages and connectivity gaps translate into downtime, higher operating costs, and reputational risk, while logistics- and grid-dependent ventures face higher transaction costs serving dispersed or low-income markets, making it harder to deliver consistent value and to capture the full economic, social, and environmental benefits of their innovative models.

4.2.3. Regulatory Uncertainty and Compliance Burden

The regulatory environment for Nigerian tech startups is characterised by policy volatility, overlapping mandates, and inconsistent enforcement, which together

create uncertainty for long-term innovation and investment. *Muhammad et al.* (2026) note that, despite recent reforms, startups still face regulatory bottlenecks, bureaucratic registration processes, multiple taxation, and ambiguous sector-specific rules, especially in fintech and data-driven sectors. Evidence from Nigeria's fintech and digital sectors further shows that regulatory uncertainty, high compliance costs, and lengthy approval timelines weigh heavily on startups' ability to innovate and bring products to market quickly (Nnebuihe & Ogu, 2025; Puja, 2025). Compliance costs and unpredictable regulatory timelines are widely reported in this literature as a significant drag on innovation capacity and time-to-market for Nigerian fintech and data-driven ventures, although precise, independently verifiable industry-wide figures remain scarce and are therefore not reproduced here. For ventures seeking to deliver sustainability-oriented solutions, unclear or outdated regulations can also limit access to incentives or create risk perceptions that deter both founders and investors.

4.2.4. Organisational Culture, Short-Termism, and Risk Aversion

At the firm level, organisational culture and managerial mindset can significantly hinder sustainable innovative performance. Many founders and managers perceive sustainability initiatives as costly or non-essential, particularly under short-term survival pressures in a volatile economic environment (Duve & Marx, 2025; Ikyabo et al., 2026). This short-term focus reduces investment in impact measurement, environmental improvements and community-oriented initiatives, while risk aversion discourages experimentation with sustainable business models. As a result, an emphasis on immediate profitability and rapid scaling often limits the integration of social and environmental goals into innovation processes, constraining

sustainable innovative performance despite available capabilities.

4.2.5. ESG and Sustainability Integration Challenges

Despite increasing attention to ESG and sustainability in Nigeria, their systematic integration into startup operations remains limited. Many tech startups continue to prioritise financial growth over environmental sustainability, climate resilience and structured social impact measurement, while low awareness, weak data systems and the absence of standardised reporting frameworks further constrain adoption (Owoeye, 2025). As a result, even when startups generate meaningful social or environmental value, they often struggle to effectively capture, communicate and optimise these outcomes, limiting their ability to signal sustainable innovative performance to key stakeholders such as investors and regulators.

4.3 How Does Sustainable Innovative Performance Influence Startup Growth and Competitiveness?

4.3.1. Growth, Survival, Resilience, and Competitive Advantage

Higher levels of innovation capability in Nigerian startups are strongly associated with improved performance, competitiveness, resilience and growth prospects, as firms that engage in systematic product, process and marketing innovation tend to outperform others (Odunayo & Fagbemide, 2023). Digital innovation capabilities and adaptive business models enhance organisational survival by supporting business continuity, customer retention and responsiveness to changing conditions, allowing startups to maintain operations, adapt their offerings and serve underserved markets during disruptions (Liu et al., 2024). When innovation is aligned with social and environmental problem-solving, startups also become embedded in critical value chains, increasing their relevance and stability within the ecosystem. This combination of

adaptive capacity and clear value propositions strengthens competitive positioning and supports sustained growth within the Nigerian tech ecosystem.

4.3.2. Resource Efficiency, Cost Structure, and Operational Performance

Sustainable innovative performance often leads to improved resource efficiency, reduced operating costs and enhanced processes, particularly using technology and data-driven optimisation. Firms that adopt eco-efficient technologies and innovative processes tend to achieve cost savings, better operational performance and increased profitability alongside environmental benefits (Majid *et al.*, 2023). In the Nigerian tech context, digital platforms and optimisation tools help reduce operational inefficiencies, thereby improving unit economics and service delivery. These gains enhance reliability, affordability and impact, thereby strengthening competitiveness and supporting long-term growth.

4.3.3. Regulatory, Investor, and Stakeholder Legitimacy

As ESG and sustainability finance become more prominent in Nigeria, startups that demonstrate sustainable innovative performance increasingly attract support from impact investors, development finance institutions and ESG-focused funds, with mechanisms such as impact investing and green bonds favouring ventures that combine financial returns with social and environmental value (Kandpal et al., 2024; Owoeye, 2025). This same credibility extends beyond financing: firms with demonstrable social and environmental commitments build stronger relationships with customers, regulators and communities, as ESG-oriented practices enhance transparency and accountability and thereby foster trust and reputation. For tech startups operating with limited formal marketing capacity, this relational capital, evidenced through improved livelihoods, better services or environmental benefits,

drives customer loyalty and partnership opportunities, reinforcing the financial and reputational advantages of sustainability-oriented innovation over firms without such commitments.

4.4 What Contextual and Ecosystem Conditions Shape Sustainable Innovative Performance in Nigerian Tech Startups?

4.4.1. Geographic Concentration and Urban Tech Hubs

Nigerian tech activity is heavily concentrated in urban hubs, particularly Lagos, which hosts the majority of startups, attracts most foreign investment and offers strong network effects, talent availability and access to capital. This concentration enables startups to scale more easily but also introduces challenges such as high operating costs, congestion and intense competition for skilled labour. In contrast, startups operating in secondary cities or rural areas face weaker infrastructure and limited market depth, requiring alternative approaches such as decentralised operations and innovative financing models to sustain performance and growth.

4.4.2. Infrastructure, Digital Connectivity, and Operating Environment

As discussed in Section 4.2.2, unreliable electricity, limited broadband and weak logistics networks remain a critical ecosystem-level constraint, reducing system reliability and limiting the scalability of sustainability-oriented solutions in sectors such as waste and energy. Startups therefore develop adaptive strategies, including distributed operations and hybrid models, to sustain innovation within this constrained environment.

4.4.3. Policy, Regulation, and the Nigerian Startup Act

As outlined in Sections 4.1.1 and 4.2.3, the policy and regulatory environment, particularly the Nigeria Startup Act and complementary state-level initiatives, shapes sustainable innovative performance by offering clearer regulations and

incentives on one hand, while implementation gaps, multiple taxation and regulatory complexity create uncertainty and compliance burdens on the other. For impact-driven ventures, alignment with energy, waste and ESG policies can facilitate access to concessional finance, although fragmented regulation still limits the full realisation of these opportunities.

4.4.4. Funding Landscape, Investor Preferences, and Sustainability Finance

Building on the funding constraints discussed in Section 4.2.1 and the international capital dynamics noted in Section 4.1.6, the funding environment strongly shapes which innovations Nigerian startups pursue: capital remains concentrated in fintech and Lagos-based ventures focused on rapid growth, and although impact investors and ESG-focused funds increasingly support ventures with social and environmental value, persistent funding gaps and operational costs still push many early-stage startups toward short-term survival over long-term sustainable innovation.

4.4.5. Market Structure, Demand Conditions, and Inclusion Gaps

The structure of local markets and the presence of large underserved populations create strong incentives for sustainable innovative performance in Nigerian tech startups. Gaps in financial inclusion, healthcare access, agricultural productivity, and energy supply generate opportunities for startups to develop solutions that address these unmet needs. These structural conditions enable startups to simultaneously create new markets and tackle persistent development challenges. As a result, when supported by adequate funding, infrastructure and regulation, such environments can significantly enhance the potential for sustainable innovative performance.

4.4.6. Ecosystem Coordination, Platforms, and Support Organisations

Ecosystem coordination and support structures, such as hubs, accelerators, co-working spaces and public-private partnerships, play a critical role in enabling sustainable innovative performance. These platforms facilitate knowledge sharing, mentoring and market access, while structured programmes help startups refine business models, strengthen governance and engage with ESG and impact measurement practices (Adebayo *et al.*, 2026).

Participation in local and global networks further supports the scaling of sustainability-oriented innovations, whereas weak coordination, particularly outside major hubs, limits the ability of startups to achieve and sustain such performance.

4.5 Toward a Consolidated Conceptual Model of Sustainable Innovative Performance

The six drivers identified in Section 4.1 can be consolidated into a single conceptual model in which ecosystem-level conditions (regulation and policy support, market and user demand, and international capital and standards) and firm-level capabilities (technological and digital capacity, ESG and impact orientation, and strategic leadership and intangible capabilities) jointly function as antecedents of sustainable innovative performance. Consistent with the theoretical framework in Section 2.2, the Resource-Based View explains how firm-level capabilities are built and protected, dynamic capabilities theory explains how startups sense, seize and reconfigure these capabilities in response to the constraints identified in Section 4.2, and institutional theory explains how ecosystem conditions enable or restrict this process. Within this model, sustainable innovative performance functions as the mediating construct through which capabilities and ecosystem

conditions are converted into the performance outcomes discussed in Section 4.3, namely growth, resource efficiency, alignment with regulatory and investor expectations, stakeholder trust, and resilience, moderated throughout by the contextual and ecosystem conditions examined in Section 4.4. This consolidation is offered as a conceptual synthesis of the patterns identified in the reviewed literature and case evidence, intended to guide future primary research rather than as a statistically validated causal model.

Discussion

Overview of Sustainable Innovative Performance in Nigerian Tech Startups

The findings indicate that sustainable innovative performance is increasingly embedded in how Nigerian tech startups design and scale their innovations, rather than being a peripheral activity. Digital innovation enables ventures to generate economic, social and, in some cases, environmental value simultaneously, reflecting a Triple Bottom Line orientation. Overall, sustainable innovative performance is shaped by the interaction of internal capabilities, such as digital capacity and leadership, and external ecosystem conditions, including regulation, infrastructure and funding. This positions it as a strategic asset that drives multi-dimensional performance in the Nigerian tech ecosystem.

Internal Drivers and the Resource-Based View (RBV)

From an RBV perspective, the results highlight the centrality of firm-specific capabilities and resources in driving sustainable innovative performance. Startups that possess strong digital innovation capabilities, robust platform architectures, and mission-oriented leadership are better able to transform sustainability opportunities into defensible performance advantages: the case startups' technology platforms and data assets, described in Section 2.4, are not easily

replicable, reflecting cumulative investments in technology, data, human capital, and partnerships. These resource bundles underpin their ability to deliver scalable, impact-oriented solutions and to withstand competitive and environmental shocks, consistent with RBV arguments that valuable, rare, inimitable, and well-organised resources support superior performance. The evidence also shows intangible capabilities such as innovation culture, agility, learning orientation, and leadership commitment to purpose mediate the translation of innovation inputs into performance outcomes, with agile, socially and environmentally driven leadership more likely to embed and sustain sustainability within innovation processes over time.

Institutional Pressures, Ecosystem Conditions, and Constraints

The study underscores that institutional and ecosystem conditions are central to sustainable innovative performance, consistent with institutional theory and entrepreneurial ecosystem perspectives. Policy reforms such as the Nigeria Startup Act, the expansion of innovation hubs and the growth of ESG and impact-oriented finance create enabling signals and resources for sustainability-oriented innovation, yet persistent infrastructure deficits, regulatory complexity, fragmented coordination and skills gaps continue to constrain startups' ability to deliver and scale these innovations. Regulatory uncertainty and compliance burdens in fintech and data-intensive sectors divert managerial attention, while fragile power, broadband, logistics, and waste or energy systems force startups to invest heavily in coping strategies rather than experimenting with new sustainability features.

The findings also point to ESG and sustainability integration challenges: although many startups generate clear social or environmental benefits, formal impact measurement, ESG reporting and structured

sustainability strategies remain underdeveloped beyond the most visible ventures. This weakens their ability to credibly signal sustainable, innovative performance to investors, regulators, and partners, and reflects institutional environments where ESG standards, incentives, and data infrastructures are still emerging.

Sustainable Innovative Performance, Growth, and Competitiveness

The results strongly suggest that sustainable, innovative performance is tightly linked to startup growth, survival, and competitive positioning, with higher innovation capability associated with improved performance, resilience, and competitiveness in turbulent environments. Digital innovation capabilities and adaptive business models are particularly important for navigating uncertainty and sustaining operations over time.

The case startups discussed in Section 2.4 illustrate how impact-oriented innovation pathways can underpin competitive advantage, turning gaps in payments, health logistics, agrifinance, waste management and clean energy into defensible markets. This shows that market creation, diversification, and stakeholder trust often emerge when sustainability is central to the innovation logic rather than incidental, thereby strengthening access to impact capital, partnerships, and long-term relevance.

Shared Value, ESG Logic, and Stakeholder Relationships

The evidence aligns with shared value and ESG perspectives, which argue that firms can achieve economic success by addressing societal problems in commercially viable ways. Nigerian tech startups working on financial inclusion, health access, sustainable agriculture, waste reduction and clean energy show that creating value for underserved users and communities can closely reinforce startup performance.

Stakeholder trust and reputation emerge as key channels through which sustainable, innovative performance translates into organisational outcomes, as credible improvements in payments, health, farmer incomes, waste reduction, or clean energy deepen relationships with customers, communities, regulators, and investors. This relational capital supports retention, word-of-mouth and partnerships, especially where marketing budgets are limited, and institutions are weak, yet many startups are still early in their ESG journey and lack formal structures for reporting, governance and risk management, which may constrain their appeal to some institutional investors over time.

Dynamic Capabilities and Resilience under Volatility

The Nigerian tech ecosystem is marked by macroeconomic volatility, regulatory shifts, and infrastructural fragility, making dynamic capabilities essential. The study's findings emphasise that agility, experimentation, and adaptation are central to how sustainable innovative performance is maintained over time. According to Durman et al. (2025), firms with stronger digital innovation capabilities and flexible business models are better able to withstand shocks, maintain continuity, and retain customers, reinforcing arguments from dynamic capabilities theory about the importance of sensing, seizing, and reconfiguring in turbulent environments. The LifeBank and Arnergy cases, operating in mission-critical health and energy domains, illustrate how sustainability-oriented solutions can become embedded in essential infrastructures, enhancing both societal resilience and strategic indispensability.

Ecosystem Logics and Contingency: Why Context Matters

The analysis adopts a contingency perspective, showing that sustainable innovative performance in Nigerian tech startups is shaped by context-specific

ecosystem conditions rather than sector alone. Factors such as geographic location, funding models and market structure influence how startups innovate and scale, with urban hubs benefiting from stronger networks and access to capital, while others rely more on impact finance and adapt to infrastructural and market constraints. As a result, there is no single pathway to achieving sustainable innovative performance, as outcomes depend on how well startups align their capabilities and strategies with their operating environment. Building on these insights, and consistent with the consolidated conceptual model presented in Section 4.5, the study positions sustainable innovative performance as the link between firm-level capabilities and ecosystem conditions, ultimately driving multi-dimensional performance outcomes within the Nigerian tech ecosystem.

5. Conclusion and Recommendation

This study has presented a qualitative, literature-based synthesis of sustainable innovative performance in Nigerian tech startups, examining its drivers, constraints, performance implications and ecosystem conditions. Theoretically, the study contributes a context-sensitive conceptualisation of sustainable innovative performance for African startup ecosystems and the consolidated framework presented in Section 4.5, which links firm-level capabilities, drawing on the Resource-Based View and dynamic capabilities theory, and ecosystem conditions, drawing on institutional theory, to multi-dimensional performance outcomes. In practical and policy terms, the synthesis suggests that digital innovation capabilities, mission-oriented leadership and ESG orientation help startups such as Flutterwave, LifeBank, Thrive Agric, RecyclePoints and Arnergy translate sustainability opportunities into growth and resilience, while policy reforms, infrastructure investment and more consistent regulatory

implementation remain necessary to widen this trajectory beyond a small set of well-documented ventures. These conclusions are drawn entirely from secondary literature and illustrative case evidence rather than from primary fieldwork, and should therefore be read as a conceptual synthesis that motivates, rather than substitutes for, direct empirical investigation of Nigerian tech startups.

Recommendations

Drawing directly on the drivers and constraints identified in Sections 4.1 and 4.2, startup founders and managers should embed sustainability within their core innovation strategies by designing commercially viable solutions that address social and environmental challenges, while building strong digital and organisational capabilities in areas such as data analytics, platform scalability and agile management. Adopting basic ESG and impact measurement practices will help them track and communicate their contributions more clearly, strengthening credibility and access to impact-oriented finance.

In response to the ecosystem and institutional constraints identified in Sections 4.2 and 4.4, investors, support organisations and policymakers should reinforce this direction by incorporating sustainability indicators into investment decisions and expanding impact-focused accelerators, mentorship and technical support, especially in capital-intensive sectors such as agritech, waste management and clean energy. Governments also need to

implement startup and sustainability policies consistently, reduce regulatory uncertainty and invest in critical infrastructure and innovation support systems to lower the cost of developing and scaling sustainability-driven digital solutions.

Limitations and Suggestions for Future Research

This study adopts an integrated qualitative synthesis of secondary sources, including academic literature, ecosystem reports, policy documents, and selected startup cases, which enables a broad and multi-layered understanding of sustainable innovative performance in Nigerian tech startups. However, the approach is limited in its ability to capture firm-specific dynamics, rapidly evolving strategies and internal decision-making processes, and the case illustrations are indicative rather than generalisable.

Future research should address these limitations through primary qualitative methods, such as interviews and ethnographic studies, and by developing quantitative measures that link sustainability-oriented innovation practices and ESG capabilities to performance outcomes. Comparative studies across locations, sectors, and ecosystem configurations would further deepen understanding of how sustainable, innovative performance can be effectively developed and scaled in Nigeria and similar emerging economies.

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